Oracle® Utilities Customer Program Management Cloud Service

User Guides

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Oracle Utilities Customer Program Management Cloud Service User Guides, Release 26.10

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Part I

Oracle Utilities Customer Program Management Cloud Service User Guides

Oracle Utilities Customer Program Management Cloud Service shares significant functionality with Oracle Utilities Work and Asset Management. As such, both use the same user documentation. Oracle Utilities Customer Program Management Cloud Service User Guides comprise the following:

- Oracle Utilities Work and Asset Management Business User Guide
- Oracle Utilities Application Framework Administrative User Guide
- Oracle Utilities Work and Asset Management Administrative User Guide
- Oracle Utilities Cloud Service Foundation Administrative User Guide

Refer to Oracle Utilities Customer Program Management Cloud Service / Customer Program Management in the *Business User Guide* and Defining Oracle Utilities Customer Program Management Cloud Service / Customer Program Management Options in the *Administrative User Guide* for more specific information related to Oracle Utilities Customer Program Management Cloud Service.

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Part II

Work and Asset Management Business User Guide

Welcome to the Oracle Utilities Work and Asset Management / Operational Device Management Business User Guide. This document is used with the following products:

- Oracle Utilities Work and Asset Management
- Oracle Utilities Operational Device Management
- Oracle Utilities Customer Program Management
- Oracle Utilities Work and Asset Cloud Service
- Oracle Utilities Customer Program Management Cloud Service

This guide describes business process-related features and functionality, including:

- Overview
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Overview

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About Oracle Utilities Work and Asset Management

Oracle Utilities Work and Asset Management provides functionality to handle large volumes of assets and to manage the receipt, installation, maintenance, tracking, and removal of those assets. The system also manages approval processing, tracks purchasing transactions, manages inventory and resources, and tracks costs, accounting, and financial transactions.

The system manages the following main functional areas:

- **Home Page**: The home page provides a comprehensive dashboard where you can access information you need to review and complete your work. For example, the **Main** tab can be configured to display your key work areas; crews or buyers that you monitor, approval summary, your bookmarks or saved searches, and so on. Additional tabs provide easy access for approvers, planners, executives, and others to information and to review organizational functions and complete work.
- **Approvals**: One of the ways that the system simplifies and speeds up work is by routing records when they require approval. Approval requests use approval profiles to determine the properties and requirements for the approval. Approvers can use the **Approval Dashboard** to manage the approvals that require their attention.
- **Assets**: Asset management provides functionality to track the purchase, repair, and maintenance of assets and asset components using general work management processing, preventive maintenance techniques, purchase processing, and inventory tracking. The system also allows organizations to record asset measurements and perform asset inspections in addition to the standard maintenance that is performed on assets.
- **Financial Transactions** : The system tracks transactions that incur costs, including purchasing and procurement costs, inventory and stocking costs, and cost associated with the labor, equipment, and materials that are incurred when completing work.
- **Inventory**: Inventory is tracked, ordered, and received from vendors and allocated in the **Inventory** system. As inventory is allocated to work, the system passes this information back to the **Work Management** system so that maintenance managers and crews know that their parts are available.
- **Preventive Maintenance**: Maintenance type work on assets is a proactive way to care for and maintain proper functioning of an asset. This type of work can include inspections, repairs, replacements and so on. Maintenance schedules and triggers identify the type of asset needing maintenance and triggers tell the system when the asset is due for maintenance.
- **Purchasing**: Purchasing functions can be used to plan, initiate, and process purchases and purchasing contracts from requisition to invoicing. The system also manages vendors, designated buyers, and stock items.

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- **Resource Management**: Resources encompass any object that contributes to the running of your organization. This includes crews and crew shifts, employees, equipment, contacts, documents, standard notes and attachments, and so on.
- **Work Management**: Work management is the process by which work orders are requested, approved and activated, work is performed and then finished and closed. While the work is being performed, materials, equipment assets, and labor are tracked, as applicable, to your business processes. The system also allows organizations to set up preventive and predictive maintenance cycles.
- **Construction Work Management**: Construction work management refers to the various functions related to construction type work, such as new facilities, requests for new services or additions, and designing and estimating line extensions. Construction work uses compatible units to identify the resources necessary to install or remove assets associated with a work site.

Glossary of Terms

Below is a list of terms, along with their definition, to assist with understanding Oracle Utilities Work and Asset Management:

Term	Definition
Actions	Links and commands available to simplify work tasks and functions throughout the system.
Activate	In order to change the status of record to Active to begin work. In order to change the status of record to Active to make it available for use in the system. For example, items that are not in Active status cannot be referenced on other records.
Activity Checklist	Activity checklists are forms that define the prerequisites or procedural steps that need to be accomplished during the work completion process. Checklists can be used for information purposes only or contain the actual steps the user must take prior to completing work in the field.
Actuals or Actual Costs	System-maintained costs associated with stock issues and returns, posted invoices, posted labor charges, cost adjustments, and so forth. An actual amount paid or incurred, as opposed to estimated cost or standard cost. On work orders, for example, actual costs include direct labor, direct material, other direct charges, and overhead.
Alert	A system-generated message that requires further action or notifies you of an event.
Allocated Costs	Costs that have already been dispersed to the accounts they were allocated to.
Approval Documents	Items within the system that go through an approval process, such as work requests and requisitions.
Approval Limit	The maximum dollar amount that an approver can authorize for documents that affect costs.

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Term	Definition
Approval Portal	A work management tool that displays all of the purchasing records requiring a specific approver's attention in a web browser. The Approval Portal can be accessed from the home page or from e-mails that are sent to approvers alerting them that their approval is required on a record.
Approval Profile	Portal used to manage the approval process for each record type (work orders, timesheets, and so on); identifies approval and hierarchy information needed for setting authorization levels, limits, and approval path the record takes once submitted.
Approval Route	A predefined list of approval titles needed to either review or approve a purchasing record.
Approve	In order to agree that work needs to be done; to authorize.
Approver	The user with the authority to authorize a purchase. The approver must have the necessary approval title assigned and be referenced in the Next Approver field to approve a record.
Asset	Anything defined in the Asset portal, from a piece of equipment to a vehicle to a room.
Asset Criticality	Asset Criticality defines the importance of the location in terms of the potential impact of having issues or problems at that location. For example, a hospital might have a high criticality rating since losing power there might result in the death of patients and a city park would have a low criticality since there are few consequences if the lawns are not mowed on time. (Attribute on the Asset Location record)
Asset Hierarchy	Manages assets designated by an organization. The structure consists of processes, assets, and components capturing work costs at an "object" level. Costs start at the process level then roll to assets and then to components as applicable.
Asset Number	The unique number identifying an asset in the system.
Asset Reading	Periodic readings (cycle-hours, kilowatt-hours, miles, and so on) taken from various types of equipment.
Associated Service Request	Service requests that are related to the same problem, customer, or that share any other common information.
Attachment	Documents that are independent of, yet give information about, a record. For example, you may wish to attach an installation guide update to a Component ID record, or attach a safety data sheet to a stock item record.

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Term	Definition
Auto Pay Indicator	A check box that appears on many purchasing and receiving records indicating whether or not the items on the purchasing record can be invoiced automatically by the system.
Automatic Reorder	The system can be set to automatically reorder stock items when stores quantity reach a certain point.
Available Quantity	A field on the storeroom record for a stock item calculated as the inventory quantity plus on hand minus on hold and on demand.
Average Unit Price	The average cost per item. It is calculated by the system based upon price adjustments, purchase order receipts, and invoices. The settings in the Receiving Configuration business rule determines whether or not this price factors in taxes when it is calculated. The setting of the Average Unit Price Calculation rule key in the Invoice Setup Criteria business rule determines how the average unit price is calculated.
Backlog Group	Describes a crew group that crews would be associated to that would or could pick up work that was not completed from a specific shift. For example, work that is not completed on the Streetlight Day Shift would be picked up by the Streetlight Afternoon Shift.
Backorder	Inventory type stock items that have insufficient quantities in the storeroom and are needed for a work order or material request (internal backorder). The system can be set to display a message and gives you the option of opening a picklist window to view where the items are needed and print reports if necessary when such items are received in the Stock Transfer, Receiving, or Multi-Step Receiving modules.
Batch Control	A task that can be configured for the system to run automatically. This functionality allows the system to make updates, purge obsolete data, generate schedules, or perform other automatic functions established by your organization without user intervention.
Bid	The process through which a list of items is reviewed and priced by vendors. Bids could be for material or services on a Blanket Contract or against the scope of a Compatible Unit.
Bill of Material (BOM)	A listing of parts for assets and components. These lists help to speed up the process of ordering parts because they only show stock codes for the parts related to a specific asset or component.

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Term	Definition
Blanket Contract	A contract established with a vendor, containing negotiated purchasing information such as total value of the contract, individual item, prices, terms, and so on. The blanket contract is also often called a “standing purchase order” from which “releases” are cut.
Blind Count Physical Inventory	An inventory list that does not show current storeroom inventory quantities.
Bookmark	A link that points to a specific record in the system.
Buyer	The person responsible for generating purchase orders from requisitions and then issuing approved purchase orders to vendors.
Carrier	A vendor responsible for delivery of items. (UPS, Federal Express, DHL, and so on.).
Change Order	Refers to either a revision to a purchase order or refers to an expedite purchase order.
Charge Number	The specific number being charged; for example, activity, asset ID, cost center, and so on.
Charge Type	The type of charge number being charged; for example, work activity, asset, vacation, sick leave, and so on.
Commitments/Committed Costs	System-maintained costs associated with active work orders placing demand in the storeroom, approved purchase orders and approved labor charges. Costs, usually fixed costs, which the management of an organization has a responsibility to pay. Examples include rent on a long-term lease or depreciation on an asset with an extended life.
Commodity Code	A way to categorize stock items based on the nature of the item.
Compatible Unit	A group of material items, with associated labor and equipment estimates, used to plan work for capital improvements and the maintenance of existing assets.
Component	A trackable stock item that must have a unique Component ID. It may be installed in and removed from an asset, and may or may not be defined as repairable. Components can only be tracked as single units.
Construction Location	Can either be a work location or an asset location but not both. A work location is a new location that identifies the location where the compatible units are used to build the new assets. Once the work is finished and the asset is identified as being at that location, the work location transitions to being an asset location.
Construction Work Management (CWM)	A subsystem of the Work and Asset Management application that manages the planning, cost, and resources needed to perform all construction-related work.

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Term	Definition
Construction Work Order (CWO)	A collection of construction work activities involved in performing the actual work at a construction location.
Construction Work Activity (CWA)	A specific task on the work order that identifies the type of work that needs to be completed for the construction job.
Consumable	An item issued or dispensed to assets that will not be recovered for return such as oil, gas, and so on.
Contact	The main contact information for a customer and the information used when creating new Work Request records for the customer.
Contract Limit	The accumulated purchase order total (dollar) value against the limit set on the blanket contract. This value cannot be exceeded.
Controllable Asset or Device	In DACS, a Controllable asset or device refers to an asset or device that is controlled by the utility directly. For example, a customer thermostat would be considered the “Controllable” asset or device and the HVAC system controlled by that thermostat would be considered the “Controlled” asset or device.
Controlled Asset or Device	In DACS, a Controlled asset or device refers to an asset or device that is controlled by a controllable asset or device. For example, a customer thermostat would be considered the “Controllable” asset or device and the HVAC system controlled by that thermostat would be considered the “Controlled” asset or device.
Converted Total	(Item Total) x (Vendor’s Currency). The total number of items multiplied by the vendor’s currency rate.
Cost Summary	A summary of budget and actual costs per expense category.
Customer Program Management Cloud Service (CPMCS)	Refers to the cloud version of the application used for demand response and distributed energy resource programs.
Customer Program Management (CPM)	Refers to the on-premise version of the application used for demand response and distributed energy resource programs.
Craft	The labor classification of an employee.
Credit	A (negative) cost charge applied to increase available dollars.
Crew	A group of employees with crafts that are able to complete work on a shift.
Critical Number	A system-maintained number indicating the relative lateness of work; a critical number of 100 indicates that the work is due today.
Customize	In order to modify according to individual specifications.
Cyclical Work	Tasks and work performed on a regular, repeating, or periodic basis.
Debit	A (positive) cost charge applied to reduce available dollars.

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Term	Definition
Default Values	Values that are automatically entered by the system. Sometimes the value can be changed, sometimes it cannot be changed.
Demand	The unfilled need for an inventoried item. The quantity of a stock item estimated to be needed for active work activities but not yet issued.
Description Field	These fields are all ‘free-form’ text fields where you can enter around 100 characters. In many pages you can search the description field to help locate specific records, and the first several words will appear in the results of search. Make sure that your descriptions begin with meaningful text and that they include keywords to help in these searches. Double click most long text or description fields to open a Text Editor window that makes it easier for you to enter and edit text. The Editor window can be resized as necessary. The Editor window also includes a Search button that can be useful for finding specific text in a long description.
Direct Charge	Charges or other expenses incurred while completing work. For example, if equipment is rented to complete an activity, a direct charge would be applied back to the activity to account for the cost. These are not charges that are generally incurred in the system such as labor or materials costs.
Direct Purchase	Ordering materials and services not available in a storeroom.
Direct Purchase Item	A stock item that is listed in the master catalog but not kept on hand. Examples are high cost or limited life items that are not kept in inventory but still need to be listed on bills of materials.
Discrepant Invoice	Line items that do not match against purchase order line items on an invoice.
Dispositioning	The combination of an asset's location and current status. Assets are typically dispositioned by being sold, reused, repaired, scrapped or returned to the vendor.
Downtime	Time when an asset and or component is out of service.
Dynamic Approval Routing	Supports the addition of new approvers to an existing approval request already in progress.
Expedite	The process of improving or managing delivery of ordered terms; to speed up the progress of a purchase acquisition.
Expense	An item or expenditure that incurs a cost in the system.
Expense Code	A code assigned to an expenditure indicating which payment category the cost falls into.
Favorites	Personalized links to favorite pages and scripts. These links are located on the Home Page.

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Field	A space allocated for a particular item of information on a record. Fields are grouped into records and any given field may be used in several different kinds of records. For example a stock number may be used in a record for keeping track of inventory, and also be used in a record about the service life and reliability of parts.
Fleet Asset	A vehicle defined in the Asset module.
Follow-up Work Order	A work order created to expand on work from a work request or from an originating work order. The information on these work orders is basically a duplication of the originating work order. If the work required requires extensive planning or scheduling, it may be best to create a follow-up work order so that the functionality can be used to perform functions such as breaking the work up into tasks, assigning the tasks, and scheduling the work.
Forced Complete	In order to accept partial receipt of items or services as fully received.
Freight on Board or Free on Board (FOB)	The physical location to which the vendor agrees to pay for the product's freight delivery charges.
Functional Process	A logical collection of assets which together perform a function or work process.
Header	The main information window on a page.
Home Page	The first screen that opens when you log on to the system. Helps you to manage your system work.
In Transfer	The quantity of items issued but not yet received during a stores transfer.
Initiator	The person who fills out the purchase order for goods or services.
Inventoried Item	A stock item kept in a storeroom.
Inventory	Items stocked in the storeroom, issued and returned using material request processing and replenished by automatic stock reorder processing.
Inventory Quantity	The total number of items physically located on storeroom shelves.
Invoice	The process where the vendor bill is entered into the system, reviewed, and approved for final payment.
Issue (a purchase order)	In order to send a purchase order to a vendor.
Issue Price	The price used for issuing and returning stock.
Issuing Storeroom	The storeroom where demand is placed and from where the items are issued.
Item Type	A code that indicates the category that an item falls into. Purchase order items can be materials, services, or other.
Labor Requirement	Estimates entered on the activity record regarding the amount of labor hours needed to complete the work.

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Line Items	Individual items or services listed underneath a purchase order or requisition.
Lockout Tagout (LOTO)	A tagging system used to manage assets that have been shut down for repairs.
Lot	An identified group (subset) of a stocked item. The system maintains quantities by Lot number (Lot ID). Typically, all items in a lot are manufactured in the same production.
Maintenance Compliance	Involves Corrective or Preventive maintenance compliance. Users can define compliance rules to ensure that corrective or preventive maintenance work is completed in a timely manner and to track and report against compliance work.
Maintenance Manager	An individual who is responsible for a certain collection of assets; referenced on the Asset record as a way of capturing all costs associated with the maintenance of the asset.
Maximum Quantity	The highest allowable inventory level. Used during automatic stock reorder processing, to determine the level to which to order.
Minimum Quantity	The lowest allowable inventory level. Also called the “safety point” or minimum safe quantity.
Net Received Quantity	The total received quantity against a purchase order to date.
Offsetting Transaction	A charge applied to a different charge number to balance the total (to a zero dollar level).
On Demand Quantity	The required quantity estimated and not yet issued for work orders in an active status.
On Order Quantity	The quantity not yet received for issued purchase orders.
Operational Data	Operating limits for assets that the system validates data against. During validation, data readings that fall outside of expected limits are marked with an out of range indicator. The person responsible for the asset can then review the reading and, if necessary, initiate a Work Request to repair the measurement device or asset.
Operational Tolerance	A particular asset measurement record that indicate measurement types, units, and the valid range of values for the measurement.
Oracle Assets	Automates the management of fixed assets and simplifies fixed asset accounting tasks.
Order By	The way in which results of search are sorted when a query is run. For example, if you search for purchase orders you can have the system order them by purchase order number or date.
Order On Demand	Stock items that need to be ordered only when there is a demand for them.
Organizational Hierarchy	An organizational level used to group or categorize assets.

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Original Estimate	The total dollars planned before a work order is set to Active; copied over from the revised estimates and frozen at Active status change; maintained by the system.
Over Committed	More craft hours scheduled than available.
Overhead Cost	Costs that are incurred during the completion of work but that fall outside of labor, materials, and other costs that are incurred. Direct overhead costs are charged to a specific construction work activity and then dispersed to associated activities upon closure of those activities. Indirect overhead costs are a percentage allocated upon closure of a CWA and subsequent creation of the Activity Reconciliation record.
Parent and Child Objects	The relationship between asset locations and organization which identifies one as “belonging to” another.
Pay Period	A time period set in the system to which timesheet costs are applied. Costs can be applied to this block of time until the period is set to “Closed” status.
Pay to Vendor	Refers to payment details defined on the vendor location that's considered when creating an invoice.
Payables	Obligations to pay for materials and services received.
Performance	A work value rating.
Permit	A document required by regulations that call for the creation of an audit trail to show that proper procedures were followed. For example, working with hazardous materials typically requires permits indicating that the person doing the work has been trained and certified, that isolation procedures were followed, and so on.
Permit Template	A master template of a permit that can be used to create work order specific permits. Permit templates are more generally associated with an activity but can also be associated with a work location or an asset at an asset location.
Phantom Stock Item	A nonexistent stock item that was assigned a stock code strictly for the purpose of grouping other related stock items such as a kit.
Physical Inventory	The process of physically counting items in inventory.
Pick List	A listing of items related to a record. For example, Multi-Step Receiving contains a pick list of purchase order items so that user’s can pick which purchase order items to receive on the receiving record.

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Planned	In order to plan for In Service and Out of Service assets. This is also the initial status of the work activity which includes all the resource and cost information needed to complete the type of work being planned for and to appropriately charge cost centers for resources and materials. Activities in this status can move between work orders.
Planner	The person who determines the labor requirements, material requirements, permits, and so on to complete a work order task.
PM Event	A preventive maintenance (PM) event is most typically associated with outages or other event-based maintenance. Planners manage when to cycle a certain event, such as a plant shutdown, occurs.
PO Quantity	The purchase order (PO) quantity of material the buyer requested from a vendor.
Posting Costs	A process which automatically distributes costs throughout the system.
Preventive Maintenance (PM)	Maintenance performed on a routine basis to help prevent equipment failure.
Procedure	A list of step by step directions.
Project	A grouping of subprojects, work orders, timesheets, purchase orders, and activities.
Property Unit	A group of assets with similar depreciation characteristics, such as transmission poles, high tension cables, or water mains. However, actual depreciation of assets is not managed in the Work and Asset Management system but in the Fixed Asset system. Keep this in mind if your organization is required by a regulatory authority to report depreciation by property unit groupings.
Purchase Order (PO)	A document used to secure purchases of materials and services. Purchase orders are sent to vendors and serve as a contract which designates information such as shipping arrangements, purchasing terms, items for purchase, and a PO# to track the purchase.
Purchase Request (PR)	A request for materials or services to be purchased which must be approved.
Purchase to Issue Ratio (PI Ratio)	The system uses the Unit of Purchase (UOP), Unit of Issue (UOI), and Purchase to Issue Ratio (PI Ratio) information to maintain quantities as parts are issued and new parts are received. You may, for instance, issue in individual items but order the items by the box where one box would contain 10 individual items. The Unit of Purchase would then be BOX, the Unit of Issue would be EA, and the PI Ratio would be 10.
Purchasing Terms	Payment and delivery conditions that are agreed upon by both the vendor and the purchaser.
Receipts	Items that have been received.

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Receiving Storeroom	The storeroom requesting and receiving the stock items.
Record	An organized group of related fields. If you think of an address book as a kind of database you can make some associations to better understand the structure of a database. A page in the address book is a record containing the name of a person, a home phone number, a work phone number, other contact information and possibly some notes about that person. Each of these smaller bits of information is called a field in a database.
Refresh	Update the a record with the most recent information posted on the system. For instance, if a new alert or a new news item is posted after you have logged on to the system, clicking the Refresh button will add these new items to your Home Page.
Reliability	The level of confidence that an asset will perform as expected.
Renewal Work	Work that was completed to restore or replace an asset towards its original size, condition, or capacity.
Reorder Point	The inventory level at which stock reorder processing should begin; The “trigger” point for automated reorder processing. (Inventory quantity plus on order quantity minus demand equals the reorder point).
Reorder Processing	The process by which stock items are replenished when they reach specified minimum levels. You can configure the system to automatically generate an order when the reorder point is reached.
Reorder Quantity	The number of items to reorder. If not entered, the system defaults to a reorder quantity of 1.
Reorder Review	A record created by the system that allows users to review items that have been picked for automatic reorder.
Repair Quantity	The number of items in repair.
Repairable	An asset that can be repaired if it is broken or damaged. These components have an indicator checked on the Asset record to indicate that they are repairable.
Requestor	The person who requests items or services on a purchase order.
Required Field	A field that must be filled in on a record before the record can be saved.
Results of Search	The screen displayed after a search is executed. It shows a listing of all records that were returned by the search.
Return	Items received but needing to be returned to vendor for replacement.
Return for Credit	Items received but needing to be returned to vendor for credit (no replacement items needed).

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Term	Definition
Revised Estimate	The current total dollars planned for a work order; continues to grow even after the work order is active in order to capture current estimates; maintained by the system.
Revision	The number of times the blanket contract or purchase order has been revised.
Routing for Approval	Sending a document for review and approval.
Saved Search	A link on the Home Page to a frequently used search in the system.
Scheduler	The person who schedules when the work order activity will be completed using craft resources.
Service Call	A service call enables work to be created when a call from either an internal or external resource is received by a company representative. Some examples of these types of calls would be as follows: • Customer calls in to report a streetlight out, odor in area, sewage overflow, service run to new home, and so on. • Contractor requests new service to be run for a new subdivision or a business requests an upgrade in service for an expansion project.
Service Condition	A one time assessment performed to understand stress and environmental factors related to the asset, such as humidity and corrosion levels for plant assets and soil acidity levels for below ground assets. Typical values include Severe and Mild. (Attribute on the Asset Location record)
Service History Question	Refers to the types of questions that are created to guide workers through a service history inspection process.
Shift	A duration of time worked by an employee.
Shift Differential	The value added to the wage rate based on the shift worked by an employee.
Shipping Memo	A record of shipments leaving a plant, including stock items being returned to vendors for credit or replacement and items being repaired at an offsite facility. Shipping memos can also track the return of rented equipment and other miscellaneous shipments. Shipping memos can contain a description of the items shipped and information about quantities, shipment value, and expected return date.
Specification	A specification contains the manufacturer, model, and other information about a set of assets. Specifications may also contain written procedures, careful handling instructions for hazardous or delicate materials, or any other set of attributes needed to provide information about a set of assets.
Stock Code	A unique stock identifier.

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Term	Definition
Stock Item (SI)	Any item that a business wants to keep in inventory of. Each item is assigned a unique “stock code,” a “stock type,” and a description.
Stock Item Detail (SID)	Additional details for the stock item which is created when the stock item is added to a storeroom. Provides storeroom-specific information such as pricing, storeroom location, reorder information, quantity purchased, and so on.
Storeroom	A physical or virtual place where items are “stored” in the system.
Stores Replenishment	Orders used to increase inventory quantities or re-stock inventory items.
Subproject	A breakdown of a project; may be comprised of several work orders.
Subsystem	A working part of a whole system. Oracle Utilities Work and Asset Management is comprised of several subsystems for example, Assets, Resources, Preventive Maintenance, Purchasing, Inventory, to name a few.
Template Construction Work Order	Template document that enable construction work orders to be re-used to aid in repeat planning of similar jobs.
Tool Tips	The description of what an icon does that appears when the cursor rests on the icon in the toolbar.
Total Risk Priority	Total Risk Priority provides a total risk value in terms of scheduling work at a particular location. Total risk is calculated as work priority multiplied by Asset Location Criticality. For example, if Work Priority is 6 and Asset Location Criticality is 7, then Total Risk Priority equals 42 (6 x 7 = 42). This value can be overridden by the user.
Trackable Stock	Items in inventory that merit being individually identified and followed from initial receipt on-site through complete usage.
Transaction Log	A log containing detailed information for each item or cost transaction processed. Transaction logs are compiled and maintained by the system.
Transfer Quantity	The quantity issued from one storeroom, not yet received by the receiving storeroom.
Unit of Purchase (UOP)	The system uses the Unit of Purchase (UOP), Unit of Issue (UOI), and Purchase to Issue Ratio (PI Ratio) information to maintain quantities as parts are issued and new parts are received. You may, for instance, issue in individual items but order the items by the box where one box would contain 10 individual items. The Unit of Purchase would then be BOX, the Unit of Issue would be EA, and the PI Ratio would be 10.

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Term	Definition
Unit of Issue (UOI)	The system uses the Unit of Purchase (UOP), Unit of Issue (UOI), and Purchase to Issue Ratio (PI Ratio) information to maintain quantities as parts are issued and new parts are received. You may, for instance, issue in individual items but order the items by the box where one box would contain 10 individual items. The Unit of Purchase would then be BOX, the Unit of Issue would be EA, and the PI Ratio would be 10.
Unused Demand	Demand placed on stock items that is not used after work documents have been completed. When the items are not used the over-demand causes inventory quantities to be increased over the maximum level.
Update	The process of modifying existing records.
Used Amount	The total dollar value (across purchase orders) which has been spent to date against the blanket contract.
User-Defined Fields (UDF)	Fields defined by an organization to customize the system.
User Interface (UI)	The way in which a user interacts with an application; desktop, screens, and so on.
User Limit	The maximum dollar amount a user has available for each purchase order against a blanket contract.
Vendor	The supplier or carrier of items or services.
Work Design	A record used for construction projects to produce one or many construction estimates with resource requirements.
Work Order (WO)	A record used to manage work in need of completion.
Work Order Activity	A specific job that needs to be completed as part of a work order. A work order can include any number of activities. Activities can then be can be planned and scheduled independently of the work order. Activities allow planners to break up work for more efficient planning and management.
Work Request	A request for work or services to be performed; often the first step of performing work.

About Home Page

The **Home Page** portal provides a comprehensive dashboard where you can access much of the information you need to review and complete your work.

The **Home Page** can serve as a personal web page where you configure system elements that you use most frequently.

Refer to the Understanding Home Page Configuration section in the **Administrative User Guide** for information on configuring home page settings.

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In general, click on any link, pie chart, or graph to open details about that item. The **Go To** icon at the front of some items opens the corresponding tab with the related information populated. For example, if you click the symbol in front of a storeroom in the **My Storerooms** section on the **Main** tab, the system opens the **Inventory** tab with that **Storeroom ID** populated. Click **Refresh** to update and display the graphs.

The base package home page can include the following tabs (refer to the embedded help for zone details):

- **Main**: The **Main** tab displays general system information and any custom zones provided by your implementation (such as company news).
  - Click the **Add** link in any zone to add the related information. The **My Buyers**, **My Storerooms**, **My Crews**, and **My Projects** zones do not automatically include the records. For example, if the logged in user is a buyer, they must still add their own buyer to the zone, if they want to include their own buyer in the zone.
  - The **Insights** zone provides a real-time summary of key work activities and work requests tailored to your role. Insights are generated based on the planners, backlog groups, and service areas associated with your user profile, helping you quickly monitor overdue tasks, pending requests, and activities requiring your attention.

    > **Note**
    >
    > You must have an insight group configured to display the Insights zone. If no insight group is set, insights will not appear on your Home Page.

- **Approvals**: The **Approvals** tab provides the same information and functionality as the Approval Dashboard.
- **Work**: The **Work** tab can display statistics about work requests and work orders. Some of the work zones might include a link to the **Statistics** portal. Authorized users can edit some of the details displayed in the zones using this portal.
- **Inventory**: The **Inventory** tab provides information about stock items by storeroom. You must enter a storeroom and click **Refresh** to display the zones.
- **Purchasing**: The **Purchasing** tab can display purchasing statistics by buyer. You must select a buyer and click **Refresh** to display the zones.

The specific zones that appear in each tab can be configured on the **Portal Preferences** tab of the **User Portal**.

Supported Portals on iOS

The following portals are supported when accessing the WAM application via a browser on Apple iOS devices in this release:

Crew Work-related Portals:

- Work Requests
- Service Call
- Work Order
- Work Activity
- Permit

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- Timesheet
- Other Direct Charges
- Construction Work Order
- Construction work Activity

Inventory-related Portals:

- Material Request
- Material Return
- Receiving Receipt
- Receiving Return
- Physical Inventory
- Reorder Review
- Reorder Mass Approval
- Stock Item
- Stock Item Detail
- Stock Transfer

User Interface Features

This section describes basic system concepts, features, and standards of the user interface.

- User Interface Standard Features
- User Preferences
- Initiating Scripts
- Shortcut Key Summary

User Interface Standard Features

This section describes standard functionality realted to how the system looks and behaves.

- Page Components
- Portal Pages
- Fixed Pages
- UI View Settings

Page Components

Oracle Utilities Application Framework screens are comprised of the following main areas:

1. The Application Toolbar
2. The Page Title Area
3. The Object Display Area
4. The Sidebar Area

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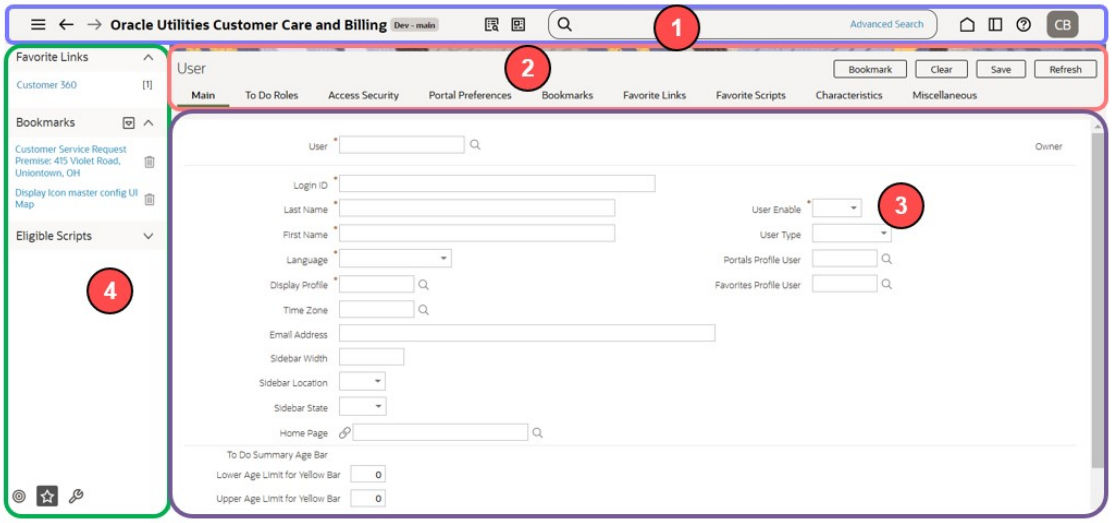

In addition there are two optional areas, not shown, that may be visible depending on conditions: the Assistant Area and the Script Area.

Keyboard Shortcuts	Description
`Alt+[`	Moves the cursor focus to the next main page component based on the standard browser keyboard navigation "order".
`Shift+Alt+[`	Moves the cursor focus to the previous main page component based on the standard browser keyboard navigation "order".

> **Note**
>
> The look and feel of the application may be modified after the product is installed. See Custom Look and Feel Options for customization information, including how to change colors, fonts, and other system features. The information provided in this document represents features and functionality available only in the delivered product.

The next topics provide more information about each component.

- Redwood User Experience
- The Application Toolbar
- Page Title Area
- Object Display Area
- Sidebar Area
- Assistant Area
- Script Area

Redwood User Experience

The Redwood user experience option may be enabled system wide via a feature configuration. Additionally, the user menu allows individual users to toggle between the Redwood user experience and the classic user experience.

When enabled, the following illustrates a typical portal page layout.

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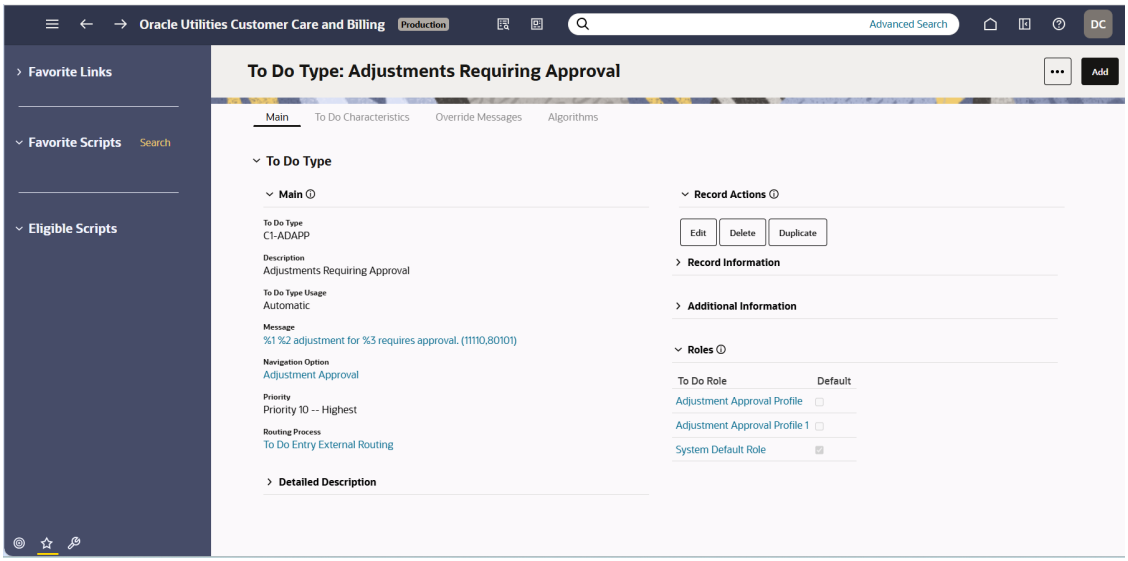

The following points highlight differences in the behavior and appearance of pages in the application when enabling this experience:

- A colored theme is used for the application toolbar and the sidebar.
- Portal based pages follow the standard of the Label over the Field rather than before it.
- Some icons are different.
- The expand / collapse control for a zone or section is moved to the left (or right for a right-to-left language).
- All input dialogues for portal based pages are displayed as a Drawer.
- When there are more than two page action buttons, one button is visible directly and the rest are grouped in an 'overflow' button (with three dots). This change applies to both portal based pages and fixed pages
- The spacing of elements is adjusted.

The Application Toolbar

The application toolbar includes the product's name along with several features described in the subsequent sections.

> **Note**
>
> Your specific application may introduce additional icons or features to the toolbar.

> **Note**
>
> If a domain name is configured for your environment, it is listed after the product name.

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> **Note**
>
> The toolbar is responsive to window resizing or zooming in. When there is less room, the product name and the domain name are the initial elements to be reduced or removed altogether.

- Menu
- Back and Forward Arrows
- Search
- Home Icon
- Sidebar Toggle
- Help Menu
- User Menu

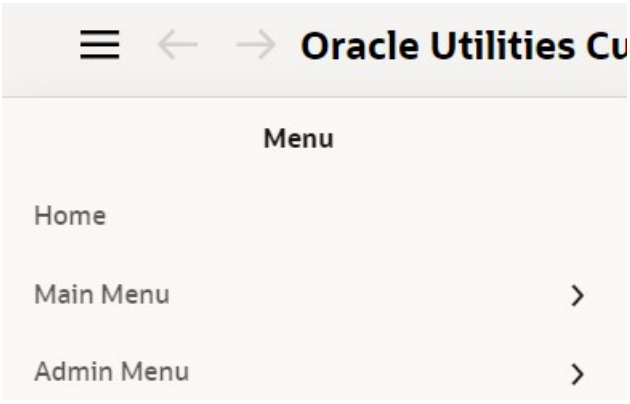
Menu

The Menu icon, , is available in the application toolbar to help you navigate to the different pages of the system.

You only see the menu items that you have security access for. In turn if you do not have access to any menu items in a submenu, the whole submenu is suppressed.

Keyboard Shortcut
`Ctrl+Alt+M`

The initial view of the menu includes a link to the Home page, plus entries for the Main Menu and Admin Menu.



Main Menu

Clicking the Main Menu entry displays a submenu organized by functional area.

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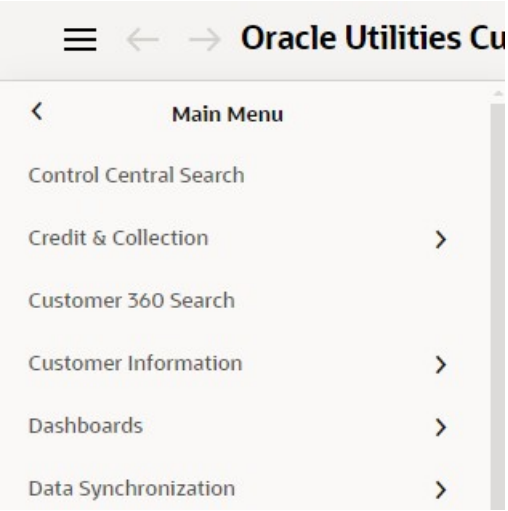
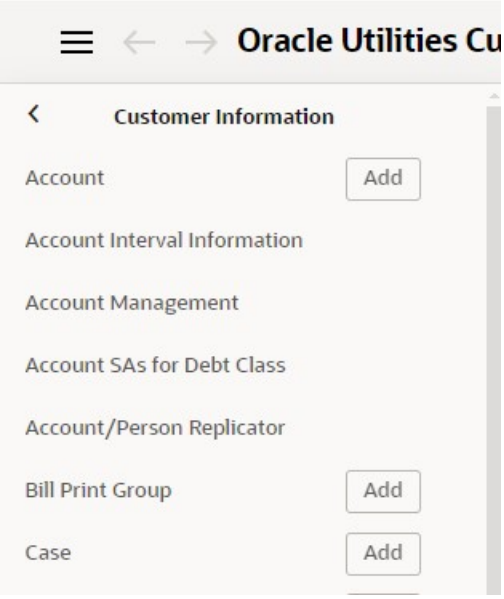


Clicking any functional area in turn displays a submenu that contains pages within that area.



Some entries have an Add button adjacent. For these entries, clicking the menu item text opens the Search for that menu item. Click the Add button to add a new record for that search item. For entries without an Add option, select the menu item itself to launch that page.

How the Search and Add option behaves depends upon whether the maintenance page is fixed or portal-based.

Fixed:

- **Search:** Navigates to the page and displays a pop-up search window for the user to enter the search criteria and select the entity to display. Once the entity is selected, the maintenance page is displayed with the data populated in the fields.
- **Add:** Displays the maintenance page with empty fields so that the user can complete the information and save the entity.

Portal-Based:

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- **Search:** Displays a search portal where the user can enter the search criteria and select the desired entity. Once the entity is selected, the user is typically taken to a maintenance portal or the information is broadcasted to other zones within the same portal.
- **Add:** Either navigates to a page where the user can select the entity type or business object, or directly to the input map where the user can enter and save the entity.

Users may also opt to use Menu Item Search to find a page.

Admin Menu

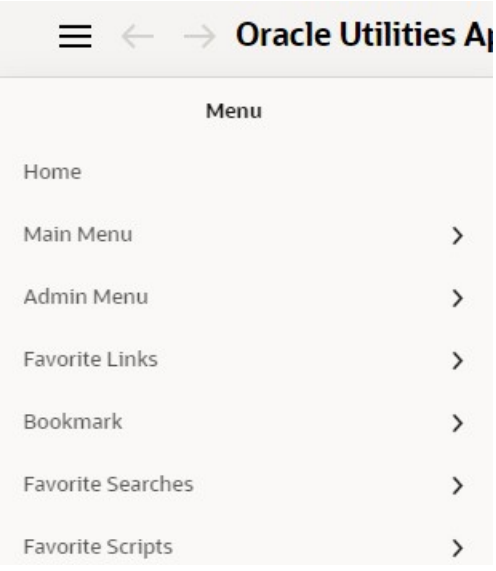
The admin menu functionality is analogous to the Main Menu functionality. One difference is that your implementation may opt to organize the admin menu alphabetically rather than by functional area.

> **Note**
>
> Refer to Installation Options for information about the admin menu configuration options.

> **Note**
>
> Menu navigation paths referenced in the administrative user guide provide the functional grouping. If your implementation uses the alphabetic grouping, the page can be found in the alphabetic letter that is the first letter of the page name.

Favorites, Bookmarks

If you have any Favorite Links, Favorite Scripts, Favorite Searches or Bookmarks, entries to open those options are also visible when initially opening the menu.



Clicking any of those menu entries displays you configured favorites or your saved bookmarks. The information is the same as what you see in the equivalent sidebar zone.

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Back and Forward Arrows

The back and forward arrows, , in the application toolbar allow you to navigate between the most recently viewed pages.

Back

Click the **Back** arrow to open the previously visited page.

Keyboard Shortcut
`Alt+B`

Click and hold the **Back** arrow to open a list of pages previously visited that you can choose from.

Forward

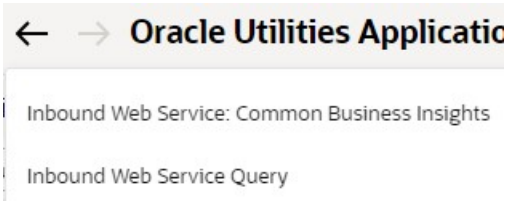
Click the **Forward** arrow to return to the page that was most recently dismissed.

Keyboard Shortcut
`Alt+G`

Click and hold the **Forward** arrow to open a list of pages that you had visited but went 'back' from that you can choose from.

The **back** and **forward** arrows are enabled in the toolbar only when page use warrants their appearance.

Note that if the page has been configured to display an information string in the page title area, that information will also be visible in the dropdown of previous pages listed.



> **Note**
>
> Under certain circumstances, such as revisiting a page that was left unsaved after being loaded with default data, a page may not appear as it did when you left it.

Search

The toolbar Search field and search icon provide the ability to search for specific menu items or, depending on your product, certain business entities.

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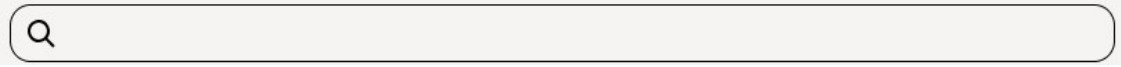
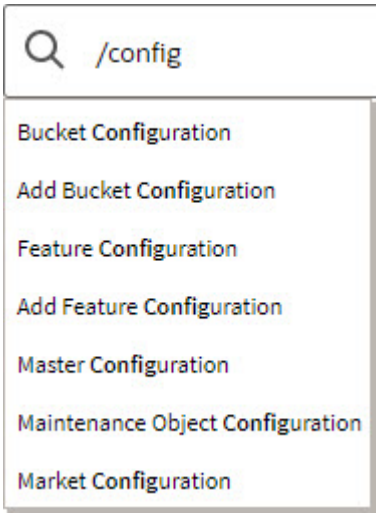
Menu Item Search

This search allows a user to enter the description of a menu item entry to navigate directly to the corresponding page or BPA script rather than using the menus to navigate to the desired page or script. If you start the search text with a slash "/", the search is confined to menu items. If you search for a menu item without a slash, the menu items are searched along with other unified search results.

Keyboard Shortcut
`Ctrl+Alt+F`



Typing text in the field preceded by a slash shows menu items whose descriptions include the typed text.



Note that for menu items within the Main Menu and Admin Menu, only menu entries that the user has security access for are included in the results. The text included in the search is taken from the menu item description. As described in Main Menu, menu lines often have options for search and Add. In most instances, the description of the "search" menu item is simply the menu entry text, for example **To Do Entry**. The description of the "Add" menu entry includes the word Add in front of the menu entry text, for example **Add To Do Entry**.

As mentioned in Menu Item Suppression, menu items will not appear if it is associated with a module that is suppressed.

> **Note**
>
> When operating in debug mode, the description of the parent menu is displayed in parentheses after the menu item description.

In addition, any of your Favorites, Bookmarks visible in the menu and in the respective sidebar zone are included in the search results. When the search result is related to one of these categories of configuration, the category name is displayed in parentheses in the results.

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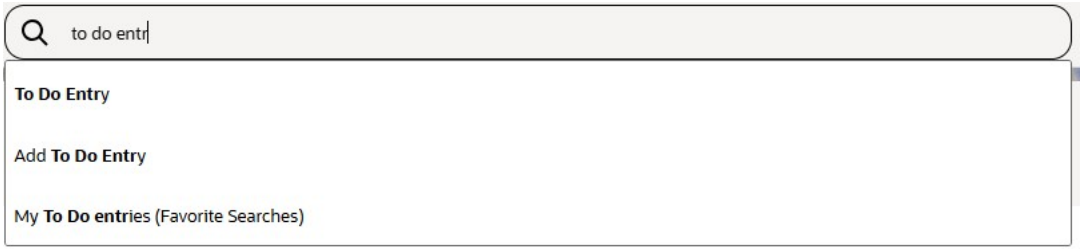
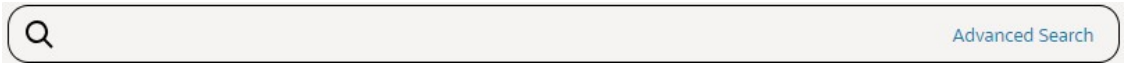


> **Note**
>
> The toolbar is responsive to window resizing or zooming in. The search field may be removed when the toolbar area is reduced.

Unified Search

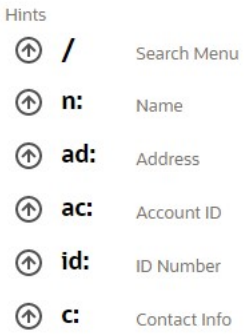
If your product has implemented unified search, you may use the toolbar search box to search for business entities. The unified search feature is a simplified version of your product's main search that allows you to lookup up records using free form text without leaving your current page. For more complex queries, use the link provided as part of the search box to navigate to your product's advanced search portal.



The type of business entities you may query and the filters you may use depend on the specific unified search implementation of your product. For example, if your product supports a search for customers based on their name or address, you may type in part of a name or an address to find matching results. If a unified search option is not configured for your product or you do not have security access to use it then the search box may only be used for searching for menu items.

To search for business entities, you may enter your search criteria in the following ways:

- Type in your search text in **free form**. For example, if your product's unified search option supports a search for customers by name or address, the text you enter may be considered as part of a name or an address.
- Depending on your product's unified search configuration, you may use specific **hints** to explicitly identify your filtering criteria. For example, an address filter may be associated with the hint name "ad:" allowing you to be more explicit and enter "ad: main" to find records by their address. Click the search icon in the search input area to view the hints that are configured for this search. You can also click the up arrow adjacent to the hint to automatically populate the hint text into the search.



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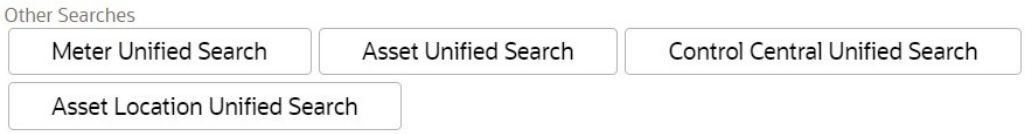
- You may use free form text or hints but not both.

As you type in your text, the application attempts to find matching records and presents the top most results for your review. You may select a record from the results list to navigate to the corresponding portal.

If your product has configured more than one unified search that you are allowed to use, one of the searches is the default search. Click the search icon in the search input area to choose a different search option. After selecting a different option, the hints for the selected search are shown and the Advanced Search link will navigate to the query portal configured for the selected search.



Refer to your specific product documentation for more information about your product's unified search features.

Refer to Understanding Unified Search to better understand unified search configuration.

Home Icon

Click the **Home** icon, , on the Application Toolbar to open your home page. Your home page is defined on the main tab in User Preferences.

Keyboard Shortcut	Alternate Shortcut
`Alt+O`	`Alt+Shift+O`

> **Note**
>
> Refer to Shortcut Key Summary for information about the alternate shortcut.

> **Note**
>
> The toolbar is responsive to window resizing or zooming in. The home icon may be removed when the toolbar area is reduced.

Sidebar Toggle

Click the **Sidebar Toggle** icon on the application toolbar to open or close the Sidebar Area. The image displayed depends on your sidebar's configured location and whether it's visible or collapsed.

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Table Sidebar icon list

Location / State	Icon
Left / Visible	
Left / Collapsed	
Right / Visible	
Right / Collapsed	

Keyboard Shortcut
`Alt+J`

> **Note**
>
> Refer to Shortcut Key Summary for information about the alternate shortcut.

Closing the sidebar suppresses the refresh of the zones within the sidebar based on updates to the context. Opening the sidebar bar restores the display of the sidebar portal. Maximizing the sidebar then refreshes the zones with the latest appropriate content.

Your user preferences record is updated with the current state of the sidebar.

Help Menu

The Help menu is available in the application toolbar to provide access to the following product support options. Open the menu by clicking the Help icon .

Help

Select the **Help** entry in the menu to launch the Oracle Help Center in a new tab. The application will automatically navigate to the context-sensitive help information within the help center. Alternatively, use the following shortcut key to launch help directly.

Keyboard Shortcut
`Alt+F1`

Help Assistant

This entry is only relevant for cloud installations. The Implementation Assistant centralizes Oracle documentation, including configuration guides, setup instructions, data mappings, user guides, best practices, and troubleshooting material—into a natural-language chat experience. You may open this feature directly from the Oracle Help Center in the Utilities > Integrations page. In addition, if you have security access to the application service `F1-HELPASSISTANT`, you will see the Help Assistant option in the menu. Launching this opens the implementation assistant tool, targeting your specific product and version.

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Prepare Issue Details

Select the **Prepare Issue Details** entry in the menu to launch a script to capture details of an error that needs to be reported. Refer to Prepare Issue Details for more information on this option.

Release Notes

This entry is only visible for on premises installations. Select the **Release Notes** entry in the menu to launch in a new tab the Release Notes for your product and version.

What's New

This entry is only relevant for cloud installations. Select the **What's New** entry in the menu to navigate to the What's New Portal.

Enable | Disable Debug

If you have security access to the application service F10UDBUG, you will see an option in the menu related to debug mode depending on its current state. If debug mode is currently not enabled, the entry says Enable Debug, otherwise it says Disable Debug.

About

Select the **About** entry in the menu to display a window that describes the current release information for your version of your product.

The about window shows a variety of information including:

- The logged in user ID
- The list of products installed in the application along with the release ID. This information comes from the installation record. Note that in a Cloud installation, only the Cloud product name and release ID are displayed. The details of the products that make up the Cloud installation are not displayed (but are still visible on the installation record).

User Menu

The User menu is available in the application toolbar to provide access to user-specific options. Open the menu by clicking the User icon

.

> **Note**
>
> **Configurable Menu.** Additional menu entries may be visible in your implementation as this menu configuration allows for additional options to be defined.

Preferences

Select the **Preferences** entry in the menu to view or modify your settings in a form that appears in the **Main** tab in the object display area. Alternatively, use the following shortcut key to access preferences directly.

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Keyboard Shortcut
`Ctrl+Alt+P`

Refer to User Preferences for more information.

Switch UI View

Select the **Switch UI View** entry in the menu to change the user experience from the Redwood User Experience to the classic user experience or from the classic to the Redwood user experience. This option is only available for users that have access to the **F1UIVIEW** application service.

Logout

Select the **Logout** entry in the menu to complete your current session of the application. Clicking this item logs the current user out and displays the Welcome page so that another user can login. Alternatively, use the following shortcut key to logout.

Keyboard Shortcut
`Ctrl+Alt+L`

Page Title Area

The Page Title Area displays the page title and the page actions toolbar.

> **Note**
>
> A portal-based page may be configured to suppress the page title altogether, including the page actions toolbar.

For certain portal pages in the system, the page title may have additional information.

- If a portal-based page displays a single record, its information string may be displayed after the page title. This information is only visible if the portal has been configured to display the primary key's information string. Typically only "stand alone" maintenance portals are configured to show the information string, whereas "all-in-one" portals are not configured this way.

  > **NOT_SUPPORTED**
  >
  > Refer to Common Base Portals and Zones for more information about standard base product portals.

  > **Note**
  >
  > If an information string is long and would interfere with a page actions button, the information string will automatically be truncated and suffixed by an ellipsis, "...", indicating that more information is available. In this situation, the missing text can be viewed if the user hovers their mouse over the string.

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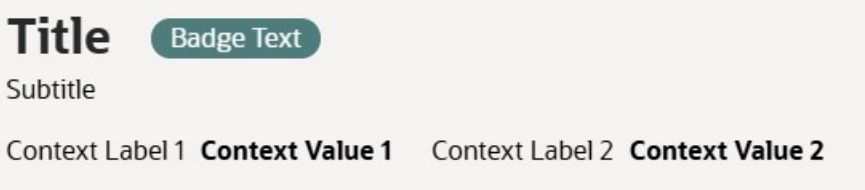
- A portal based page may be configured to show enhanced information, including a subtitle, information in 'badge' format and context name / value pairs, which may also allow you to click and drill into more information.



> **Note**
>
> Refer to Advanced Configuration for Portal Title / Tabs for details on how to configure this capability.

The Page Actions Toolbar displays standard control options, such as Save and Duplicate. More detail about the actions that may appear are described in the following section.

When applicable, banners may be presented to highlight important messages about the page content.

- Page Actions Toolbar
- Portal Banners

Page Actions Toolbar

In the Page Title Area, control functions appear in the Page Actions Toolbar; such as, Clear, Save, Duplicate, Delete and Refresh buttons.

> **Note**
>
> Buttons in the Page Title Area appear as the function is available to the user; for example, the Delete button will not appear if the user has made any changes to the page's content, or does not have the necessary security rights for this action.
>
> In addition, other functions that are specific to a portal-based page may appear in the toolbar, if configured. For example, the ability to navigate to the Search zone for a specific maintenance object may be visible on the maintenance portal. The portal specific actions may be displayed as individual actions, or grouped as an action menu.
>
> A portal-based page may be configured to suppress the page title altogether, including the page actions toolbar.

This section describes the standard features that are available in the Page Actions Toolbar.

- Bookmark Button
- Next/Previous Item Buttons
- Duplicate Button
- Delete Button
- Clear Button
- Save Button

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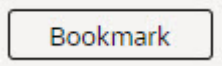
- Refresh Button
- Portal Maintenance

Bookmark Button

Click the Bookmark button on the Page Actions Toolbar to save the current page and context to the bookmarks list.



Keyboard Shortcut
`Ctrl+Alt+B`

> **Note**
>
> **Secured.** This button is secured using the `F1-BOOKMARKS` application service. Users that do not have security for the application service will not see the Bookmark button (or the corresponding sidebar zone).

After clicking the Bookmark button, you are prompted to provide a name for the bookmark. After saving, it is visible in the Bookmarks Zone, as well as through the Menu, allowing you to return to this page with this context loaded with one click.

> **Note**
>
> Unsaved data will not be included in the bookmark. If you view a record and make changes to data without saving the changes and then bookmark the page, the unsaved changes are not included in the bookmark information.

You may change the name of the bookmark or change the sequence of the bookmarks by navigating to the User - Bookmarks in the user preferences.

> **Note**
>
> Depending on other actions available, this action may be grouped with other actions in a '**General Actions**' menu.

Next/Previous Item Buttons

The **Previous Item** and **Next Item** buttons appear in the Page Actions Toolbar under these conditions:

- You access a fixed page, meaning that it is not portal-based.
- You use a search page to display an item.
- There are multiple items in the search results list *below* or *above* the selected item.

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If, for example, you enter search criteria of "Smith" on the User Search page, you might see the following results:

- Smith, Albert
- Smith, Peter
- Smith, Zane

If you select **Smith, Peter**, Peter's user information is displayed on the User page. If you then click the **Next Item** button, **Smith, Zane** will be displayed. In addition, because **Smith, Zane** is the last entry in the search results, the **Next Item** button is no longer needed and will not appear in the Page Actions Toolbar.

If you then click the **Previous Item** button, **Smith, Peter** will be displayed; click again and the **Smith, Albert** record will appear, and, because **Smith, Albert** is the first entry in the search results, the **Previous Item** button is no longer needed and will not appear in the Page Actions Toolbar.

Keyboard Shortcut	Alternate Shortcut
`Alt+P`	
`Alt+N`	`Alt+Shift+N`

> **Note**
>
> Refer to Shortcut Key Summary for information about the alternate shortcut.

Duplicate Button

Click the **Duplicate** button in the Page Actions Toolbar to create a duplicate of the currently selected object.

Before the new object is added to the database, a dialog appears in which you must enter the unique identifier for the duplicate object. When you click OK, the system creates the record by copying the original record. It may be helpful to think of the duplication function as the equivalent of a "save as" action.

Keyboard Shortcut
`Ctrl+Alt+D`

> **Note**
>
> Copying ancillary information for a record sometimes requires confirmation during a duplication request. If so, you may also be asked if you also want to duplicate ancillary information. If, for example, you duplicate a user group, besides supplying the ID of the new user group, you are asked if all users in the original user group should be linked to the new user group.

This button does not appear in the Page Actions Toolbar when:

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- Duplication is not supported for the current object.
- You are on a portal based page. (For these types of pages, if duplication is supported, the actions are defined in a zone on the portal.)
- You have made changes to the object without committing the changes to the database by clicking Save. (After making changes, you must either discard them using the **Refresh** button, or save them.)

Delete Button

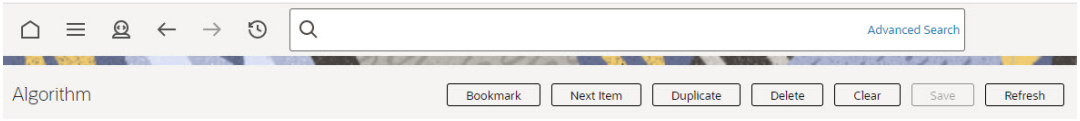
Not all transactions have the capability to be deleted. Deletion is related to the business impact of the action. In some transactions, Delete is present for some scenarios and unavailable for others; for example, you may not be able to delete a record at a certain status level.

> **Note**
>
> If you make a change to an object and do not save the changes to the database, you cannot delete the object until you either save the changes or refresh the object with the contents on the database.

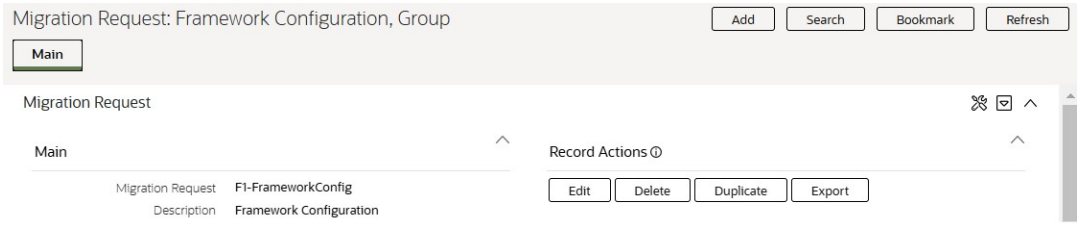
Before you delete an object, the system verifies that the object is not referenced anywhere in the system. If it is, you cannot delete it. If, for example, you attempt to delete a user, the system ensures this user has not been referenced in a user group or on a To Do.

Depending on the type of page that you are using, the option to delete may vary.

- Fixed pages display a Delete button in the page actions toolbar when the option is available.



- Portal-based pages display the Delete button in the object-related map.



- List style fixed pages commonly display the Delete button (garbage can icon) next to the entity in the list.

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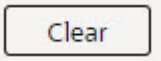
In all cases, before the object is deleted, a confirmation dialog is displayed.

> **⚠ Caution**
>
> A timeout situation could occur as the system attempts to verify the use of the deleted object if the object is referenced in many places *and* involves large volumes of production data. If this timeout situation occurs, you must with your database administration group to delete the offending object.

Clear Button

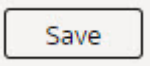
Click the **Clear** button to remove the values from the currently displayed object's fields. This action is typically used to clear input fields when adding a new object.



Keyboard Shortcut
`Ctrl+Alt+C`

Save Button

Clicking the **Save** button saves any changes you have made in the data on the current object.



Keyboard Shortcut	Alternate Shortcut
`Alt+S`	`Alt+Shift+S`

> **ⓘ Note**
>
> Refer to Shortcut Key Summary for information about the alternate shortcut.

The button does not appear unless:

- You enter a page in add mode and default values are loaded.
- You make changes to an object after it is displayed (note that you must tab or click out of the field before the Save button appears).

Refresh Button

Click the Refresh button to reload the values on the page with those from the database.

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> **⚠ Caution**
>
> All unsaved changes are discarded.

Keyboard Shortcut
`Alt+R`

Portal Maintenance

The **Portal Maintenance** action appears in the Page Actions Toolbar under these conditions:

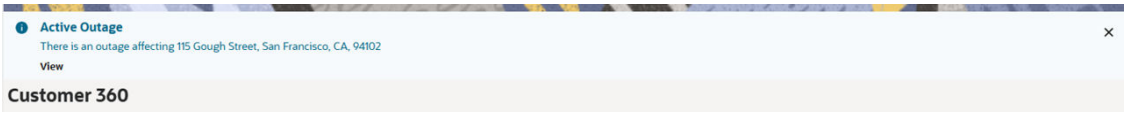
- You are on a Portal page.
- You have inquire access to the Portal application service.

Use this action to navigate to the portal definition for the portal page you are currently viewing.

> **ⓘ Note**
>
> Depending on other actions available, this action may be grouped with other actions in a '**General Actions**' menu.

Portal Banners

Important messages related to the context of a page may be displayed in the form of banners as part of the page title area.



The following describe important aspects of portal banner functionality:

- A banner message may optionally include actions that allow the user to navigate to another page or launch a drawer for more information.
- Up to three banners are displayed. When more exist, a 'View All' action is available to display all in a drawer.
- Banners can be temporarily closed while staying on the current page but navigating back to the page displays them again.

Object Display Area

The Object Display Area contains the details of the object(s) currently being viewed or maintained. For example, if you display a portal, its zones are displayed in this area.

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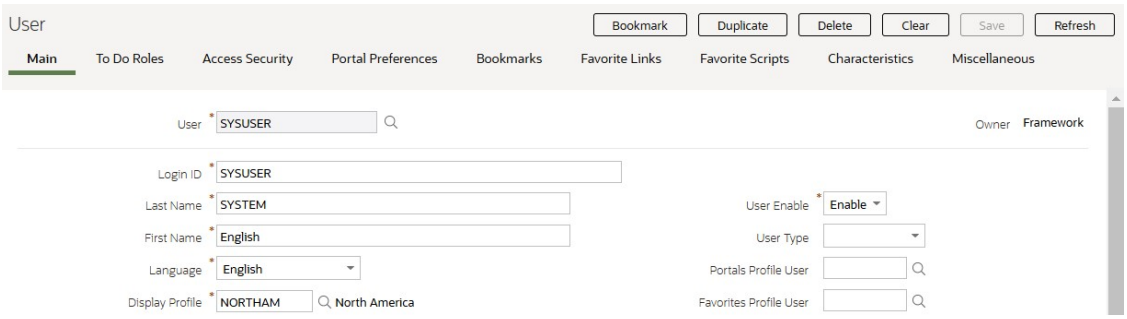
Because many of the page components follow Internet standards of operation, the behavior of these types of components are not explicitly described. This section focuses on special features that are unique to the application framework.

- Multiple Tabs
- Drawer
- Text Box
- Date and Time Fields
- Input Field with Search
- Context Menu Button
- Go To Button
- Broadcast Button
- Embedded Help Icon
- Knowledge Article Icon
- Work Lists
- Scroll Bars with Dynamic Height
- Sorting Functionality
- Get More Functionality
- Adding and Removing Rows Using Arrows
- Reorganizing Items Using the Up and Down Arrows
- Trees
- Required Field Indicator
- Accordion Windows

Multiple Tabs

When a page in the application includes a lot of information, the page may be implemented with vertical scrolling to allow the user to view all the information. Or alternatively, the page may be implemented with several tabs, allowing the user to navigate between tabs to view or update information. The following image is a section of the User page showing the multiple tabs.

Figure Multiple Tabs Example



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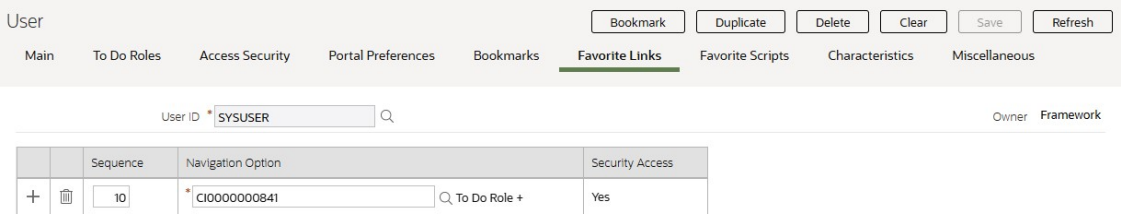
The names of the tabs describe the type of information that will be displayed in the page when the tab is clicked. For example, if you click on the **Favorite Links** tab, the contents of the page show the favorite links configured for the user.

Figure Multiple Tabs Example (After Favorite Links Tab Is Clicked)



> **Note**
>
> **Hot key options.** Rather than clicking on a tab, you can click `Alt+F2` or `Alt+Shift+F2` to scroll through the tabs. `F2` moves you through the tabs from left to right. `Shift+F2` moves you through the tabs from right to left.

> **Note**
>
> **Hot key options.** Use `Alt+` a number to navigate to the tab page whose relative position corresponds with the number. For example, if you press `Alt+6` on the above page, the **Favorite Links** tab will be displayed. `Alt+0` may be used to navigate to the tenth tab. If there are more than 10 tabs on a page, you must use the mouse or `F2` / `Shift+F2` to display additional tabs. Note that the numeric keypad on your keyboard cannot be used to implement this function.

> **Note**
>
> **Returning to a page that contains multiple tabs.** If you return to a page (by clicking the Back arrow, the page will be positioned on the last tab that was opened.

> **Note**
>
> **Page versus Tab nomenclature.** The documentation frequently refers to the contents of a given tab as a page. However, the page actually comprises the entire collection of tabs.

Scoreboard Configuration

The product provides the ability for Dashboard portals to use the tab area to display a "scoreboard", where each tab includes its own specific information, called a "scorecard". A scorecard may contain any of the following information: additional text, a metric, trend information, a graph and information configured as a badge.

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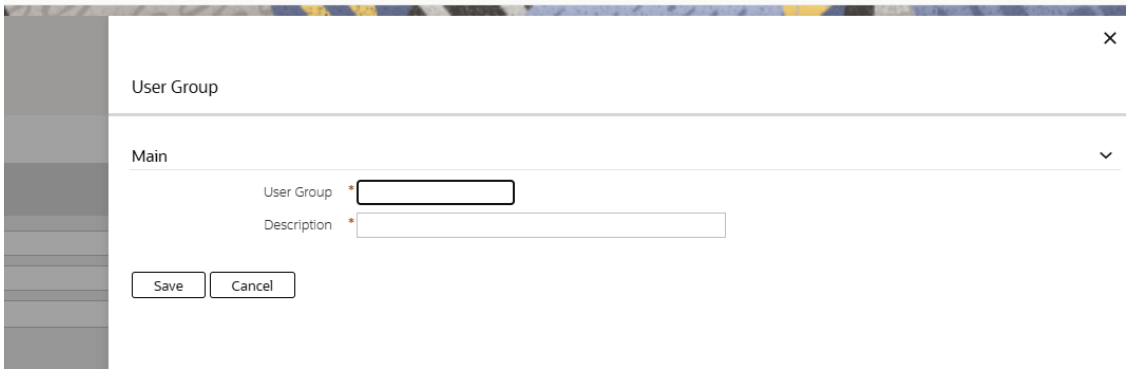
> **Note**
>
> Refer to Advanced Configuration for Portal Title / Tabs for details on how to configure this capability.

Drawer

A drawer can be launched from the Object Display area to present related extended information. Drawers can be of small, medium and large sizes.



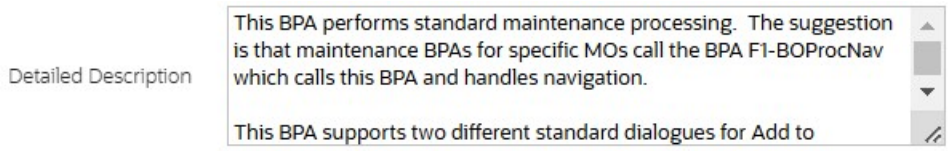
When applicable, a drawer may be launched from another drawer, forming a nested display of panels. You may navigate to the previous drawer using a 'back' action. Closing the top drawer closes all drawers.

Input forms may also be displayed in a small, medium, or large drawer panel. A drawer may not be launched from an input form drawer.

Text Box

The following is an example of a basic text box:

If the text box is a large field, the text box may be configured to enable scrolling. In this situation, most browsers offer a widget in the bottom outer corner that allows you to resize the editable window.



In our fixed pages, this type of text box also offers an expanded edit icon, (a pencil), that will appear adjacent to it.

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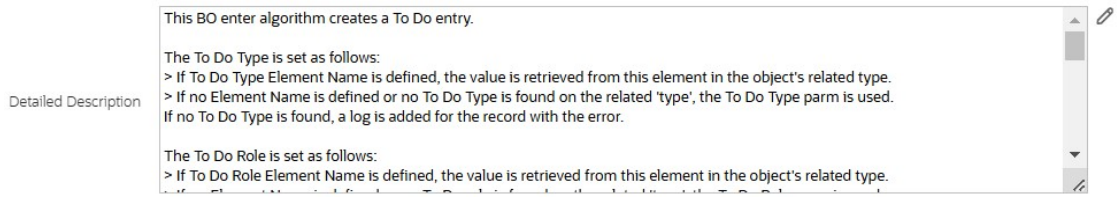
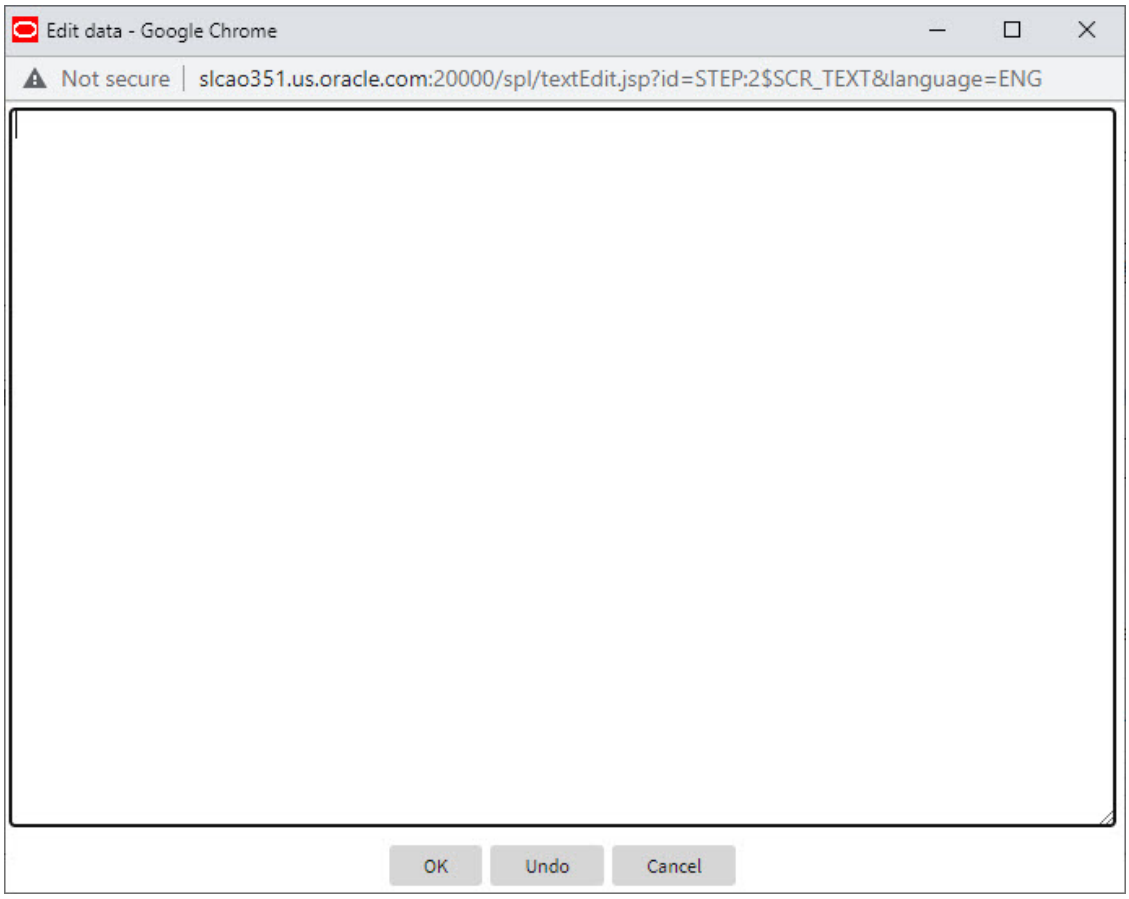


- If you click the expanded edit icon, an editable pop-up window appears. If the field is not protected as a result of business rules for the page, you may modify the text in this window.



> **Note**
>
> The following table highlights special characters that are converted to equivalent standard characters when entered in a text box.

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Entered Character Description	Converted Character Description
U+201D	Straight double quote.
U+201C	Straight double quote.

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Entered Character Description	Converted Character Description
Unicode U+201C	Straight double quote.
curly right double quote.	

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Entered Character Description	Converted Character Description
Unicode urly left single quote.	Straight single quote.

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Entered Character Description	Converted Character Description
U+2018	Straight single quote.
U+2019	Straight single quote.

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Unicode Entered Character Description	Converted Character Description
U+2013 ndash.	Simple hyphen.
U+2014 mdash.	Simple hyphen.

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Unicode Entered Character Description	Converted Character Description
U+2026 ellipse	Three dots.

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Entered Character Description	Unicode	Converted Character Description
Middle dot (bullet/centered dot)	U+00B7	Asterisk.

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Unicode Entered Character Description	Converted Character Description
U+00BC	1/4 (using three separate character

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Entered Character	Unicode Description	Converted Character Description
		s) .

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Entered Character Description	Unicode	Converted Character Description
fraction 1/2 (using 1 character).	U+00BD	1/2 (using three separate character

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Unicode Entered Character Description	Converted Character Description
	s) .

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Entered Character Description	Unicode	Converted Character Description
fraction 3/4 (using 1 character).	U+00BE	3/4 (using three separate character

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Entered Character Description	Converted Character Description
Unicode	s).

Date and Time Fields

When both the date and time are required, the Date and Time fields typically look as follows:

When only the date is required, the Date field looks as follows:

When only the time is required, the Time field looks as follows:

If you click on the calendar icon or press the Enter key while the cursor is positioned to the left of the icon in a Date or Date and Time field, the following window appears:

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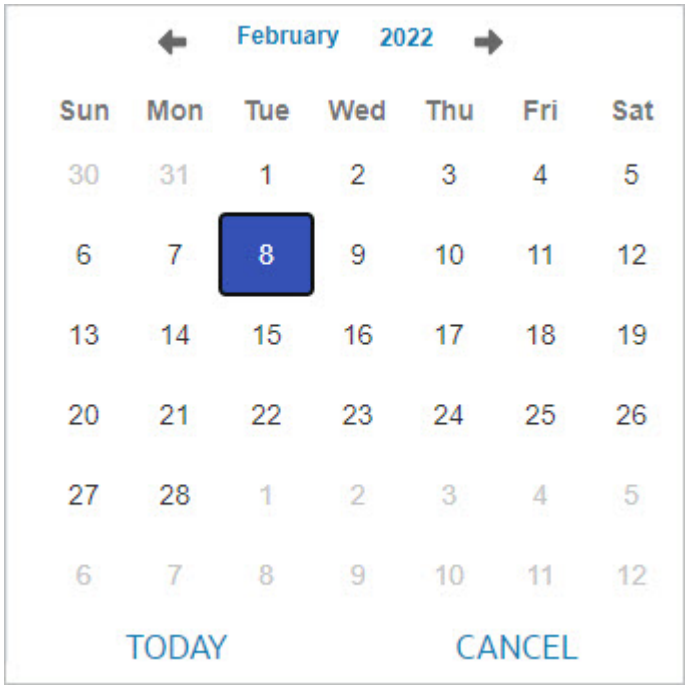
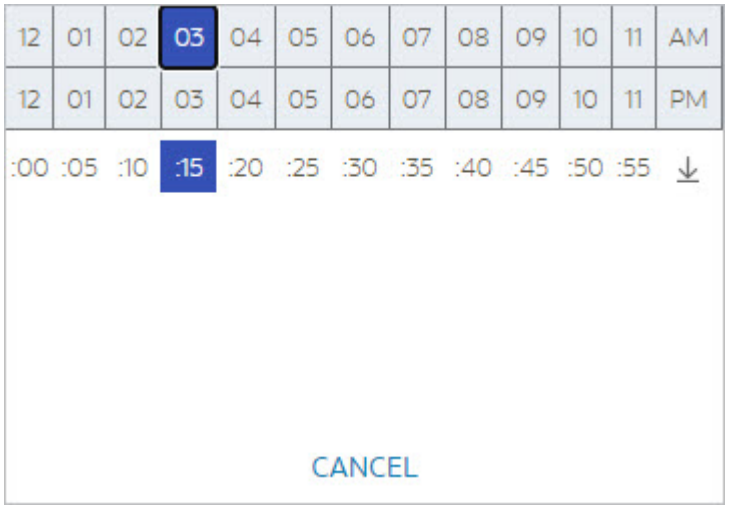


Click or press enter to select the date and populate the input field. Use the left and right arrows to scroll back or forward a month. Click on the "Month" text to bring up a range of months to select from. Click on the year to bring up a range of years to select from.

If you click on the clock icon or press the Enter key while the cursor is positioned to the left of the icon in a Time or Date and Time field, the following window appears:



Select the hour then click or press enter on the minutes to select the time and populate the input field.

Input Field with Search

If an input field is related to an object in the system that uses a search to find a valid value, a search button appears, using the magnifying glass icon.

The position of the magnifying glass depends on the type of page you are on and configuration. If it is a fixed page, the search icon is adjacent to the input field. This is also where the icon appears in portal based input pages if the Auto-filtering option is turned off.

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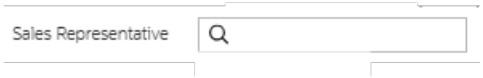
On a portal based page, if the Auto-filtering option is turned on in your environment, the search icon is embedded in the beginning of the input field.



When the auto-filtering is turned on and the search is configured to enable auto-filtering functionality, the search also includes a down arrow.

> **Note**
>
> See below for more information about the auto-filtering functionality.

In all cases, you can have the system search for an item that matches the data you entered using any of the following methods:

- Enter a value in the search field and press **Enter** while the cursor is in the search field. The system assumes you want to search for the value entered and pre-populates it in the search window's search criteria. If a unique match can be found, the system automatically populates the field with details corresponding to the record found. If a unique match cannot be found (either no matches or multiple matches), a search page opens containing selectable items.
- Click the Search button without entering a criteria. This will typically cause a pop-up search window to appear so that you can further refine your search.
- Enter a value and tab out of the search field. The system looks for a value that exactly matches what you entered. If it cannot find such a value, the search dialog will not be presented.

When an item is selected in the search page, the search page closes and the input field is populated with the value selected.

> **Note**
>
> **Sorting columns within the search grid.** You may click on the column heading of columns in a search grid to cause the contents of the grid to be sorted. Refer to Sorting Functionality for more information.

Auto-filtering

If your environment has turned on the Auto-filtering functionality, then if the search for an input field is configured for auto-filtering, the user can click the down arrow to open the filter area.

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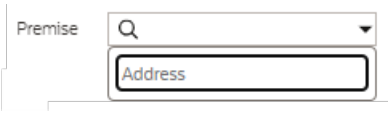
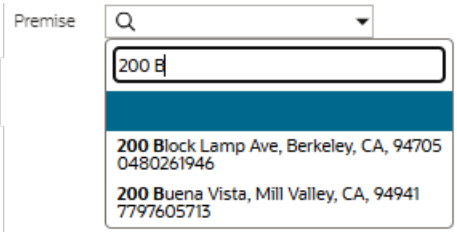


Start typing in the filter area to see results that match the entered text. The search may be configured to display up to three rows of information for you to choose the correct record. The text that matches what you typed is highlighted in bold.

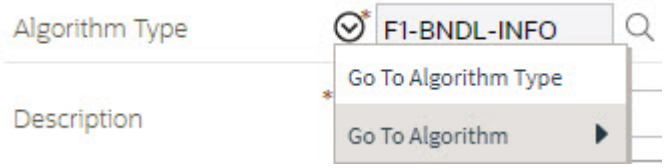


> **Note**
>
> Whether the text you type is matched only at the beginning of the string or at the middle of the string depends on how the filter is configured in the underlying search. Most search filters are configured to match text at the beginning of the string.

Context Menu Button

The Context Menu button is a small arrow that appears adjacent to an object's value or information string. An example is shown below:

Context menus exist to help you navigate to other pages and populating the page with the current context (by passing the ID of the related object). In addition, the menu items offered in a Context Menu differ depending on the entity that the menu is related to; for example, when you click the Algorithm Type context menu, a pop-up menu similar to this appears:



Different context menus exist for each of the major objects in the system; for example, in Customer Care and Billing, the context menu for Premise contains premise-oriented menu items, whereas the context menu for Account contains account-oriented menu items.

Go To Button

Clicking a Go To button, , opens the page for the related object - it functions like a hyperlink.

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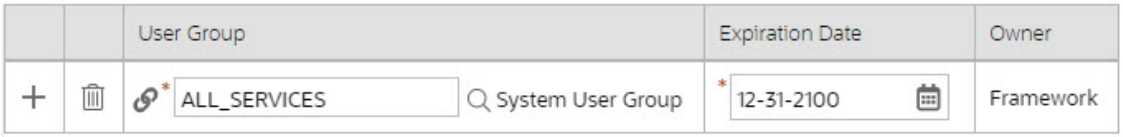

Broadcast Button

Some zones have been configured to "broadcast" unique identifiers to other zones within the portal; if so, you'll see a broadcast icon, , in the first column. Clicking the icon causes specific zones to reload - these zones that have been configured to rebuild when the unique identifier is received. For example, you might have configured a zone to display the image of a bill when a bill ID is broadcast from an info zone.

Embedded Help Icon

The icon containing a small 'i' is an Embedded Help icon.

ⓘ

When an embedded help icon is clicked, a tool tip appears containing additional information.

Knowledge Article Icon

The Knowledge Article icon may appear in select contexts that are associated with a knowledge article.

Clicking the Knowledge Article icon presents the related article in a drawer panel. You may also search for and review other related articles in that panel.

Refer to Knowledge Article for configuration information.

Work Lists

The work list buttons can appear in a zone's column heading, .

Clicking the icon results in populating the sidebar Work List Zone with the entire column. The user may use the Work List zone to easily process entries one at a time without returning back to the source query zone.

> **Note**
>
> The Work List zone is populated only upon user request.

Scroll Bars with Dynamic Height

Sometimes the height of a grid isn't sufficient to display a grid's rows. When this occurs, a vertical scroll bar appears and an "expand button" appears above this bar, . For example, the following grid is not high enough to show all of a the available sidebar zones:

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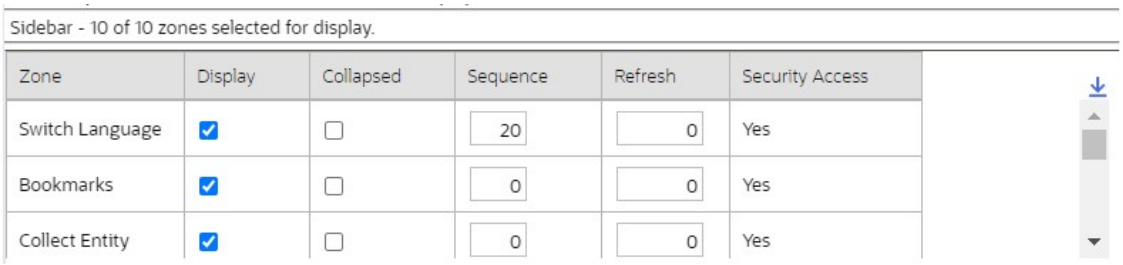

If you want to view all of the available zones without using the vertical scroll bar, you can you click the expand button. When clicked, the height of the grid expands to show all rows in the grid:

Notice, after the grid is expanded, the grid's vertical scroll bar disappears and the button in the upper corner becomes a Collapse Button, . If you click the collapse button, the grid will return to its original height.

> **Note**
>
> **Search grids.** Expand all functionality is not available in search grids.

Sorting Functionality

Grids have a heading row that contains labels for the columns. By clicking a column heading, you cause the rows to be sorted in the order of the selected column. By clicking on a column more than once, you cause the rows to be sorted in reverse order. Clicking the heading a third time removes the sorting function and returns the grid to its default display organization.

The following shows how information look after organizing the grid, clicking the column heading, by algorithm type (notice the icon in the column name).

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	Algorithm	Description	Algorithm Type
1	F1-OVRDT-ALG	Validates date in format YYYY-MM-DD	ADHV-DTD
2	F1-ACTIVEWS	Web Service - Verify Active Operations	F1-ACTIVEWS
3	F1-ATCHM-INF	Attachment Information	F1-ATCHM-INF
4	F1-ATSZCLVL	Attachment Size Class Validation	F1-ATSZCLVL
5	F1-BAT-LSDEF	Timed Batch - Service Level Based on 1.5 Timer Interval Factor	F1-BAT-LVSVC
6	F1-BFEMOLOG	Add Business Flag Error MO Log	F1-BFEMOLOG
7	F1-BFSTDNMVA	Business Flag Standard Name Validation	F1-BFSTDNMVA

> **Note**
>
> **Sorting on dropdown values.** If you attempt to sort a column that contains a dropdown value, the information is sorted in the order of the unique identifier associated with the dropdown value, not the description you see on the screen; for example, if you sort on a column containing unit of measure, the information will be sorted in the order of the unit of measure code, not the description that appears in the drop down. This means that the resultant sort will appear incorrect and therefore we discourage you from doing this.

Get More Functionality

Grids in fixed pages that can potentially contain a large number of rows have special processing that we refer to as Get More functionality. Rather than show every row, the system retrieves the first X records (where X varies from grid to grid, and from release to release) and appends a Get More button to the bottom of the grid:

When you click the **Get More** button, the system appends the next X rows to the bottom of the grid.

> **Note**
>
> **The absence of a "get more" button.** For pages configured to include Get More, if no button appears at the bottom of the grid, this means all of the rows are displayed.

> **Note**
>
> **Search grids.** The Get More function is not available in search grids.

Adding and Removing Rows Using Arrows

In some editable grids, a new row can be added to another editable grid (the grid on the left) by clicking the Add item button, , of the desired row in the grid on the right:

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	Sequence	Description
	10	Winter kWh charge, first 500
	20	Winter kWh charge, remaining

	Sequence	Description
	5	Service Charge

When the Remove item button is clicked, , the row is transferred from the grid on the right to the grid on the left. This change will not be committed to the database until you save the object being maintained

Reorganizing Items Using the Up and Down Arrows

Occasionally, rows can be repositioned in an editable grid by clicking up and down arrows. The following is an example of such a grid:

		Merge Type	Sequence	SQ Rule
		Original	10	DA Credits
		Original	20	Calc. Number of Days In Bill Period
		Original	30	Copy SQs from Master SA to sub SA

Notice the following about such a grid:

- The up arrow is dim in the first row. This is because it can't be moved further to the top.
- The down arrow is dim in the last row. This is because it can't be moved further down.
- The up and down arrows are usable in all other rows. Each time you click one of these arrows, the respective row is moved up or down one row.

> **Note**
>
> **Reminder.** When you move rows into a grid, the system does not apply the change to the database until you click the Save button (which commits the entire object to the database).

Trees

Trees are used to illustrate complex relationships between objects. The following is an example from Oracle Utilities Customer Care and Billing of a page with a tree that is expanded:

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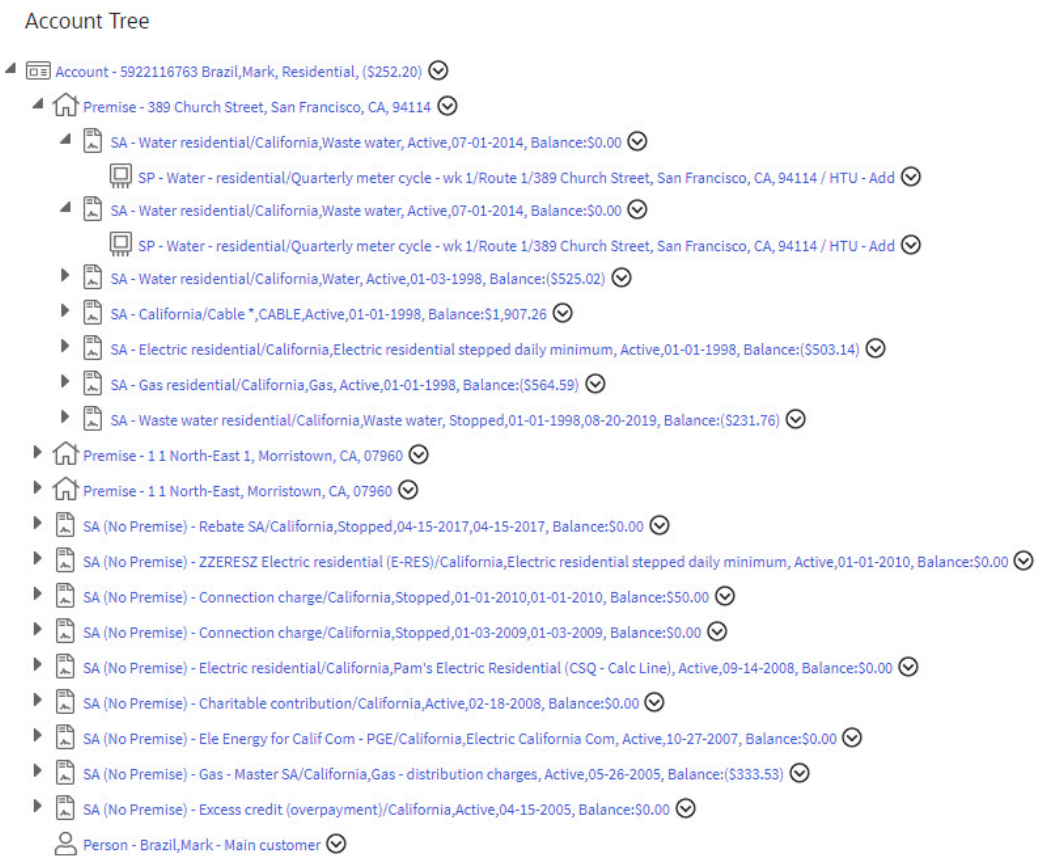

The following points describe how to use trees:

You can expand and contract the nodes in a tree by clicking on the icon that prefixes the node (you can also click the arrows to expand and contract a node).

> **Note**
>
> **Expand all.** If you press `Ctrl` while clicking on an icon that prefixes a node, all child nodes (and their children) expand.

You can click the context menu button to cause a context menu to appear. You can navigate to any of the pages that are presented on this menu. Refer to Context Menu Button for more information.

You can click on the information that appears in an underlined node to drill into the page in which the object is maintained. For example, if you click on the account information, you will be transferred to the Account - Main page.

> **Note**
>
> **Important!** If you make changes after expanding a tree's nodes (e.g., by drilling down on a Premise and changing the premise's address), the tree will contract to the first node if you return to the page.

Nodes in trees fit into two broad categories:

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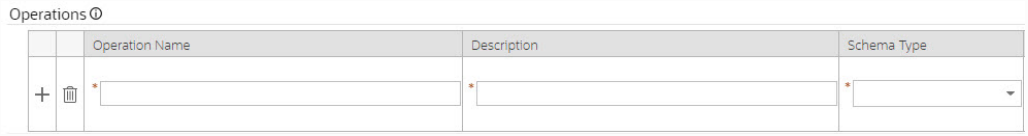
- **Information nodes.** Information nodes highlight the existence of other data. For example, on the Control Central - Bill Payment Tree, a node exists to highlight the existence of new financial transactions that were created since the last bill was completed.
- **Data nodes.** Data nodes show information about objects in the system. For example, data nodes exist on the Control Central - Bill Payment Tree that show bills and payments.

Required Field Indicator

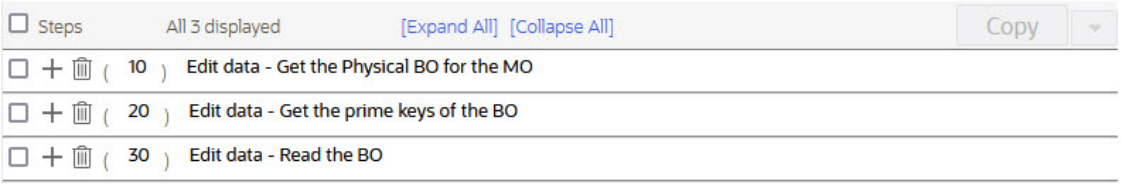
An asterisk (*) is used to indicate that a field is required. The system determines this based on the field's configuration. When a field becomes required because of an algorithm and not the field's configuration, however, the system will not add an asterisk.

> **Note**
>
> If a page includes a grid, fields within a row may be marked as required.
>
> 
>
>
> In this situation, the fields within the grid are **only** required if the row is being populated.

Accordion Windows

Accordion windows are used when the data held in an object's rows does not comfortably fit into a grid.

Each row in an accordion has a header that summarizes a row's details. When you click a header, the row expands to show the details. The following is an example of an accordion where all headers are collapsed (meaning that only summaries of the rows' details are shown):



When you expand a header, its details are exposed. For example, the following shows the same accordion after the third row is expanded:

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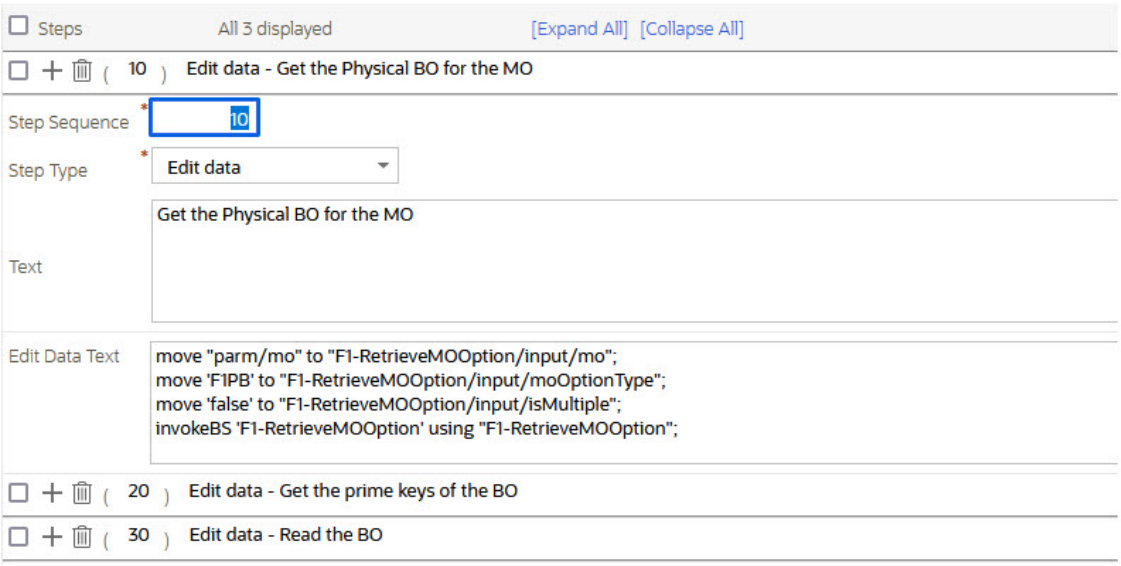

> **Note**
>
> **You must expand to update.** In order to update a row in an accordion, you must expand it.

Sidebar Area

The sidebar is a special area that is always available for display on the desktop. It displays the zones defined in the Sidebar Portal.

> **Note**
>
> **Open / close the sidebar**. You can open or close the sidebar using the Sidebar Toggle.
>
> **Minimize the sidebar when launching the system.** If desired, a URL parameter may be used to minimize the sidebar when launching the system, using the parameter `minSidebar=true`. Refer to Creating Application Links in External Applications for more information and examples.
>
> **Adjusting the sidebar width.** You can adjust the width of the sidebar by moving the slider that separates the sidebar from the object display area. This also updates your user preferences with the new width.

The sidebar area is displayed after the Object Display area by default. (On the right for a left-to-right language and on the left for a right-to-left language). You have control over its location, width and more as part of your user preferences.

Assistant Area

The assistant area is a special area that may appear for your product, depending on what is offered.

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The assistant area is located directly above the Sidebar Area and as such, is impacted by some of the appearance behavior that applies to the sidebar. If you collapse the sidebar area, the assistant area is also collapsed. If you adjust the sidebar width, the assistant area width is adjusted accordingly. However, the refresh events that impact the sidebar do not impact the assistant area.

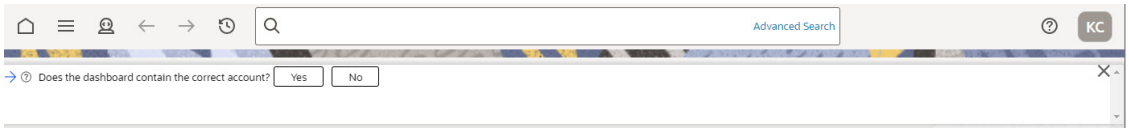
Refer to your product's specific documentation for more information about the functionality visible in this area.

Script Area

> **⚠ Caution**
>
> Guiding scripts that interact with the user using the script area are limited to surf over fixed pages only and are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

When a script is initiated, the object display area shifts down to make room for the script area.

The information in the script area takes you through the steps in the selected business process (provided by your implementation team).



Portal Pages

This section describes using portals and zones to find and display information. This is the preferred technique used by the base product for building user interfaces.

Additionally, portals and zones may be configured by your implementation to supplement the base package provided functionality.

The contents of this section provide background information about portal page behavior.

- Portals Are Made Up Of Zones
- Users Must Be Granted Security Access To Each Zone
- Zones May Appear Collapsed When A Page Opens
- Some Portals Allow User Customization
- Sidebar Portal
- Zone Types and Characteristics
- Common Base Portals and Zones
- Process Flow

Portals Are Made Up Of Zones

The term "zone" is used to describe a section on a portal. Each zone has a heading and content.

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Keyboard Shortcuts	Description
`Alt+]`	Moves the cursor focus to the next zone on the page based on the standard browser keyboard navigation "order".
`Shift+Alt+]`	Moves the cursor focus to the previous zone on the page based on the standard browser keyboard navigation "order".

The following is a portal with seven zones:

- Current Context
- Current To Do
- Customer Contact
- Eligible Scripts
- Favorite Links

> **Note**
>
> This example may not be available in your application; it is used for illustration purposes only.

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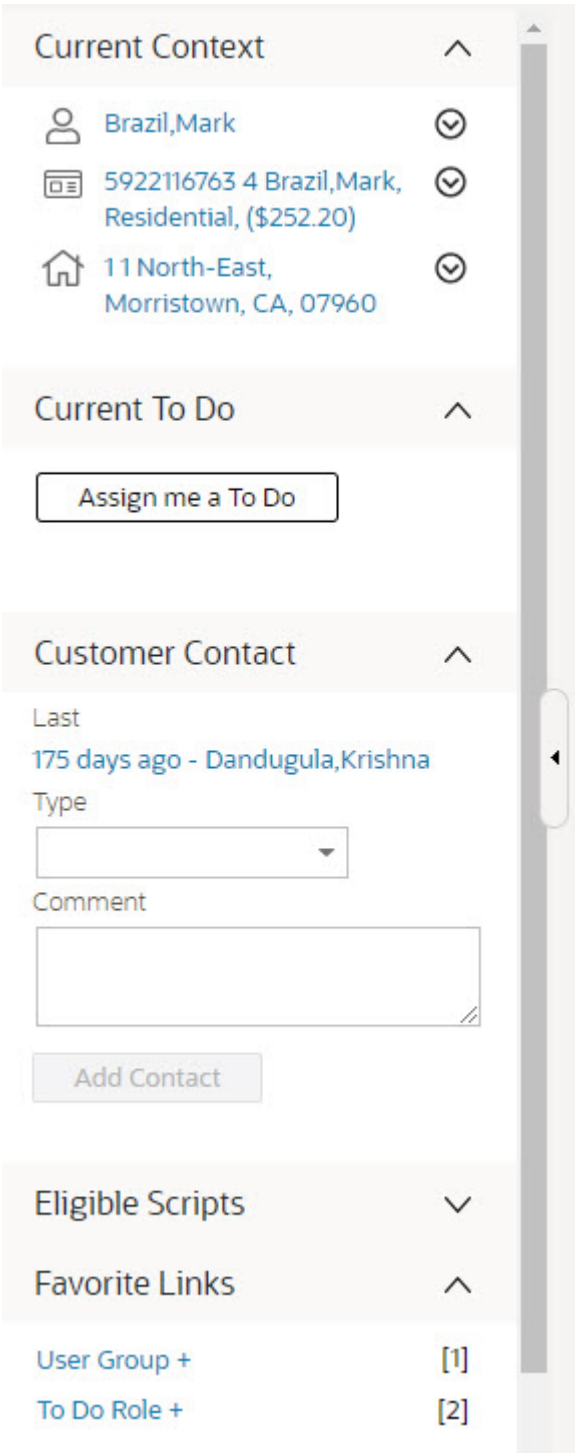

Users Must Be Granted Security Access To Each Zone

A user must be security granted access rights in order to see a zone on a portal.

NOT_SUPPORTED

Refer to Granting Access to Zones for information .

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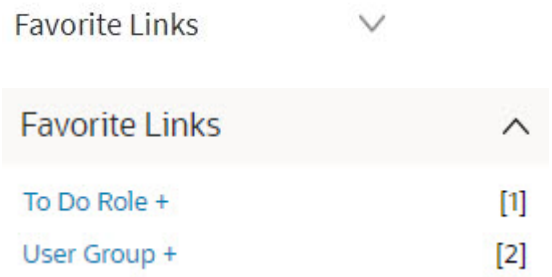
Zones May Appear Collapsed When A Page Opens

Zones may be designed to appear collapsed (or minimized) when the portal is initially displayed. To view the information in a collapsed zone, the user can press the zone's expansion button, , to either expand or collapse the zone:



A zone's data is only retrieved when it is expanded.

Some Portals Allow User Customization

There are some portals in each base product that are configured to allow user customization. In this case, the portal is visible on the user's portal preferences. For these portals each user has control over the following:

- Which zones appear on their portal
- The order in which the zones appear
- Whether the zones should be "collapsed" (i.e., minimized) when the portal opens.

Users define their preferences by clicking the User Preferences button. Pressing this button transfers the user to the User Preferences page on which their Portal Preferences can be defined.

Portals used for base product query and maintenance pages are typically configured to not allow user customization.

Sidebar Portal

The sidebar is a special portal displayed in the Sidebar Area. Its zones contain tools and data that are useful regardless of the object being displayed.

Functional Grouping. Depending on your configuration, content may be organized in functional areas with key information presented in the main focus area along with ancillary areas for favorites and tools. Each functional area is a sidebar portal enabled by the "Sidebar Configuration" extendable lookup. Functional grouping is disabled when the legacy sidebar portal "CI_DASHBOARD" is marked active and other functional sidebar portals are marked inactive in the sidebar configuration definition.

When your implementation is configured to be organized by functional area, you see icons at the bottom of the sidebar area. In this image, the 'target' icon is selected, indicating that you see the sidebar zones in the 'main' functional area. Click the 'star' icon to show the zones in the 'favorites' functional area. Click the 'wrench' icon to show zones in the 'tools' functional area.

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The subsequent topics describe the zones that are provided by the framework product for this portal. Please note the following additional information about the sidebar portal that may impact how it appears.

- **Additional zones may be available in other products.** The zones described below are available in every base product. Please refer to the product-specific documentation for additional sidebar zones available in your product.
- **Context Sensitive Zones may appear.** Some pages may define additional zones that should appear in the sidebar only if that page is displayed. These are referred to as Context Sensitive Zones.
- **Sidebar zones are configurable.** The sidebar portal is configured to allow a user to define preferences for it. Refer to Portal Preferences for more information.

> **Note**
>
> **Security.** As a general rule, sidebar zones each refer to a unique application service so that a security administrator may configure which users are allowed to have access to which zones. Note that the user portal preferences indicates which zones a user has security access to.

- Bookmarks Zone
- Collect Entity Zone
- Current To Do Zone
- Favorite Links Zone
- Favorite Scripts Zone
- Favorite Searches Zone
- Switch Language Zone
- Tags Zone
- To Do Summary Zone
- Work List Zone

Bookmarks Zone

After clicking the Bookmark button and saving a bookmark, it is visible in the **Bookmarks** zone. Clicking one of the links in the zone navigates to the page where the bookmark was saved and loads the information related to the record that was displayed when the bookmark was saved.

Click the trash can icon to delete the bookmark.

Note that a user may change the name of the bookmark or change the sequence of the bookmarks by navigating to the User - Bookmarks in the user preferences.

This information is also visible in the Favorites, Bookmarks section of the menu.

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Collect Entity Zone

The **Collect Entity** zone provides a quick way to add or remove the entity currently being displayed to and from the migration request in context. This is mainly useful when reviewing data to export and while doing so maintain the export list. The zone automatically appears once an **Entity List** migration request is visited and set in context.

Current To Do Zone

The **Current To Do** zone is designed to streamline the process of working on To Do entries from assignment to completion. It displays key information about the user's current To Do entry and provides functions that help minimize the number of steps it takes to resolve the entry and potentially other entries related to it.

> **Important**
>
> The information here assumes that you have configured the system to use the ability to have a substatus of Assigned, which includes the **In Progress** value. If you are not taking advantage of the substatus, then see below for information about how the functionality described here works differently.

The following sections provide more detail about the zone.

To Do Entry Visible

If you have a To Do Entry that is currently **In Progress**, its information is visible in this zone when you launch the system. As described in Working On A To Do, most of the actions in the system that cause a new To Do Entry to be pushed to this zone cause that To Do Entry to be updated to **Assigned / In Progress**. If you use those actions then the To Do Entry in this zone will always be your current **In Progress**. However, there are use cases that populate the To Do entry without assigning it to you. If you perform those actions, the To Do Entry that is pushed to this zone and remains until you perform a subsequent action that refreshes the information in this zone.

Next To Do Assignment

Users may have the option to click the **Assign me a To Do** button to request the next To Do entry they should work on. This functionality is optional and can be configured to follow your organization's business rules in determining the next task for a user. For example, if your organization practices work distribution "on demand", this feature can be configured to find the highest priority entry a user can work on and assign it to the user. Refer to work distribution for more information on this business practice.

> **Note**
>
> Refer to On Demand Assignment Configuration for more information on how to configure the system to take advantage of this function.

If the system is successful in determining the next entry the user should work on, this entry is assigned to the user and moved to In Progress and becomes the user's current To Do. Its information is displayed on the zone.

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To Do Information

The user's current To Do may be set using the Next Assignment algorithm, or by actions described in Working On A To Do. Once a current To Do has been set, the zone displays details related to the To Do.

The **Message** describes why the entry exists. The message description allows the user to drill into the page on which the entry's respective object is displayed. For example, if the entry is associated with an asset that needs review, the user is brought to the asset page to view the information and potentially take action. If the To Do type has been configured to associate a script with this To Do entry's message number, then instead of being taken to the respective page, the associated script is launched.

Info displays the standard To Do information. An icon appears if there are comments on the To Do and a Log Entry icon appears if there is a log entry of type **Forwarded**, **Sent Back** or **User Details** on the To Do. Clicking the description drills into the To Do entry page allowing the user to view more information about the entry or make changes to it as needed.

Depending on the status of the To Do entry and whether you are allowed to perform the actions, the following action buttons may be visible.

- You may use the **Complete** button in the zone to complete the current entry.
- If the current entry is **In Progress** and assigned to you, you may use the **Hold Progress** button to put the entry into the **On Hold** status. This is useful if your implementation wants an accurate picture of how long it takes to work on a To Do entry. You can put the entry on hold if you need to wait for some event to occur before continuing progress on the entry.
- You may see the **Start Progress** button if the current entry is assigned to you and not currently in progress. You may also see this if the current entry is Open and in a role that you are in. (This may happen if you drill into an open To Do from the To Do Search page.) Clicking this button puts the entry into **In Progress**.
- You may see the **Stop Work** button if the current entry is assigned to you and is not currently **In Progress** or **On Hold**. Clicking this button returns the entry to the **Assigned** state (resetting the assigned substatus).

Next / Previous Buttons

The **Previous** and **Next** buttons are enabled on this zone under the following conditions:

- The user selected an entry either on the To Do List page or the To Do Search page.
- At least one other entry exists *below* (for Next) or *above* the entry selected (for Previous).

> **Note**
>
> The system recommendation is to use the To Do Management or To Do Dashboard / To Do Details portals to manage work lists of To Do entries. Those pages use the worklist zone to manage the list and these Next and Previous buttons are not applicable.

Clicking **Next** or **Previous** will bring the user to the transaction indicated on the To Do Entry's message, where its respective object is displayed. It also makes that To Do the Current To Do displayed in the zone.

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Keyboard Shortcut	Comments	Alternate Shortcut
Alt+Y	Previous To Do	
Alt+Z	Next To Do	Alt+Shift+Z

> **Note**
>
> Refer to Shortcut Key Summary for information about the alternate shortcut.

> **Note**
>
> When a user drills down on a To Do entry from the To Do List page, the system automatically changes the status of the entry to **Assigned** and **In Progress**. If **Next To Do** or **Previous To Do** is subsequently used to scroll through this list, the system does *not* change the To Do entry's status. You may click the **Start Progress** button in this zone.

Related To Do Entries

If the To Do entry has non-complete related entries a summary **Related To Do** description appears. The description states the total number of related entries, how many are still in **Open**, how many are assigned to current user and how many assigned to others. This hyperlink navigates to the To Do Search query allowing you to review the related entries. At this point you may decide to assign entries that can be positively identified as being caused by the same problem as the current To Do also to you.

If at least one related To Do entry is **Open** or also assigned to you, the **Complete All** button is visible. If you determines that the related To Do entries have been resolved with the appropriate action taken, the button may be used to complete in one step the current entry and all related entries that are **Open** or assigned to you.

If the related entries are not resolved with one action, you may opt to use the **Complete** button to complete the current entry alone and work on related entries one at a time. Using the related To Do information hyperlink you may navigate to the To Do search page and drill into the first related To Do to work on using the message hyperlink. This entry now becomes you current To Do and the **Next** and **Previous** action buttons are set to scroll through the related entries list. It's not automatically assigned to you. Use the **Start Progress** button in this zone to assign it to you and start progress.

Implementations Not Using Substatus

If your implementation is not taking advantage of the substatus as described in The Lifecycle Of A To Do Entry, some functionality described above works differently.

When launching the system, no To Do Entry is populated in this zone by default. To Do entries only get populated in this zone when you take an explicit action.

Any action that automatically assigns you a To Do Entry only performs that step and does not update it to **In Progress**.

The buttons **Start Progress**, **Hold Progress** and **Stop Work** are never visible.

If you are using To Do Search and drill in on an entry before assigning it to you, you'd need to go back to To Do Search page or drill into the To Do Entry page to assign it to you. Similarly, if

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you use the Next / Previous buttons to work through a list from either To Do Search or To Do List where the entries are not already assigned to you, the recommendation is to return to the respective pages to assign them to you.

Favorite Links Zone

Each line in the **Favorite Links Zone** corresponds with one of the user's favorite links (e.g., transactions). Clicking on a line invokes the transaction. The first nine entries can be invoked by pressing an accelerator key (`Ctrl` + the number of the relative position of the link in the list). Note that the numeric keypad on your keyboard cannot be used to implement this function.

Users define their favorite links by clicking the User Preferences button. Clicking this button transfers the user to the User Preferences page on which their Favorite Links can be defined.

This information is also visible in the Favorites, Bookmarks section of the menu.

Favorite Scripts Zone

The Favorite Scripts zone lists the business process assistant (BPA) scripts that you have defined on your user preferences. You can click on a script to execute it. You can click the **Search** button in the zone to search for other scripts.

> **Note**
>
> If you do not see the Favorite Scripts zone in the sidebar, navigate to User Menu and click the **Preferences** menu item to display the User - Portal Preferences page. Under the Sidebar Portal row, select the **Display** option for the Favorite Scripts zone.

This information is also visible in the Favorites, Bookmarks section of the menu.

Favorite Searches Zone

If you marked a saved search as a favorite using Saved Searches functionality, the search is visible in the **Favorite Searches** zone. Clicking one of the links in the zone navigates to the page where the search was saved and populates the filter values and executes the search.

This information is also visible in the Favorites, Bookmarks section of the menu.

Switch Language Zone

The **Switch Language** zone is used to switch the application's language. Only languages that are supported by your implementation will appear.

To switch the application's language, choose the desired language and press the **Refresh** button.

> **Note**
>
> This zone only appears if more than one language is enabled in your implementation. You may further limit which users see this zone by not granting security rights to the zone's application service.

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Tags Zone

The **Tags** zone provides a quick way to associate the entity currently being displayed with an entity tag or remove any of the tags it currently has. Tagging an entity may be useful to highlight various contexts in which it can be used, for example for testing or reporting purposes. Refer to Defining Entity Tags for more information.

Note that the zone is visible only when there is an entity in context, i.e. there is an entity to tag, and the user has application security access to this zone.

To Do Summary Zone

The **To Do Summary Zone** may appear in the sidebar area for backward compatibility reasons. The zone has several purposes:

- It presents a summary of the To Do entries that have been assigned to you.
- The colored "age bars" highlight the age of the To Do entries. The colors red, yellow and green are used to highlight the relative number of old, middle-aged and new To Do entries. The age associated with each of these colors is user-configurable. Note, you can hover the cursor over an "age bar" to see the number of To Do entries.
- If you click on the To Do Type description, you'll be transferred to the To Do Management portal where these To Do entries will be displayed. From this page, you can drill down to the specific entries.

> **Note**
>
> **Time saver!** Use the worklist button when working on an entry in the To Do Management portal. All the individual To Do entries will be visible in the Worklist sidebar zone, allowing you to work through additional To Do entries without returning to the To Do Management portal.

Work List Zone

The **Work List** zone is populated when a user click the Work Lists icon in an info or query zone. When you click the link of the work list entry, the system does whatever it would have done if you had clicked on the hyperlink in the zone. The system marks the current entry with a star. It marks any previously worked entry with a checkmark.

Previous and Next buttons are available in the zone allowing you to go to the next or previous entry without having to locate it yourself and click the link.

You may actively mark an entry to be ignored by the Previous or Next button by clicking the icon column for that entry. An icon of an eye with a slash through it is visible. You can click the icon to re-include that entry in the previous / next action.

The work list stays populated until you either click the Clear link in the zone's header or you overlay the work list by clicking a different column's work list icon.

The image shows a work list zone illustrating that the first entry was "visited", the second entry is the current one being viewed and the fourth entry is marked to skip or ignore.

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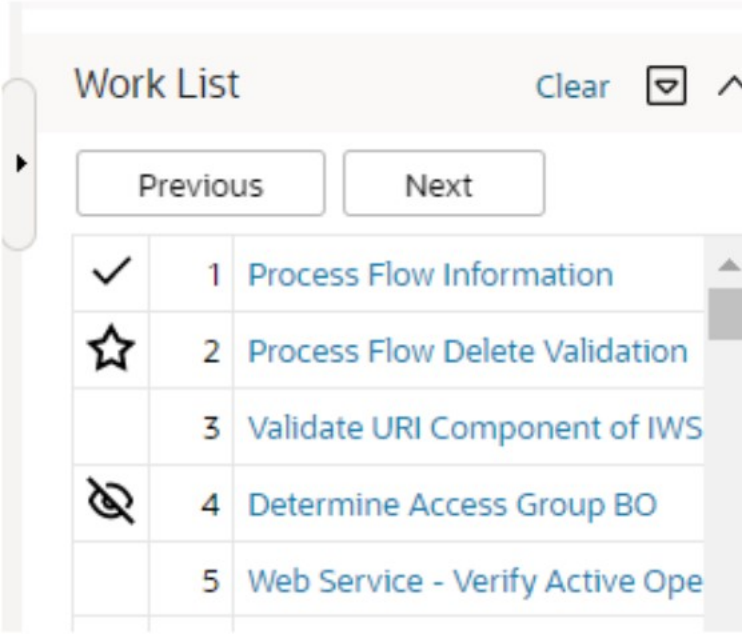

Zone Types and Characteristics

The topics in this section describe common zone types, function, and common characteristics.

> **NOT_SUPPORTED**
>
> Refer to The Big Picture of Portals and Zones for a description of general portal and zone functionality.

- Common Characteristics of Zones
- Explorer Zones
- Map Zones
- Tabbed Display Zones
- Timeline Zone

Common Characteristics of Zones

The following topics describe common characteristics of all zone types supported by the base package.

- Zone Visibility

Zone Visibility

A zone may be configured to dynamically be visible or completely hidden depending on the information being displayed. When hidden, not even the header is displayed.

For configuration information, refer to Zone Visibility Service Script.

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Explorer Zones

The product provide several zone types that are used to find or display a set of information. These are called explorer zones. There are two types of explorer zones:

- **Info zones.** An info zone displays a list of information about an object. These types of zones often display information without requiring any input from the user.
- **Query zones.** A query zone allows users to find objects matching a given search criteria.

Virtually every aspect of an info or query zone is controlled by its zone configuration. However, most share basic common components described in the subsequent sections.

- Search Criteria / Filter Area
- Description Bar
- Results Area
- Title Bar
- Configurable Columns
- Multi-Query Zones

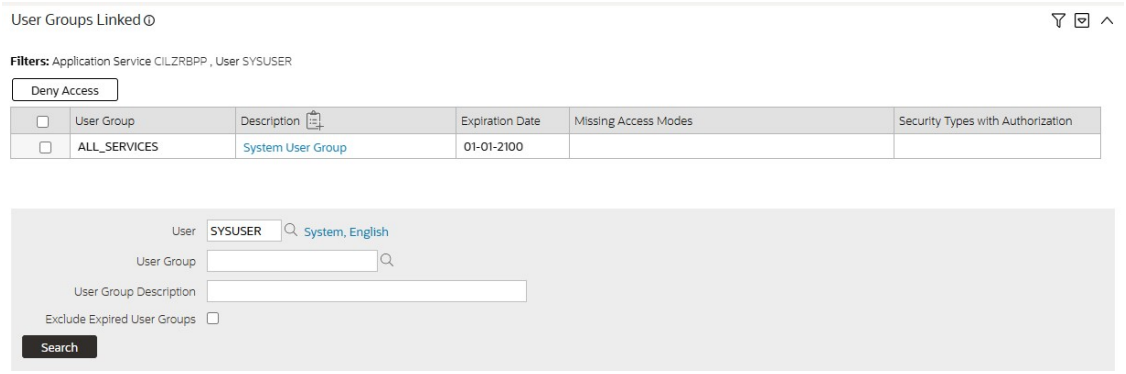
Search Criteria / Filter Area

For query zones, the Search Criteria Area (also called Filter Area) contains the criteria used to find objects. The design of the zone controls the number and type of filters that appear in this area. After search criteria is entered, clicking the **Search** button causes the system to look for records that match the criteria. The results are shown in the Results Area.

The system automatically collapses the filter area to allow more space for displaying the results. At that time the **Expand Filters** button may be used to open the filter area to enter different criteria. When the filter area is expanded the **Hide Filters** button may be used to collapse the filter area again without performing a new search.

For info zones, the zone's configuration indicates whether or not a Filter area is applicable and if so, whether or not it is open or closed by default. If the filter area is configured, the Show Filter icon is visible in the zone header. Click this icon to expose the Filter Area, if it is not visible and click the icon to hide the Filter Area if desired. Use this area to filter the information that appears in the zone by different values. Click the **Search** button to rebuild the Results Area using the specified filters.

For example, the following shows an info zone listing user groups that have access to a given Application Service where a filter area has been configured to allow users to refine the list by various criteria.



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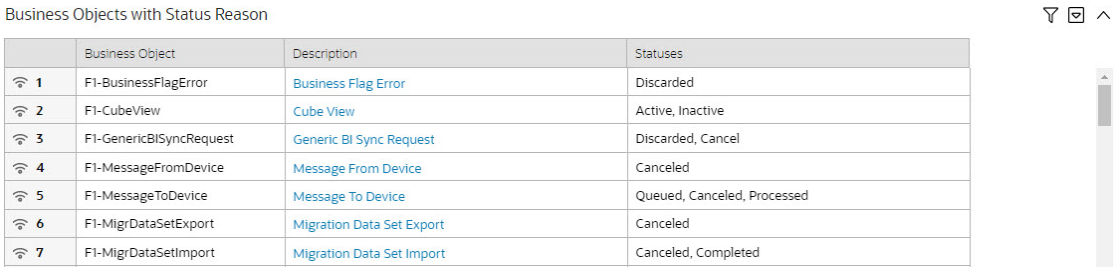
The info zone includes configuration to indicate whether the filter area, when exposed, should be shown at the top of the zone (above the results) or at the bottom of the zone (below the results). For query zones, the search criteria is always displayed at the top.

Description Bar

The Description Bar describes the search criteria that were used to build the Search Results Area.

Results Area

The Results Area displays the appropriate list of objects. For an info zone, this is the list of appropriate objects with any input filter criteria considered. The following is an example of the results for an info zone. For a query zone, this is the list that matches the search criteria defined in the Filter Area. The following is an example of the results set of an Info Zone.


Business Objects with Status Reason

	Business Object	Description	Statuses
1	F1-BusinessFlagError	Business Flag Error	Discarded
2	F1-CubeView	Cube View	Active, Inactive
3	F1-GenericBISyncRequest	Generic BI Sync Request	Discarded, Cancel
4	F1-MessageFromDevice	Message From Device	Canceled
5	F1-MessageToDevice	Message To Device	Queued, Canceled, Processed
6	F1-MigrDataSetExport	Migration Data Set Export	Canceled
7	F1-MigrDataSetImport	Migration Data Set Import	Canceled, Completed

For a query zone, the columns that appear may differ depending on the search criteria. For example, if you search for a customer by their driver's license number, the resulting columns may be different than the ones displayed when you search by customer name.

The following points highlight details related to viewing and working with the result set:

- **Broadcast.** If the results set is configured to display a broadcast icon, , it means that at least one other zone on the portal is configured to display data related to the record selected in the results list. Clicking this icon will cause the other zone or zones to be built or refreshed to display related data.
- **Hypertext.** One or more columns in the zone may be configured as hypertext. Clicking the hypertext will result in navigating to another page to display data related to that column based on the configuration for that column.
- **Maximum height.** The maximum height of the report area is controlled by the zone's configuration. A vertical scroll will appear when more rows exist than fit into the height.
- **Maximum rows.** The maximum number of rows that can appear is controlled by the zone's configuration. Excess rows are truncated before display. Please note, you can configure the zone to export more rows than appear in the Results Area.
- **Control column sorting.** By default zones are designed to allow a user to sort the results list by clicking any column heading. Clicking once sorts ascending. Clicking again sorts descending. However, a zone may be configured to not allow this type of sorting.
- **Work list.** Columns may be configured to enable the work list icon, . Clicking this pushes all the data into the Work List zone.
- **Rearranging columns.** A zone may be configured to allow a user to rearrange columns and add or remove columns visible in the Result Area. Refer to Column Configuration for the details.

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The type and variety of columns that appear in the Results Area is controlled by the zone's configuration.

Title Bar

The Title Bar contains the zone's description along with other icons and functions described in this section.

In the corner of the Title Bar, you will see an indicator that tells you whether the zone is collapsed or expanded. Each time you click the indicator, the zone toggles between expanded and collapsed. The following image shows a collapsed zone.

> **Note**
>
> Recommendation: For zones that are configured to show on portal preferences, set up Portal Preferences to collapse zones that aren't needed every time a portal is displayed. Rationale: The system doesn't build collapsed zones when a portal is displayed. Instead, collapsed zones are only built when a user expands them. Thus, indicating a zone is collapsed improves response times.

If the zone is configured with help text, a help icon appears to the right of the zone title. Click this icon to view the help text.

The following sections describe additional icons and tools visible on the title bar. Note that in addition to the information described in this section, additional actions that are specific to a zone may appear based on configuration. The actions may appear in the form of hypertext, an icon or a button.

- Explorer Zone Menu
- Show Filters
- Show Column Configuration Area
- The Open Zone Maintenance Icon

Explorer Zone Menu

Click the Explorer Zone Menu icon to list available tools. The following topics describe each tool.

- Clear Filters
- Export Data
- Save Search Options

Clear Filters

Click the **Clear Filters** link in the Explorer Zone menu to clear the filter values and zone data.

Export Data

Click the **Export** link in the Explorer Zone menu to download the zone's data in csv format. This link is hidden if the zone has been configured to not download rows.

Please note the following with respect to this feature:

- Clicking export performs the search because it is possible to configure a number of records for download that differs from the number of records configured to display.

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- Because the search is performed, you can request an export even without first searching on the zone. The filters populated (or not populated) at time of exporting are the ones used for the export. If the user did not search at all or did a search and then changed the filters and exported before searching again, the results in the export may not match what is visible on the zone.
- It is possible through zone configuration to mark columns that are visible to the user interface as suppressed in the export. Conversely, it's also possibly to mark columns as suppressed on the user interface but included in the export. As such, the columns visible in the export may not always match what is visible in the user interface. This applies when for zones that support configurable columns. Columns removed from view through this technique are still included in the export if not marked to suppress.
- If the column results include any HTML, the HTML is stripped out before exporting.

Save Search Options

Query zones and info zones that include filter areas, allow a user to capture and save filter criteria so that the same search can be more quickly executed in the future. Users may save many different search options for the same zone. Users also have the option to nominate one search as the default so that this search is automatically loaded upon entering the zone. In addition, users may choose to set one or more searches as a Favorite, which causes the search to appear in the Favorite Searches zone in the sidebar, as well as through the Menu. This allows a user to navigate to the portal for that zone and load the saved search in one click.

The Explorer Menu includes various options for supporting Saved Searches that are described below.

Note the following additional points about this functionality:

- **Click Search before Saving.** When a user wants to save a search, the search criteria should be entered and the **Search** button should be clicked prior to saving the search.
- **Criteria is saved, not results.** Although a user must click **Search** prior to saving the search, the system saves the criteria, but not the results. When returning to the query or info zone in the future and opening a given saved search, the results displayed will be the current records in the system that match the saved search criteria.
- **Multi-Query Zones.** When a user is on a multi-query zone, the searches are saved at the multi-query zone level so that all saved searches for the various search dropdowns for a given multi-query zone are visible in the Open Saved Searches menu option.
- **Functionality is Secured.** If for any reason an implementation wishes to restrict which users are allowed to save searches, the functionality is securable. Only users with **Inquire** access to the `F1_USRFAVSCH` application service will see these options in the explorer menu. This is the same application service that is used to provide access to the Favorite Searches sidebar zone.
- Save As
- Open Saved Search
- Save
- Set As Default
- Remove As Default
- Add To Favorites
- Remove From Favorites
- Delete

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Save As

The **Save As...** option in the Explorer Zone menu allows a user to save the current entered search criteria. This should be clicked after executing the search.

The user is prompted to provide a name for the search. This search is now available from the Open Saved Searches option. If desired, a user can also choose to make this search the Default or may choose to Add to Favorites.

This option is visible whether or not an existing saved search is loaded. When a saved search is loaded, this option allows a user to make changes to the search criteria and save a new search with that criteria.

Open Saved Search

The **Open Saved Search...** option in the Explorer Zone menu is visible if there are any saved searches for the zone that is currently visible. Select this menu entry to view the current list of saved searches for the zone. For multi-query zones, any saved search for any of the query zones that are part of the multi-query zone are visible. Choose the desired saved search. The criteria is updated with this information and the search is performed.

Save

The **Save** option in the Explorer Zone menu is visible if a Saved Search is already loaded. This option allows a user to save changes to the criteria of an existing saved search (overwriting the previously saved criteria).

Set As Default

The **Set As Default** option in the Explorer Zone menu is only visible if a saved search is loaded and it is not currently the default. Click this option to nominate this search to be the one that is loaded when navigating to this zone from the menu.

Remove As Default

The **Remove As Default** option in the Explorer Zone menu is only visible if a saved search is loaded and it is currently the default. Click this option to no longer load this search automatically when navigating to this zone from the menu.

Add To Favorites

The **Add To Favorites** option in the Explorer Zone menu is only visible if a saved search is loaded and it is not currently included in the favorite searches zone. Click this option to include this search in the Favorite Searches zone. Once a search is in the Favorite Searches zone, you can use the link to the search in the sidebar to navigate to the portal for this zone and load the saved search in one click.

> **Note**
>
> **Not available for dependent zones** There are some portals that include a zone that is not the main query or info zone on the portal, but is rather a zone providing additional information for a record that is displayed. If a zone like this has filter options or configurable columns, a user is able to save searches and mark one as a default, but will not be able to add the saved search to favorites because the zone is dependent on other data on the page that is not captured for the individual zone.

> **Note**
>
> **Sidebar Zone Preferences.** Be sure that your portal preferences are configured to include the Favorite Searches sidebar zone.

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Remove From Favorites

The **Remove From Favorites** option in the Explorer Zone menu is only visible if a saved search is loaded and it is currently included in the Favorite Searches zone. Click this option when you want to keep the saved search but you no longer want it visible in your Favorite Searches zone. (Deleting a saved search that is also marked as a favorite will automatically remove the search from the favorite searches zone.)

Delete

The **Delete** option in the Explorer Zone menu is only visible if a saved search is loaded. Click this option to remove the currently opened saved search from the list of saved searches.

Note that if the saved search had been configured as favorite, deleting the saved search remove it from the favorite searches zone.

Show Filters

Click the **Show Filters** icon to show the Filter Area. This button only appears if the zone has been configured to have filters.

> **Note**
>
> If the zone is configured to have filters and the drag and drop (column configuration) area, only one or the other is shown at any given time. It means that a user can either change the filter criteria and refresh the search results or change the column configuration and refresh the results.

Show Column Configuration Area

Click the **Column Configuration** icon to show the Column Configuration Area. This button only appears if the zone has been configured to allow columns to be dragged and dropped into the Results Area.

> **Note**
>
> If the zone is configured to have filters and the drag and drop (column configuration) area, only one or the other is shown at any given time. It means that a user can either change the filter criteria and refresh the search results or change the column configuration and refresh the results.

The Open Zone Maintenance Icon

Click the **Go To Zone** icon to switch to the zone's zone maintenance page. On this page, you can change the parameters that control the zone's behavior.

> **Note**
>
> **Debug mode only.** This icon only appears when the system operates in Debug mode.

Configurable Columns

Info zones and query zones may be configured to allow users to rearrange columns and to remove or add columns to the output. This is also referred to as "drag and drop" of columns.

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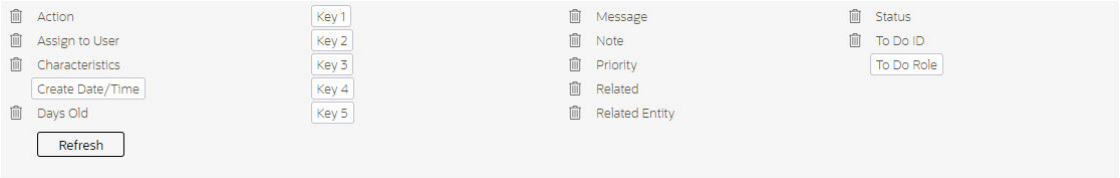
When a zones is configured to support this functionality, the Show Column Configuration Area icon is visible in the zone title area. Click this icon to expose the Column Configuration Area, if it is not visible and click the icon to hide the Column Configuration Area if desired.

If configurable columns are allowed, a user may rearrange the order of columns currently displayed in the Results Area by clicking the column heading and "dragging" it to the desired location.

In addition, the column configuration area may display columns that are not currently in the Results Area. These are indicated by a color cream background. A user can drag one of these columns to the results area and then click **Refresh** to rebuild the zone.

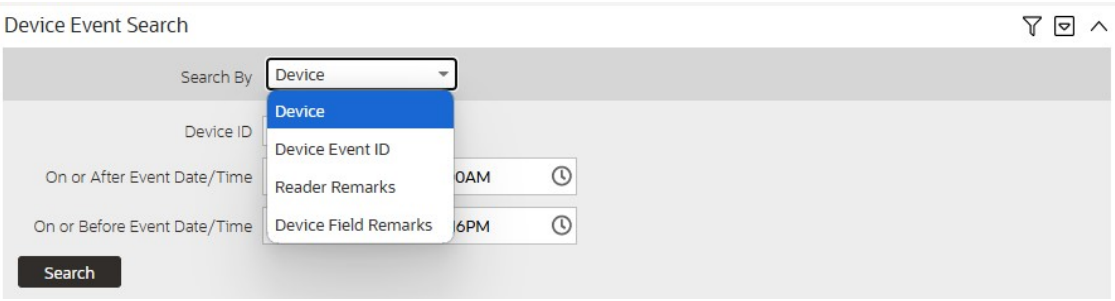
To remove a column that is currently in the results area, click the trash can icon next to the column name in the column configuration area and then click **Refresh** to rebuild the zone.

The following is an example of how the Column Configuration Area looks:



Multi-Query Zones

This type of zone combines individual Query Zones into a single query zone. A **Search By** dropdown, built from the zone descriptions of the individual Query Zones, allows you to select the desired query to execute. Selecting a specific Query Zone display the filters of that query in the filter area. At this point the zone simply executes the selected Query Zone, as if it was executed on a standalone zone. By default, the first query zone option is selected.



Map Zones

A map zone displays information related to one or more objects. For objects that are maintained using portal-based pages, the standard display of the object is using a map zone. Map zones may be configured to display an explicit map or may dynamically display the map based on the configuration of the record being displayed.

Because the information displayed in a map zone is configured using HTML, virtually any format supported by HTML is possible. The following is an example of a typical map zone used to display information about an object.

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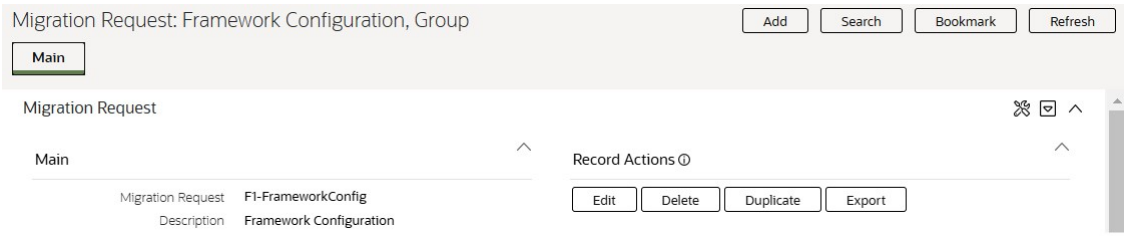

A tool tip can be used to display additional help information for the details shown in a map zone. The tool tip may appear adjacent to the section header or adjacent to individual elements on a map.

> **Note**
>
> You can customize the help icon or disable map help using the Custom Look and Feel feature configuration.

- Open Map Maintenance Icon

Open Map Maintenance Icon

Click the **Go To Map** icon to switch to the UI map maintenance page. On this page, you can view the HTML configuration for the zone. Note that for map zones that display a business object configured without a map, the elements displayed are automatically rendered. In this case, no icon is visible.

> **Note**
>
> **Debug mode only.** This icon only appears when the system operates in Debug mode.

Tabbed Display Zones

This type of zone combines individual map zones into a single zone, allowing for complex of information to be organized and displayed in different tabs.

Tab labels are built from the zone descriptions of the individual zones and become the zone's title. Selecting a specific tab displays the information managed by the underlying zone. By default, the first tab is selected.

Timeline Zone

A timeline zone is used to show events over time for multiple types of data. This type of zone is helpful for providing a consolidated view of separate events occurring in time that may in fact impact each other. For example, in the billing system, a timeline can show bills, payments and collection processes for the same time period.

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The topics in this section describe the functionality available in timeline zones.

Timelines Zones Are Configured By Your Implementation Team

The product provides support for creating timeline zones. However, whether timeline zones are configured for your implementation and on which portals they may be visible will depend on your specific configuration. Refer to Configuring Timeline Zones for general information about configuring timeline zones. Refer to your product documentation for details about what type of timeline information is provided out of the box.

You Can Move Through Time

You can click the controls at the top of a timeline zone to change the date-range of the zone's information. To reposition the timeline to a specific date, selected the desired month and year at the top of the zone and click the search arrow.

Controls at the top right of the zone allow you to navigate through time.

- To go back one year, click the double-left arrow.
- To go back one month, click the single-left arrow.
- To go to today, click the middle dot.
- To go forward one month, click the single-right arrow.
- To go forward one year, click the double-right arrow.

Timelines Can Have Many Lines

Depending on how a timeline zone is configured, it will typically have one or more "lines" that show when significant events have occurred. Each line represents a specific type of data. The data may be related to a specific maintenance object, for example, payments may be displayed in one line and bills in another. It may also be possible to create multiple lines for different types of records for the same maintenance object. For example, if your product provides an algorithm to display cases, it may support defining a different entry for each case type.

Each Line Shows Events

Each line on a timeline may contain zero or more events where each event shows the date when the event occurs. For example, the payment line in a timeline has a separate event for every payment received from the customer. Each line's description contains the number of events on the line.

> ⚠ **Caution**
>
> If a line has more events than can fit onto a timeline, the line will show the first "chunk" of events and a message will appear in the "more info area" explaining that some events have been truncated. If this happens and the truncated events are in a later period, you can reposition the timeline's base period to show the truncated events.

Hovering Over An Event Shows the Event Information

When you hover over an event's date icon, a pop-up widow appears showing details of the event. The following information may appear:

- The event date.

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- The event "hover text". Typically the standard information string is shown for each event.
- The event's common "information string" appears. This information is hypertext to allow for easy access to the transaction on which the object is maintained.
- Additional information may appear. This is dependent on the particular timeline algorithm. Refer to each timeline algorithm's description to find out if additional information appears in the pop-up area under any conditions.
- If the algorithm has configured BPA scripts that can be executed to perform business processes on the object, the BPA script description appears prefixed with a "wizard's hat" icon.

Common Base Portals and Zones

The following sections describe common standards followed by the product for base query and maintenance dialogue.

- All-In-One Portal
- Separate Query and Maintenance Portals

All-In-One Portal

The all-in-one portal is used for low volume objects, where a small number of records are expected.

For example, many control tables use this style of portal. In this portal, rather than separate query and maintenance portals, a single portal allows a user to find a record and maintain the record. A zone listing all existing records is displayed when first entering the portal. A user can perform actions on existing records or add new records from there. More details about the list zone are provided below.

Refer to Maintenance Portal for information about zones commonly found on maintenance portals.

The all-in-one portal will typically provide the ability to add a new record. This may be a button in the Page Action area or a hyperlink defined directly on the list zone's header area.

- List Zone

List Zone

This info zone appears when first entering the portal and displays a row for each record.

The following functions are commonly available in a list zone:

- A broadcast icon is included in each row. Clicking this icon opens other zones that contain more information about the adjacent record.
- An **Edit** icon may be included in each row. Clicking this icon launches the maintenance BPA script to modify the adjacent record.
- A **Duplicate** icon may be included in each row allowing the user to duplicate the adjacent record without having to first display the record.
- A **Delete** icon may be included in each row allowing the user to delete the adjacent record without having to first display the record.
- If the record has a simple BO lifecycle of **Active** and **Inactive**, the list zone may include a button to **Activate** or **Deactivate** the adjacent record.

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Separate Query and Maintenance Portals

For high volume objects where more sophisticated search criteria is needed to find a particular record, separate portals are provided to search for the record and to maintain it.

The query portal contains a zone to search of the object that you wish to maintain. Additional information about the query portal's search zone is provided below. Clicking an appropriate record in the search results navigates to the object's stand-alone maintenance portal.

The query portal will typically provide the ability to add a new record. This may be a button in the Page Action area or a hyperlink defined directly on the list zone's header area.

- Query Portal Search Zone
- Maintenance Portal

Query Portal Search Zone

The query portal contains one zone used to search for the object.

The zone may be a standard query zone or may be a multi-query zone providing one or more ways to search for your record.

Once the search results are displayed, click on the hypertext for the desired record's information string to navigate to the stand-alone maintenance portal.

Maintenance Portal

A maintenance portal refers to a page that is used to view and maintain a specific record. These types of records are governed by a business object, which defines the user interface layout for both the display of the record and the add or update of the record.

An all-in-one portal is a type of maintenance portal where the maintenance zone is displayed once a record has been broadcast from the list zone. For the separate query and maintenance portal dialogue, the maintenance portal includes only zones relevant for the specific record selected.

Maintenance portals may have multiple tabs to display information relevant for the object. Often, if the object has a Log, the log is on a separate tab. (However, there may be some maintenance portals that include the log zone on the Main tab.)

The stand-alone maintenance portal is typically configured with the ability to navigate back to the query portal using either a **Search** button in the Page Actions area or using a **Go To Search** hyperlink in the main zone's header area. The stand-alone maintenance portal may also include the ability to add a new record using an Add button in the Page Actions area. (If not, a new record can be added by navigating through the menu or by navigating to the query portal where an Add hyperlink may be found.)

The following sections describe zones that are common to portals used to maintain a record. Note that additional zones may exist for specific all-in-one portals or stand-alone maintenance portals based on the particular functionality. Refer to the documentation for each portal to understand the specific zones that are provided.

- Object Display Zone
- Log Zone

Object Display Zone

This is a zone that displays the object being maintained.

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An object being displayed may or may not allow for actions or updates to be made. Typically there is a Record Actions section in the display area that presents the valid actions. Depending on the functionality, the actions may prompt the users to input values required for that action.

Log Zone

If the maintenance object for the record includes a status, it typically has a log that records important events in its lifecycle.

This log is shown in an info zone on the portal, either on the Main tab or on a separate Log tab. A link appears in the zone's title bar to allow the user to add a new manual log entry.

Process Flow

This portal is used to guide a user through the steps needed to complete a process flow. If the process flow type is configured to keep a record of a completed process flow then this portal may also be used to display the details of such record.

Refer to Understanding Process Flows for more information.

Each type of process flow is assumed to be configured with designated custom menu options that allows you to launch a new process flow of that type as well as review saved off and completed records. When reviewing existing process flow records, you are brought to a query portal with options for searching for a specific record. You may **Resume** a saved off but not yet finalized process flow or review a complete one.

The **Process Flow** zone on the portal's **Main** tab page assists the user in completing the process flow as well as displays the information captured on a completed process flow.

Fixed Pages

There are some pages in the system that are built using a fixed page metaphor. All user interfaces implemented in this way function in a similar manner. This section describes functionality to these types of pages.

> **Note**
>
> Not all pages in the application use this metaphor. The preferred metaphor for pages in the system is to use portal-based pages. For more information see Common Base Portals and Zones.

- Maintenance Pages
- Query Pages

Maintenance Pages

Maintenance pages are used to maintain (add, change, etc.) the information in the system using a fixed page metaphor. This section focuses on functionality common to all maintenance pages using this metaphor.

- The Unique Identifier Area
- Confirmation & Error Messages
- Warning If Unsaved Changes Exist

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The Unique Identifier Area

Every object in the system must have a unique identifier. For some objects, typically administrative or control table data, the unique identifier is defined by the user creating the record. Other objects, typically master or transaction entities, the unique identifier is assigned by the system after the record is saved.

Where the identifier is displayed depends upon whether the ID is user-defined or system generated.

Pages displaying objects with a user defined identifier (such as To Do Type) typically display the identifier on the left along with a search button. For master and transaction tables, (such as To Do Entry) the unique identifier is typically found in the upper right corner of the screen along with a search button and is labeled as the entity's ID. In this case, if there is an information string associated with the object, it is displayed on the left.

If the object being maintained has an associated context menu, a Context Menu Button is displayed appear.

Confirmation & Error Messages

Whenever a database modification action is requested, the system first validates the data to be put on the database.

First, the system validates the information. If there are errors, the first error encountered is displayed in a window. In addition to the error message, the error window also contains the error number and the identities of the programs that detected the error. If you don't understand an error and you have to call product support, please supply them with this information.

If there are no errors, the system is modified.

Warning If Unsaved Changes Exist

If you make any changes to an object and you don't commit these changes to the database, the following warning appears: "You have unsaved changes that will be lost if you continue. Press OK to continue anyway."

If you want to commit the changes, click **Cancel**. You will then return to the page and can make further changes or press Save. If you want to discard your changes and transfer to the new page, click **OK**.

> ⚠ **Caution**
>
> This warning is not displayed if you are working on a *new* object on a fixed page and you navigate to a different page. Information about new objects is preserved in memory in anticipation of your return to the page. For example, if you are in the middle of adding a new user and you want to quickly reference information on a different page, you will not receive the above warning because your information will be saved. If you use the back button to return to the user page, all of the information you were adding will be present and you can enter the rest of the new user's data.

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Query Pages

Query pages are used to display record sets in the system. Most query pages function in a similar manner. This section focuses on functionality common to all of the system's query pages.

- The Search Area

The Search Area

The upper right corner of the screen is almost always the identifier of the object associated with the search. In Oracle Utilities Customer Care and Billing for example, the unique identifier on the Account Financial History page is the Account ID.

To the right of the unique identifier is a Search button. This button is used to search for a different object than the one whose data is being displayed in the page.

If the object being displayed has an associated context menu, a Context Menu Button is displayed.

UI View Settings

The system is delivered with a standard view of the user interface. A "compact" view of the user interface is also available. This option reduces the amount of white space for the rendered pages. This option is available system-wide or an individual user can override the system-wide setting.

- You can set change the UI view system-wide for all users via the Custom Look and Feel Options.
- Users can set their preferred value in the main tab of the user preferences.

User Preferences

The Preferences (or My Preferences) transaction and the User Maintenance transactions are the same except that with My Preferences, only the following items can be modified:

- Main Tab
  - Language
  - Display Profile
  - Time Zone
  - Email Address
  - UI View
  - Sidebar Width
  - Sidebar Location
  - Sidebar State
  - Home Page
  - To Do Summary Age Bar Parameters
- All the information on the following tabs:
  - Bookmarks

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  - Portal Preferences
  - Favorite Links
  - Favorite Scripts

- User - Main
- User - To Do Roles
- User - Access Security
- User - Bookmarks
- User - Portal Preferences
- User - Favorite Links
- User - Favorite Scripts
- User - Characteristics
- User - Miscellaneous

User - Main

This page lets you view or define user information and access settings.

To open the page, use one of the following navigation options:

- The **Admin**, and then **Security**, and then **User**, and then **Search** menu item.
- The **Menu**, and then **My Preferences** menu item.
- The **User Menu**, and then **Preferences** menu item in the application toolbar.

Note that some fields are only modifiable when the page is opened from the from the **Admin** menu.

Description of Page

Basic user identification information is viewed or set in the **First Name**, **Last Name**, **User ID**, and **Login ID** fields, all of which are modifiable only when the page is opened from the **Admin** menu. User and logon IDs must be unique. The Login ID is the ID that the user uses to log in to the system. The User ID is the ID that is used throughout the application when users are assigned to tasks or when the user ID is stamped on records when logging add or update actions.

Language defines the language in which the user's screen prompts and messages appear.

Set **User Enable** to allow the user to access the system.

> **Note**
>
> This field, available only when the page is accessed through the **Admin** menu, provides special field-level security. A user can change the field only if the **Enable/Disable** access mode is set.

Display Profile defines the display options for the user.

The following fields are related to defining a template user along with some configuration available for using a template user. This fields are modifiable only when the page is accessed through the **Admin** menu. Refer to template user for more information about these fields.

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- Set **User Type** to **Template User** if the user is going to serve as a template user.
- If a user's portal preferences are to be inherited from a "template user", use the **Portals Profile User** to define the user ID of the template user.
- If a user's favorite links are to be inherited from a "template user", use the **Favorites Profile User** to define the user ID of the template user.

The **Time Zone** associated with the user may be defined. Implementations may use this information for features and functions where the user's time zone impacts display of data. Refer to Designing Time Zones for more information about the use of time zones.

Email Address captures the user's email address.

UI View allows the user to set a preference for the UI View Settings that is different from the system wide definition.

Sidebar Width defines the number of pixels to use for the user's sidebar area. A setting of 250 is recommended as a minimum. Depending on the width of a user's monitor, a higher setting (such as 250) will display more information without compromising the space on the main area of the application. Setting the value to 0 will suppress the sidebar. The width setting is updated in background to retain the value based on dynamic sizing.

Sidebar Location governs whether the sidebar appears before or after the main page area. If no value is specified, the default position of the sidebar is after the main page area.

Sidebar State indicates whether the sidebar is open or closed. The state is updated in background to retain the value based on dynamic opening or closing of the sidebar.

Home Page defines the page that appears when the user starts a session or clicks the Home link. Access to the home page is also available from the menu.

The To Do entry fields control how To Do entries are aged in respect of the "age bars" that appear on To Do Summary, To Do Supervisor Summary and the To Do Summary Sidebar Zone.

- Use **Lower Age Limit for Yellow Bar** to define the number of days old a To Do entry must be to be considered "yellow" in the age bar. To Do entries below this limit are considered "green" in the age bar.
- Use **Upper Age Limit for Yellow Bar** is the high limit for the "yellow" bar. To Do entries older than this are considered "red" in the age bar.

The **User Group** collection defines the group(s) with which the user is associated and the date (if any) when the user's association expires. This feature is modifiable only when the page is accessed through the **Admin** menu. For more information, see The Big Picture Of Application Security. Assignments of users in a user group can also be established or maintained through the User Group page.

> **Note**
>
> The ability to maintain the user groups on this page requires special field-level security. A user can change the field only if the **System Administration** access mode is set.

If your implementation has configured Object Erasure for the User maintenance object, the **Object Erasure Schedule** sidebar zone is visible displaying the erasure status for this user record, if applicable. Refer to Erasing User Information by Obfuscation for more information on object erasure for User records.

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User - To Do Roles

Open the User page and then navigate to the **To Do Roles** tab to define the To Do roles assigned to the user.

The information on this page cannot be modified if accessed through **My Preferences**.

> **NOT_SUPPORTED**
>
> A user's To Do roles control the types of **To Do** entries the user can access. For additional information on To Do roles, see To Do Entries Reference A Role.

Description of Page

The grid contains the user's To Do roles. To modify a To Do role linked to the user, simply move to a field and change its value. To remove a To Do role, click the **-** (minus) button. To add a new To Do role, click the **+** (plus) button and enter the role.

Where Used

Every **To Do** entry references a role. A To Do role has one or more users (and a user may belong to many To Do roles). Users who are part of the To Do role assigned to a To Do entry may work on the To Do entry. For more information on this feature, see The Big Picture Of To Do Lists.

User - Access Security

Open the User page and then navigate to the **Access Security** tab to define a user's security rights. You cannot modify this page if you accessed it through **My Preferences**.

> **NOT_SUPPORTED**
>
> Refer to The Big Picture of Application Security for more information about data access roles and access groups.

Description of Page

Use the **Default Access Group** to define the access group that is defaulted on new records added by this user that are subject to row security.

The scroll area contains the **Data Access Roles** to which this user belongs. A user's data access roles play a part in determining the accounts whose data they can access.

To add additional data access roles to this user, click the **+** button and specify the following:

Enter the **Data Access Role**. Keep in mind that when you add a **Data Access Role** to a **User**, you are granting this user access to all of the accounts linked to the data access role's access groups.

Use **Expiration Date** to define when the user's membership in this data access role expires.

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> **Note**
>
> You can also use Data Access Role - Main to maintain a data access role's users.

The tree highlights the **Access Groups** to which the above **Data Access Roles** provide access.

User - Bookmarks

This page is used to manage a user's bookmarks that are created when a user clicks the Bookmark button and saves a bookmark. From this page the user can delete a bookmark, change the name of the bookmark or change the sort sequence.

Open the User page and then navigate to the **Bookmarks** tab to modify or delete a bookmark.

Description of Page

Sequence is the sort sequence associated with the bookmark. Bookmarks with the same sequence are then sorted alphabetically.

Name is the user-defined name assigned to the bookmark. This is the text that is visible in the Bookmarks sidebar zone.

> **Note**
>
> **Favorite Links vs. Bookmarks.** Favorite links are configured through the user page and define pages that a user can navigate to. They do not define context (although some pages may use information currently in global context when navigating). Some users may not be allowed to configure their own favorite links and would see the favorite links associated with a profile user. Bookmarks are created using a bookmark button available on each page. The bookmark saves navigation information, context information and also captures some information about the state of a page. Bookmarks are not governed by any user profile configuration.

User - Portal Preferences

The base product contains several portals that allow users to customize them via portal preferences. Portal preferences allow users to control:

- Which zones appear on the portal
- The order in which the zones appear
- Whether the zones should be "collapsed" (i.e., minimized) when the portal opens.

> **Note**
>
> **You may not be able to change your portal preferences.** If a note appears immediately before the list of portals, a system administrator has configured your user ID to reference a **Portals Profile User** (this is defined on the **Main** tab). Preferences set in this way cannot be modified. System administrators do this in order to enforce a common look-and-feel throughout the user community.

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Open the User page and then navigate to the **Portal Preferences** tab to modify a user's preferences.

Description of Page

The accordion contains a row for every portal configured to show on user preferences and to which you have access. To change how a portal's zones appear, expand the respective row and change the elements accordingly. The remainder of this section describes how you can configure how a portal's zones appear.

Zone lists all of the zones in the portal.

Place a check under **Display** if the zone should be displayed on the portal.

Place a check under **Initially Collapsed** if the zone should be minimized when the portal is initially opened. Setting zones as initially collapsed is a good idea to save space and to help pages to load more quickly. Refer to Zones May Appear Collapsed When A Page Opens for more information.

> ⚠ **Caution**
>
> Recommendation. It is recommended that you set your preferences to collapse zones that you don't use often. This is because the system doesn't perform the processing necessary to build collapsed zones until you ask to expand a zone. Opening a page with zones collapsed accelerates the response times of portal.

Use **Sequence** to control the position of the zone in respect of the other zones. This field is disabled if **Display** is not checked. Duplicate **Sequence** numbers are allowed.

For zones displaying data that is changing often, use **Refresh Seconds** to define in seconds how often the zone is refreshed. The minimum valid value is 15. The maximum valid value is 3600 (1 hour). A value of 0 indicates no automatic refresh.

Security Access indicates whether the user has access rights to a zone. Refer to Granting Access To Zones for more information.

User - Favorite Links

This page is used to define a user's favorite transactions and URLs. Each such link appears as an entry in the Favorite Links Zone in the Sidebar Portal, as well as through the Menu.

> ⓘ **Note**
>
> **A hot key can be used to execute a favorite link.** Rather than clicking a button in the favorite links zone, you can invoke your first nine favorite links by pressing `Ctrl` + a number (where the number corresponds with the relative position of the transaction in your list of favorites). Note that the numeric keypad on your keyboard cannot be used to implement this function.

Open the User page and then navigate to the **Favorite Links** tab to modify a user's favorite links.

Description of Page

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> **Note**
>
> **You may not be able to change your favorite links.** If a **Note** appears beneath your **User ID**, your user id has been setup to reference a specific **Favorites Profile User** as defined on the **Main** tab. If a system administrator has setup your user ID in this way, your preferences may not be changed. System administrators may apply this feature in order to enforce a common look-and-feel throughout the user community.

Each row references a Navigation Option. The navigation options supplied with the base package correspond with the system's menu items. This means you can setup a favorite link to open any transaction in the system (in either **add** or **update** mode).

> **Note**
>
> **Favorite links can point to other places.** The navigation options supplied with the base package always open a transaction's **Main** tab. If you find yourself continually accessing a different tab page, you can have your implementation team create a new navigation option that references the desired tab page. Once this navigation option is set up, you can reference it as one of your favorite links. In addition, it's also possible for your implementation team to setup navigation options that open a URL outside of the system. For example, your implementation team could setup a navigation option to a credit rating company's website. Once this navigation option is set up, you can reference it as one of your favorite links.

Use a **Sequence** to control the order in which the navigation option appears in the Favorite Links Zone.

Security Access indicates if you have been given security rights to the respective transaction. Refer to The Big Picture Of Application Security for more information.

> **Note**
>
> **Favorite Links vs. Bookmarks.** Favorite links are configured through the user page and define pages that a user can navigate to. They do not define context (although some pages may use information currently in global context when navigating). Some users may not be allowed to configure their own favorite links and would see the favorite links associated with a profile user. Bookmarks are created using a bookmark button available on each page. The bookmark saves navigation information, context information and also captures some information about the state of a page. Bookmarks are not governed by any user profile configuration.

User - Favorite Scripts

This page is used to define a user's favorite scripts. Each script is displayed in the Favorite Scripts Zone in the Sidebar Portal, as well as through the Menu. Clicking the entry in the favorites can be used to initiate a script.

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> **Note**
>
> **A hot key can be used to execute a favorite script.** Rather than selecting a script from the business process assistant search, you can invoke your first nine favorite scripts by pressing `Ctrl + Shift +` a number (where the number corresponds with the relative position of the script in your list of favorites). Note that the numeric keypad on your keyboard cannot be used to implement this function.

Open the User page and then navigate to the **Favorite Scripts** tab to modify a user's Favorite Scripts.

Description of Page

> **Note**
>
> **You may not be able to change your favorite scripts.** If a **Note** is displayed on top of the grid, your user id has been setup to reference a specific **Favorites Profile User** as defined on the **Main** tab. If a system administrator has setup your user ID in this way, your preferences may not be changed. System administrators may apply this feature in order to enforce a common look-and-feel throughout the user community.

Each row in the grid contains one of your favorite **Scripts**.

Use the **Sort Sequence** to control the order in which the scripts appear in the zone.

Security Access indicates whether you have access to the script's application service. Refer to The Big Picture Of Application Security for more information.

User - Characteristics

Select **Admin**, and then **Security**, and then **User**, and then **Search** and navigate to the **Characteristics** tab to define characteristic values for the user. You cannot modify this page if you accessed it through My Preferences.

Description of Page

Use the characteristics grid to capture additional information about the user.

You can only choose **Characteristic Types** defined as permissible for the user record. Refer to Setting Up Characteristic Types & Their Values for more information.

Enter a valid **Characteristic Value** for the selected characteristic type. You may enter more than one characteristic row for the same characteristic type, each associated with a unique **Sequence** number. If not specified, the system defaults it to the next sequence number for the characteristic type.

User - Miscellaneous

Select **Admin**, and then **Security**, and then **User**, and then **Search** and navigate to the **Miscellaneous** tab to view additional information associated with a user.

User Id, First Name and Last Name are displayed. Depending on your implementation, additional zones may appear on the User Portal

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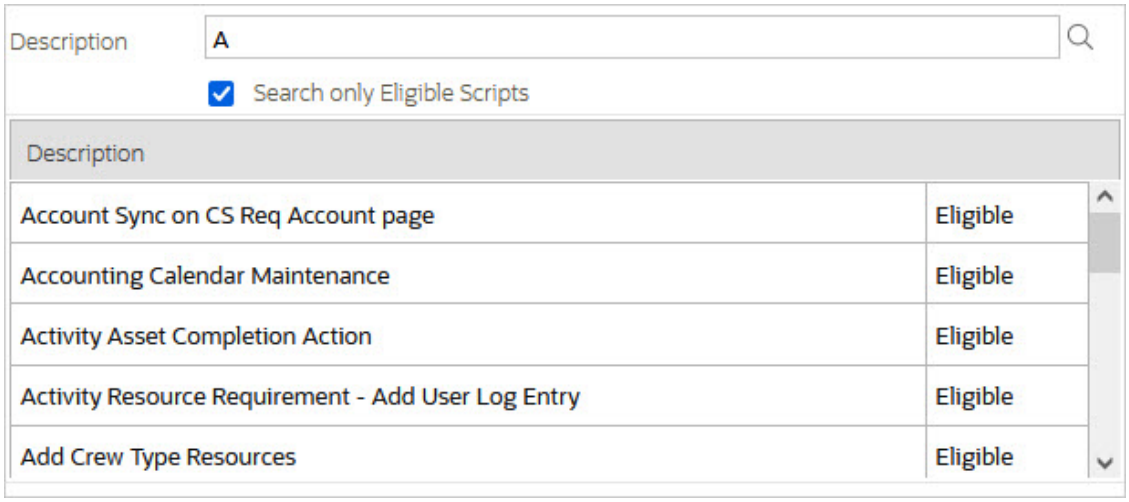
If additional zones appear, use the embedded help for information about the fields managed on the zone.

Initiating Scripts

Your implementation team can set up business process assistant (BPA) scripts to walk you through business processes. Once scripts have been set up, you can initiate a script using any of the following methods:

- You can define a list of your "favorite scripts" on your user preferences. You can then invoke any of the scripts from the Favorite Scripts zone on the sidebar. You can also invoke any of your first 9 favorites by pressing `Ctrl + Shift +` a number (where the number corresponds with the relative position of the script in your list of favorites). For example, if you press `Ctrl+Shift+2` and you've setup your "favorite scripts" to be **Start Autopay** and **Stop sending marketing information**; the **Stop receiving marketing information** script is invoked. Note that the numeric keypad on your keyboard cannot be used to implement this function.
- You can configure a menu item to launch a script by referencing a navigation option that is a **script** navigation option type.
- The system creates To Do entries to highlight tasks that require attention (e.g., bills in errors, accounts without bill cycles, etc.). Users can complete many of these tasks without assistance. However, you can set up the system to automatically launch a script when a user selects a To Do entry. For example, consider a To Do entry that highlights a bill that's in error due to an invalid mailing address. You can set up the system to execute a script when this To Do entry is selected. This script might prompt the user to first correct the customer's default mailing address and then re-complete the bill. Refer to Executing A Script When A To Do Is Launched for more information.
- You can indicate that a script should be launched upon entering the system. This functionality enables an external system to launch the system and immediately launch a script.
- The following hot keys cause an interactive menu to be displayed:
  - `Ctrl+Alt+Q`
  - `Ctrl+Shift+S`



The menu allows you to search for a script using any word in its description. Note, if you've turned on **Search only Eligible Scripts**, your search is limited to eligible scripts. Note, the system displays an indication if each script in the grid is **Eligible** or **Ineligible** in this section.

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You can initiate a script from this area by clicking on it.

When a script is initiated, this menu closes and the object display area shifts down to make room for the script area.

> **Note**
>
> **Securing scripts.** Only scripts the user is allowed to execute are displayed. Refer to Securing Script Execution for more information.

> **Note**
>
> **Customize the script area.** Using the Height step type, an individual script may be configured to use more or less of the script area than the standard script area. It is also possible to configure a script to hide the script area altogether.

The information in the script area takes you through the steps in the selected business process (note, your implementation team controls the information that appears in the script area).

The following points highlight useful information common to all scripts:

- **Return focus to script area.** Often during a script the focus moves from the script area to another section of the page. For example, you might be required to fill in data for a new record being added. When you are ready to return to the script area, rather than using the mouse to return to the area, you can press `Ctrl+Shift+F`. The focus returns you to either the first available input field or to a "default" button if no input field is available.
- **The Continue button.** Many steps in a script ask you to click the **Continue** button when you're ready to restart a script. For example, a step may ask you to confirm a customer's automatic payment information and then click **Continue** when you're ready for the script to restart. Rather than using the mouse to click this button, you can press `Ctrl+Shift+C`.
- **Selected button changes color.** When you click a button in the script area, the button selected changes color so that you can easily see which option you selected.

> **NOT_SUPPORTED**
>
> Refer to The Big Picture Of Scripts for more information about scripts.

> **Note**
>
> You can abort a script at any time by clicking the red X button in the upper right corner of the script area (or by pressing `Ctrl+Shift+X`).

Shortcut Key Summary

The following table summarizes the keyboard shortcuts (hot keys) available in the system:

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> **Note**
>
> It is possible that your specific product supports additional shortcut keys. Refer to your product documentation for more information.

> **Note**
>
> It is possible that some of the following system accelerator keys may duplicate shortcuts, or hot keys, that are predefined within your browser. If this is the case, the browser's functionality commonly takes precedence.

> **Note**
>
> It is possible that your implementation uses one of the accelerator keys listed below for a different purpose. For example, in some languages, a shortcut key may be used for a special character in the alphabet not included on all keyboards. It is possible to turn off any of the Alt+letter shortcuts and Ctrl+Alt+letter shortcuts listed below using a properties file entry. The property is `ouaf.shortcut.ignore.altKeys=` where one or more letters may be entered separated by a comma. When setting this property, the system automatically enables a 'potential alternate key' for certain functions (see the table below). Refer to the *Server Administration Guide* for more information about the property.

Accelerator Key	Potential Alternate Key (see Note above)	Function
`Alt+B`		Returns to the previous page on which you were working. This is the equivalent of clicking the Back arrow.
`Ctrl+Alt+B`		Launches the Bookmark dialog. This is the equivalent of clicking the Bookmark button.
`Alt+C,Ctrl+Alt+C, Alt+Shift+C`		Clears the currently displayed object from the page. This is the equivalent of clicking the Clear button.
`Ctrl+Shift+C`		If the current step in the Script area has a **Continue** button, this shortcut is equivalent to clicking **Continue**.
`Ctrl+Alt+D, Alt+D`		Creates a duplicate of the object being displayed. Equivalent to clicking the Duplicate button.
`Ctrl+Alt+F`		Positions the user's cursor to the Search input field.
`Ctrl+Shift+F`		If the Script area is open and you are working on a different area of the page, this key returns focus to the script area. Focus returns to either the first available input field or to a "default" button if no input field is available.
`Alt+G`		Returns to the most recent page that was displayed when the Back arrow was clicked. Equivalent to clicking the Forward arrow.
`Alt+J`		Minimizes the sidebar. It also expands the sidebar, if it was minimized.

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Accelerator Key	Potential Alternate Key (see Note above)	Function
Alt+K		Transfers you to To Do Entry - Main for the current item in the To Do list. Pressing Alt+K while on this page takes you to the first To Do entry on the list.
Ctrl+Alt+L		Logs the user out of the system. This is equivalent to clicking the Logout menu item.
Ctrl+Alt+M		Opens the Menu.
Alt+N	Alt+Shift+N	Displays the next entry in the search results. Equivalent to clicking Next Item.
Alt+O	Alt+Shift+O	Navigates to the user's home page. Equivalent to clicking the Home icon.
Ctrl+Alt+P		Opens your User Preferences page. Equivalent to clicking the Preferences menu item.
Alt+P		Displays the previous entry in the search results. Equivalent to clicking Previous Item.
Ctrl+Alt+Q		Opens the business process assistant, where you can select a script that walks you through a business process.
Alt+RCtrl+Alt+R		Refreshes the page with the last saved version of the object being displayed in the page. Equivalent to clicking the Refresh button.
Alt+S	Alt+Shift+S	Saves any changes that you've made on the database. Equivalent to clicking the Save button.
Ctrl+Shift+S		Opens the business process assistant, where you can select a script that walks you through a business process.
Alt+X	Alt+Shift+X	Opens the To Do Summary.
Ctrl+Shift+X, Ctrl+Shift+Z		If the Script area is open, equivalent to clicking the **Close** button in the script area. If a pop-up window is open, this closes the window.
Alt+Y		Displays the previous item in the To Do list. Equivalent to clicking the **Previous** button in the Current To Do zone.
Alt+Z	Alt+Shift+Z	Displays the next item in the To Do list. Equivalent to clicking the **Next** button in the Current To Do zone.
Alt+Insert		Inserts a new row into an editable grid if the insertion point is in the grid. Equivalent to clicking the **Insert** button.
Alt+Delete		Removes a row from an editable grid if the insertion point is in the grid. Equivalent to clicking the **Delete** button.
Alt+[		Navigates to the next main page component area of the application. Refer to Page Components for the list of the main page components. Using Shift+Alt+[reverses the sequence of navigation.

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Accelerator Key	Potential Alternate Key (see Note above)	Function
`Alt+]`		Navigates to the next zone. When you are on a portal with zones, this key brings you to the next zone in the portal. If you are on the last zone in the portal, the key brings you to the first zone on the sidebar, if visible. Keying through all the zones on the sidebar brings you to the first zone on the portal displayed in the main area. If the page displayed is a fixed page rather than a portal, this key will only navigate within the sidebar. Using Shift+Alt+] brings you to the previous zone.
`Alt+F1`		Invokes online Help for the application. Equivalent to clicking the Help entry in the Help menu.
`Alt+1` ...`Alt+9`, `Alt+0`		These keys are only applicable when a page / portal with multiple tabs is open. The shortcuts open the tab page whose relative position corresponds with the shortcut number. For example, if you press Alt+3 on a page with multiple tabs, the third tab is displayed. Alt+0 navigates to the 10th tab. If there are more than ten tabs on a page, you must use the mouse or F2/Shift+F2 to display additional tabs. Note that you cannot use the numeric keypad for these shortcuts.
`Ctrl+1` ...`Ctrl+9`		Invokes the favorite link whose relative position corresponds with the shortcut number. For example, if you press `Ctrl+3`, the transaction for your third "favorite link" is invoked. Note that you cannot use the numeric keypad for these shortcuts.
`Ctrl+Shift+1` ... `Ctrl+Shift+9`		Invokes the favorite script whose relative position corresponds with the shortcut number. For example, pressing Ctrl+Shift+2 selects the second of your "favorite scripts". The numeric keypad cannot be used for these shortcuts.
`Alt+left arrow`		Populates a scroll area with the previous entry. Equivalent to clicking the scroll control .
`Alt+right arrow`		Populates a scroll area with the next entry. Equivalent to clicking the scroll control .
`Enter` when in a field with an adjacent Search button		Invokes the search. Equivalent to clicking the Search Button.
`Enter` when a row in a search result grid is highlighted		Selects the item and closes the search. Note that after selecting an item from the search results, you can press Alt+N or Alt+P to scroll up or down through other items in the result grid without returning to the search results.
`Enter` when a menu item is highlighted		Selects the menu item.

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Accelerator Key	Potential Alternate Key (see Note above)	Function
`Enter` when the insertion point is within a tree node		Equivalent to clicking on the item in the tree: • If the insertion point is on a node image, the node is either expanded or collapsed, dependant on its current state. • If the insertion point is on a context menu, the context menu is opened and normal menu processing applies. • If the insertion point is on a "link" element, normal navigation processing occurs.
`Tab` when a row in a search result is highlighted		Highlights the next row.
`Shift + Tab` when a row in a search result is highlighted		Highlights the previous row.
`Space` when the insertion point is on a button		Equivalent to pressing the button.
`Space` when the insertion point is in a date/time field		Opens the date/time selection window.
`Space` when the insertion point is in a check box		Toggles the check box between checked and unchecked.
`Page Up` while in a list grid		Scrolls the contents of the list grid up approximately one page.
`Page Down` while in a list grid		Scrolls the contents of the list grid down approximately one page.
`Up or Down Arrow` when in a dropdown list		Moves to the next or previous value in the list. You can also press a letter key to locate the next value starting with that letter.
`Up or Down Arrow` keys when in search results		Highlights the next/previous row in search results.
`Up, Down, Left or Right Arrow` when using a menu		Highlights other menu items.
`Esc` when using a menu		Closes the menu.
`Alt+F2`		Opens the next tab page when viewing a page / portal with multiple tabs.
`Shift+Alt+F2`		Opens the previous tab page when viewing a page / portal with multiple tabs.

WAM Reports

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- About WAM Reports
- Running Oracle Utilities Work and Asset Management Reports

About WAM Reports

WAM reports include maintenance reports related to work orders, activities, and permits as well as purchasing reports related to requisitions, orders, inventory, and materials.

Oracle Utilities Work and Asset Management reports are implemented using Oracle Business Intelligence Publisher (BI Publisher) and are administered via Oracle Business Intelligence Publisher and the Report functionality of the Oracle Utilities Application Framework.

Refer to the Oracle Business Intelligence Publisher documentation for more information about installing Oracle Business Intelligence Publisher and creating and defining reports. For additional details on how reports are defined and administered see Monitoring and Analytics in the Oracle Utilities Application Framework *Administrative User Guide*.

Running Oracle Utilities Work and Asset Management Reports

Users can run a report directly from a record. Refer to About WAM Reports for additional information.

Navigate to the record and click **Print** from the **Record Actions** zone. The reports provided out-of-the-box are:

- **Activity Report**: This report generates an activity report for a selected activity type. The report details characteristics of the activity, such as the associated asset, work priority, and location information as well as activity dependencies and resources.
- **Crew Shift Daily Report**: This report generates a daily schedule report for each shift associated with a particular crew. Report displays basic details about the shift, such as the schedule date, time range, and shift status, as well as a detailed schedule of daily activities for the shift.
- **Crew Shift Weekly Report**: This report generates a weekly schedule plan for each shift associated with a particular crew. Report displays basic details about the shift, such as the scheduled start and end date and shift status, as well as a detailed schedule of weekly activities for the shift.
- **External Permit Report**: This report generates an external permit report that includes such criteria as the permit's effective and expiration dates, requestor, current permit holder, work location, and work window. This report also includes information about fees and checklist details.
- **Internal Permit Report**: This report generates an internal permit report that includes such criteria as the permit's effective and expiration dates, requestor, current permit holder, work location, and work window. This report also provides details for asset and location information, labor, equipment, materials, and checklist details.
- **Material Request Report**: This report generates a material request report depicting details for the selected material request header by status and specific storeroom. The report also includes additional information involved with the request, such as required by date, deliver to location, stock item and quantity details, as well as primary bin information and other selected criteria.
- **Physical Inventory Report**: This report generates a physical inventory report listing the stock items for a particular storeroom. Report details include the bin, stock item code, and unit price of each item in the storeroom.

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- **Purchase Order Report**: This report generates a purchase order (PO) report by buyer for a particular vendor. The report includes the purchase order number, blanket contract number, Ship To Location (Vendor location), Deliver To Location (Asset Location), and vendor details as well as the purchase order line and purchase order line manufacturer details.
- **Receiving Report**: This report generates a receiving report by transaction number. The report details include associated purchase order and blanket contract numbers, status of the PO, vendor and manufacturer details, and stock item and receipt line details.
- **Requisition Report**: This report generates a requisition report by requestor for a particular vendor. The report includes requesting line details, line details for accounting, work orders and activities, manufacturers, and notes.
- **Shipping Memo Report**: This report generates a shipping memo report by memo number or shipping date. The report includes ship to details, tracking information, and the purpose for the items being shipped. Also included is a table describing details about the items being shipped.
- **Work Order Report**: This report generates a work order report by work order number or activity. The report details characteristics of the work order, such as the associated assets and locations, work priority, as well as activity dependencies, resources and labor requirements.

> **Note**
>
> **Account Security**. The sample reports provided with the product do NOT incorporate account security. If a user has been given security to view the report, then all the data in the report is available for viewing.

> **Note**
>
> Also note that a limited version of **Business Intelligence** is provided with the application so users can access the sample reports. Customized reports will require purchase of the more robust **Business Intelligence** application.

Search Features

- Using Unified Search
- Pagination

Using Unified Search

The Unified Search feature allows the use of the toolbar search field to search for business entities as well as to search for menu items. See Search for more information about the general use of the unified search field.

In Oracle Utilities Work and Asset Management and Oracle Utilities Work and Asset Cloud Service, the Unified Search field allows searching for Assets or Asset Locations. The Search

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icon located on the application toolbar can be used to toggle between the Asset search or Asset Location search (Default is Asset search).

The following filters can be used to indicate your specific search criteria and are available to use when searching for Assets. When using the Asset Location search, only the filters indicated by an asterisk (*) can be used.

Filter	Filter Rule
Badge Number	Minimum of 5 characters excluding whitespaces.
Serial Number	Minimum of 5 characters excluding whitespaces.
Tag Number*	Minimum of 5 characters excluding whitespaces.
Building*	Minimum of 2 characters excluding whitespaces.
Address*	One or more numeric characters followed by space and an alphanumeric character.
Description*	Minimum of 5 characters excluding whitespaces.

For example, to search for serial number 678912, the system would look at the filter rule (all except address) and return all “likeable” search results until it reaches 20 results or finds an exact match.

To search explicitly using a specific filter, precede the filter value with one of the following predefined hints:

Filter	Hint	Example
Badge Number	bn:	bn:12345
Serial Number	sn:	sn:678912
Tag Number*	tn:	tn:56567
Building*	bl:	bl:B45
Address*	ad:	ad:1401 Flower
Description*	ds:	ds:Smith Dr

> **Note**
>
> Hints can either be all lowercase or all uppercase. For example, bn:12345 and BN:12345.

Examples:

- To search for an asset whose badge number is 12345, you could enter "bn:12345" (hint) or “12345” (no hint)
- To search for an asset whose serial number is 678912, you could enter "sn:678912" (hint) or “678912” (no hint)
- To search for an asset whose tag number is 56567, you could enter "tn:56567" (hint) or “56567” (no hint)
- To search for a building whose number is B45, you could enter "bl:B45" (hint) or "B45" (no hint)
- To search for an address located at 1401 Flower Street, you could enter "ad:1401 Flower" (hint) or “1401 Flower” (no hint)

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- To search for a description whose description is smith at vine, you could enter "ds:Smith Dr" (hint) or “Smith Dr” (no hint)

Clicking the **Advanced Search** link opens the Query Search page for your unified search, either Asset or Asset location.

For information about configuring the Unified Search for your implementation, refer to Understanding Unified Search in the *Administrative User Guide*.

Search Results

Each result in the search result list may include any of the following:

- Asset Header Info, Asset ID, Status, and Badge number (highlighted when using the Badge filter) or “No match found"
- Asset Header Info, Badge Number, Asset ID, Status, and Serial Number (highlighted when using the Serial Number filter) or “No match found”
- Asset Header Info, Asset ID, Status, and Tag Number (highlighted when using the Tag Number filter) or “No match found”
- Asset Header Info, Asset ID, Status, and Badge Number(highlighted when using Building filter) or “No match found”
- Asset Header Info, Asset ID, Status, and Address (highlighted when using Address filter) or “No match found”
- Asset Header Info, Asset ID, Status, and Description (highlighted when using Description filter) or “No match found”
- Filter Name and Search Criteria (always displayed)

To select an item from the search results, click the result.

Pagination

Pagination describes a search feature that enables users to use the portal query page to search for and view large amounts of data that normally could not be displayed within one page. The *Order By* selection on the query search portal dictates the order in which the results display and also the sort direction, either *Ascending* or *Descending*. Also, the entire list of results, not just the page in view, are able to be exported to Excel.

Please refer to Pagination Configuration for more information about Pagination.

The following chart displays the portals, zones, and order by selections currently available to use with this feature:

Portals	Zone	Selectable Order By	Default Order By
Work Planning	Activity Information	Work Order Required By Date Total Risk Priority	Work Order Number (Descending) Activity Number (Ascending)
Work Activity	Work Activity Information	Work Order Required By Date Total Risk Priority	Work Order Number (Descending) Activity Number (Ascending)

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Portals	Zone	Selectable Order By	Default Order By
Work Order	Work Order Information	Work Order Required By Date Work Priority	Work Order Number (Descending)
Asset	Asset Information	Address Badge Number Serial Number	Address (Ascending)
Asset Location	Asset Location Information	Address	Address (Ascending)
Work Request	Work Request Information	Created Date Work Request Number Address (For when Asset Location is not populated)	Created Date (Descending)
Crew Shift Schedule	Activity Information	Work Order Required By Date Total Risk Priority	Required By Date (Ascending)

Assets

- About Asset Locations
- About Assets
- About Operational Devices
- About Specifications
- About Functional Processes
- Maintaining Asset Locations
- Maintaining Contacts
- Maintaining Assets
- Maintaining Asset Replications
- Maintaining Operational Readings
- Maintaining Specifications
- Maintaining Functional Processes
- Maintaining Warranties
- Maintaining Warranty Terms
- Mass Asset Disposition Update
- Operational Reading Alert Review
- 360 Degree Search
- GIS Map Viewer

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About Asset Locations

An asset location describes the physical location where the asset is *installed* after it leaves the storage location. Some examples of asset locations are service points, underground connections, poles, and so on.

Asset locations have their own history and lifecycle and can be organized within a reporting hierarchy. For example, a campus might be defined as the parent location with the buildings on the campus defined as child locations to that parent. The parent can define attributes or identifiers common to all child locations, however specific location information must be defined on each location individually.

Refer to Understanding Inventory for information on storage locations.

- Types of Locations
- Service Area
- Location Hierarchy
- Disposition Locations
- Belongs to an Organization
- Contacts

Types of Locations

Locations identify the physical location of an asset or component. An asset location defines the physical location of where an asset is *installed* while an out of service location defines the physical location where assets or components are *stored*.

Refer to About Asset Locations section for information about physical locations where assets are *installed*.

Assets that are no longer “installed” at a location are considered to be “out of service”. Valid out of service storage locations might be storerooms, warehouses, receiving docks, retirement locations, real estate, vehicles, or any other location as defined by your organization.

Some examples for storage locations include:

- A storeroom or repair shop is a location where assets are physically stored. This type of location can be composed of a simple description (‘Central Storage’ or ‘Repair’) but might also have address information.
- A real estate location is typically an address or a building name.
- A vehicle or "fleet asset" can be configured as a storeroom and as such, can have trackable stock items and their associated tracked assets stored in the vehicle. Vehicle storerooms can be configured using “Truck” as the valid Storeroom Type.

Service Area

Service areas define a logical boundary of your organization’s territory and is considered when scheduling work to a crew shift. Service areas are defined on an asset location and the asset location is referenced on an activity. Also, every crew shift is populated with a list of service areas that the crew shift is allowed to work. Scheduling tries to match the service area

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information referenced on the activity to one of the service areas on the crew shift when determining which crew shift can work the activity.

Location Hierarchy

A parent organization can include asset locations in its hierarchy. The locations can be defined in hierarchies with parent and child locations as part of the organization. The parent can define attributes or identifiers common to all child locations, however specific location information must be defined on each location individually.

A child location cannot be in active status if the parent location is inactive. It is also not possible to make a location inactive if it has associated assets or child locations.

Disposition Locations

Disposition location refers to either a storage location or an asset location.

Storage locations are considered to be storerooms, meter shops, vehicles, or warehouses while an asset location is considered to be the physical location of an installed asset whether or not the asset is in service, out of service, or retired.

Examples depicting the differences between a storage location and an asset location:

- Assets received from the manufacturer and awaiting inspection can be held at a receiving warehouse (Storage Location).
- An asset, once it passes inspection, can be moved to a storeroom (Storage Location).
- A service person can load the asset onto their service vehicle (Storage Location).
- If damaged, the asset can be removed from the service point and sent to the meter shop for repairs (Storage Location).
- Service person installs the asset at a service point (Asset Location).
- Assets, such as pipes and poles, that remain at the install location but are no longer in use (Asset Location).
- Once repaired, the asset can be installed at another service point (Asset Location) or returned to inventory (Storage Location).

Belongs to an Organization

When a new asset or storeroom is created, a parent organization can be entered which links the new asset location or storeroom to the organization.

Contacts

Contacts are usually individuals or business entities who should be contacted in reference to a service point, work, or any other issues.

Contacts are referenced on locations to provide an associated person or business. The main attributes for contacts are managed in the **Contact** portal. For example, a person contact might be a customer calling about their asset or a business contact might be a foreman at a job site or supervisor of a storeroom. Once on the **Contact** portal, a user can click **Create Service Call** to report a service issue for the individual contact.

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About Assets

An asset describes such objects as meters, poles, pipes, transformers, components, or any other material item owned or managed by an organization. Stock items that are "Tracked" can be linked to the Asset record when the tracked stock item defined on the Specification record is associated with the Asset record. A tracked stock item defined as hazardous material will also display within the **Maintenance** tab on the asset record.

Key aspects of an asset are as follows:

- Have monetary or functional value
- Able to be inspected
- Able to be serviced and maintained
- Includes a disposition history
- Could include one or more components
- Includes a unique asset identifier

Both the Asset Number and Badge Number identified for a particular asset must be unique within the system. These numbers can be entered into the system manually or an administrator can configure individual asset types to automatically generate the asset number and/or badge number for an asset created from that asset type. Please refer to *Understanding Asset Types* for information on how to configure the system for automatic generation of asset and badge numbers.

Assets are always associated with a location. Refer to About Asset Locations for more information.

Assets typically exist within a structured hierarchy based on the relationship between the asset and its locations and organizations.

Fixed Assets

Fixed assets (or Capital assets) are generally company-owned long-term assets; having a record in the asset table with an asset ID. These assets are initially capitalized but then depreciate over time. All fixed assets must be associated with a cost since cost is part of the value of the fixed assets for depreciation purposes. Deprecation is currently not managed within **Oracle Utilities Work and Asset Management** however, **Oracle Utilities Work and Asset Management** can interface fixed assets, for example, property unit, quantity, in service date, value, and so on, to an external fixed asset management system. Fixed asset information is most often obtained during the receipt and accept process or through the construction work activity process however, there is an exception for plant based capital work. Plant based capital work is unique because it usually involves standalone assets that are very large and expensive and obtaining information on these assets fall outside of these processes, so a secured manual process can be used. This manual process enables users to populate specific fields on the **Asset Performance** tab, such as *Member Asset*, *Fixed Asset Number*, *Additional Cost*, *ERP Project Number*, and *ERP Subproject Task Number*, and send this information to the external fixed asset system using a secured **Send Asset Information Update** button.

To use this feature, implement the following:

- Define your Property Units (Groupings of fixed assets).
- Identify which **Work and Asset Management** assets are considered "Member Assets" (These are fixed assets that are not individually depreciated such as poles, conductors, or pipes).

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- Ensure the ERP Project and Task Numbers are known (This is needed if there is a Project Integration. Sends specific fixed Asset information to ERP Project instead of Fixed Assets system).
- Add two new Access Modes to the appropriate User Groups (Update Fixed Asset Information (W1UF) and Send Fixed Asset Information (W1SF).
- Ensure the application services for Fleet Asset, General Asset, Infrastructure Asset, and Smart Meter have these access modes (Users that need access to this feature must have these application services and access modes).

Linear Assets

Setting up your assets so that they are recognized as a “system” can help you to manage maintenance. If your organization uses GIS, this functionality can also help to position your assets on the mapping system that you have in use. Please consider the following when configuring linear assets:

- The Asset Location Type and Asset Location determine where the linear asset is connected.
- Linear assets include a “Connected to” field which allows you to define the connections between assets

  For example, a pipe system would consist of a pipe, connected to a manhole, connected to the next pipe, and so on.

- Components
- Types of Assets
- Asset Hierarchy
- Asset Disposition
- Extending Asset Statuses
- Replicating Assets
- Asset Service History
- Warranty Terms and Warranties

Components

Components are devices or other objects that are attached to an asset.

One of the most common examples of components are the electronic reading devices (ERTs) that are often attached to analog meters. However, a component can be any device attached to another asset.

Since components are always attached to another device, components cannot be installed at a location. However, they may be received, tracked, maintained, and inspected like any other device. Given this, activities and work orders can be created to perform these tasks on components.

Detaching components involves either moving the component to a new asset or transferring the component to a storeroom, if tracked, or an out of service location, if not tracked. The process within the system is to search for and select the component and then "detach" it from the asset where it currently resides.

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Types of Assets

There are really just two types of assets, an asset or a component. Objects such as meters, poles, pipes, lines, and transformers, are all considered assets, but components are also considered assets. What differentiates these two types of assets is the specific business object. The *asset* business object requires the creation of an asset location record, but the *component* business object requires no asset location record be created.

Refer to Components for information about components.

Refer to About Asset Locations for information about asset locations.

The Asset business object can be used to group multiple types of assets into categories:

- **General Assets** category involves *Tracked* assets, such as transformers and motors, and non-tracked assets, such as non-linear connected assets with the exception of fleet assets.
- **IT Assets** involve both tracked and non-tracked IT or facility assets associated to a person or employee record. An example might be meters and laptops.
- **Infrastructure Assets** involve connected assets that do not need to be tracked. An example might be pipes and poles.
- **Fleet Assets** are used for vehicles, such as trucks and loaders.

Asset Hierarchy

Assets typically exist within a structured hierarchy based on the relationship between the asset and its locations and organizations. The **Tree View** tab on the asset record displays the asset's location within the organization's structure.

Asset Disposition

An asset's disposition is the combination of the asset's location (storage location or asset location) and status. An asset's disposition changes throughout its lifecycle as the asset is moved between locations and service statuses.

The number of assets able to be installed at a location must be valid for the asset relationship (Multiple, Single) defined for the "Number of Assets Allowed" parameter on the location type.

Implementers can create additional asset dispositions; however, each asset disposition must indicate whether the disposition will represent an *Installed* or *Not Installed* asset and whether the asset is to be maintained by Inventory.

Some examples of Asset Disposition combinations are as follows:

- When an asset is *received from the manufacturer*, its disposition is *In Receipt* at the *receiving warehouse*.
- When an asset is *being inspected*, its disposition is *In Stores* at the *receiving warehouse*.
- When an asset is *moved into a storeroom*, its disposition is *In Stores* at the *storeroom*.
- When an asset is *moved into a service vehicle*, its disposition is *In Stores* at the *service truck*.
- When an asset is *installed at a service point*, its disposition is *Installed* at the *service point*.

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- When an asset is *being repaired*, its disposition is *In Repair* at the *meter shop*.
- When an asset is *retired from service*, its disposition is *Retired* at the *storeroom*.
- When an asset is transitioning from *In Stores* to *Installed* or *Installed* to *In Stores*, *Repair*, or *Retired*, its disposition is *Pending Disposition* in the system.

Extending Asset Statuses

If your implementation needs to create a new Asset Lifecycle BO with a status which differs from the base package, you can choose to create them by extending W1-AssetDisposition. With this extension, note the following:

- 'assetRelationship' on the Asset Disposition has 3 values: *Installed*, *Attached*, and *Not Installed*.
  - **Installed** is applicable to assets when they are installed in service.
  - **Attached** is applicable to components when they are attached to an asset.
  - **Not Installed** is applicable when assets or components are in other statuses (in store, in receipt, in repair, rejected, or retired).
- Since the assetRelationship is in a Character Large Object (CLOB), the base package uses a naming convention using the asset disposition code. The first two characters should be 'IN' for installed, 'AT' for attached, and 'NI' for not installed.

Replicating Assets

Asset Replication process enables a company to replicate large batches of assets or devices that they receive, inspect, and store in order to start tracking the assets.

Functionality enables such processes as:

- Replicating assets in the same lot or pallet
- Selecting assets for testing or inspection
- Mass updating of asset disposition, such as rejecting or accepting a lot or pallet.

Processing creates new asset IDs, badge numbers, and serial numbers for assets based on general information that is entered related to each batch. When a new replication event is created it is tied to a replication activity type to determine default settings and attributes for the replication. The actual asset information can be entered manually or uploaded using a CSV file.

Assets can then be moved between locations or dispositioned using the **Mass Asset Disposition Update** feature. See Mass Asset Disposition Update for more information.

Asset Service History

Information regarding service or maintenance on an asset is captured as service history and stored in the Asset Service History zone on the **Maintenance** tab of the asset record. An Asset Service History zone logs the date and time of the service as well as any attachments, if applicable, for every service history performed for the life of the asset.

Please refer to Service History for more information.

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Warranty Terms and Warranties

Warranty terms hold the duration, term, value, or usage limit of assets or items that are under warranty. The warranty term also specifies the specification and vendor that a warranty claim can be issued to when needed.

Warranty terms can be defined as calendar warranties (such as number of years) or runtime warranty terms (such as number of miles). When a warranty term is created and set to *Active* status, it can be associated with assets.

A warranty is a written guarantee issued to your organization promising to repair or replace a damaged item within a specified period of time or usage limit. The **Warranty** portal manages the warranties held for assets or other purchased items for your organization.

Once warranties have been created referencing the term, the **Warranty** section on the **Warranty Term** record displays a list of the applicable warranties.

About Operational Devices

Operational devices are any asset that is used in a metering system. These devices can be physical objects, such as smart meters, communication components, or communication relays, or can be virtual objects, such as firmware.

Please see other topics in this section for concepts related to operational devices.

- Measurements
- Device Configuration

Measurements

Measurements manage the asset operational and runtime data which is collected and tracked for assets. Asset measurements might include mileage, hours of uptime, number of start-stops, and so on.

Since they almost entirely depend on the usage of the related asset, readings cannot be calculated or predicted accurately by the system. Instead, readings must be collected and entered into the system, either manually by a user or imported as the result of activity completion. Data readings that fall outside of expected limits or thresholds can be set to trigger alerts. The alerts create ToDo entries and can trigger the creation of related work records, as appropriate.

Operational Reading Activities

The taking of measurements can be effectively managed by setting up the appropriate work orders or activities to track and schedule the work. This type of scheduling can be even more stringently managed using maintenance triggers and schedules.

Asset records display any related measurement activities in the **Measurements** zone.

Operational Reading Quick Entry

While most readings typically come from an external system via an interface, users can also enter read information manually using the Reading Quick Entry tool. This tool can also be used to upload multiple readings from a spreadsheet.

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Operational Reading Alert Review

Reading alert review provides users with an easy dashboard to review alerts related to asset measurements. Generally an alert is triggered when an asset reading falls outside of an established threshold. Users can select the appropriate measurement type to see a list of measurements of that type that are in error. This list is sorted by the most recent errors first. The **Asset** portal displays a similar zone on relevant assets that have had measurements taken. This zone also includes an **Add** link where users can enter a measurement directly on the **Asset** record.

Select appropriate assets (usually assets that have readings in error) and click the **Make Valid** button which automatically moves the status of the reading from an error to a valid state.

Measurement Activity zone

This zone displays a listing of activities related to a measurement. This provides visibility into maintenance planning activities that are triggered by measurement alerts. For example, your system configuration might trigger an alert if an out of range measurement is entered.

This zone also includes an **Evaluate** button which, when clicked, moves the measurement to the next state where the measurement ranges will be evaluated, such as valid or error.

Device Configuration

Device configurations represent specific configurations of a device as of a certain time. Over time, a device can have many configurations.

Device configurations are effective-dated allowing a device to retain its identifiers (such as serial number, badge number, and so on.) even while the quantities it measures change over time.

Each device configuration can have one or more measuring components associated with it. Attributes used to define device configurations include the following:

- The device configuration type
- The parent device
- The effective date and time of the device configuration
- The time zone in which the device operates

About Specifications

Specifications describe design details and functional performance criteria for a set of assets. This can include manufacturer, model, and other information specified for the assets.

Specifications may also contain written procedures, careful handling instructions for hazardous or delicate materials, or any other set of attributes needed to provide information about a set of assets.

The base package specifications provide a general starting point for your specification set-up including the following:

- General Maintenance Specification
- Operational Maintenance Specification
- Operational Device Specification

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- Fleet Specification
- General Specification
- IT Specification
- Infrastructure Specification

In **Oracle Utilities Operational Device Management**

- Analog Meter Specification
- Communication Component Specification
- Communication Relay Specification
- Firmware Specification
- Smart Meter Specification

Implementers may want to include additional specification details. An example of how this can be accomplished using the fleet or vehicle specification would be to extend the data area *W1-VehicleDetail*. Specification detail values may also be extended by adding values to the following look-up fields:

- **MODEL_YEAR_FLG** - model year
- **VEHICLE_COLOR_FLG** - vehicle color
- **DRIVE_TYPE_FLG** - drive type
- **FUEL_TYPE_FLG** - fuel type

Some of the main uses for specifications are as follows:

- **Configuration Specifications** enable definition of different attributes on each device type.
- **Engineering Specifications** enable creation of Manufacturer, Bill of Material (BOM), and Model details for specific types of assets.
- **Preventive Maintenance Specifications** provide for the building and sharing of maintenance strategies between an asset or group of assets.

Specifications can be linked to stock items. This linking associates the stock items to the tracked assets that are also associated with the specification which allows the stock item to be used to track the asset. Only specifications with asset types configured with an ‘inventory controlled storeroom’ node type can be added.

Please note the following with regard to specifications:

- Specifications often include an attachment which supports the specification definition or provides the actual specification from the manufacturer.
- A specification may also include default *in service* and *out of service* maintenance schedules for assets or components linked to the specification. When the specification is associated with the asset or component, the related maintenance schedule becomes in effect for the asset or component.
- Firmware

Firmware

Firmware is software that is embedded in a piece of hardware and enables the hardware to work as the manufacturer intended. For example, commands to enable relay devices to automatically open and close.

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Refer to About ODM Firmware for more information.

About Functional Processes

A functional process is a grouping of asset locations that contribute to a larger function together. For example, multiple asset locations throughout the city that contribute to waste water functions can be grouped together under that process and examined for how well they are contributing.

The **Functional Process** portal gives users the ability to associate asset locations to multiple functional processes. Using water hydrants as an example, the hydrant can be part of the overall **Water Distribution** process and can also be part of the overall hydrants within the city. Multiple asset locations can be added at one time to any functional process using the **Add Asset Location** zone, which is only available when the functional process is in a *Created* status, just like the **Edit** hyperlink in the **Functional Process Location** zone.

The portal enables maintenance and renewal costs for the assets at those asset locations to be tracked across the functional process. Cost data is segregated based on cost category and broken down by **Month to Date**, **Year to Date**, and **Lifetime**. This information is display-only. User can view the cost summary for a specified period or narrow the period by specifying a different “from” and “to” date.

The portal also provides multiple ways to create work orders against a functional process:

- Users can select the **Asset Location** context menu from the **Functional Process Location** zone on the **Main** tab.
- **Work Creation** zone on the **Maintenance** tab enables users to create work orders against selected asset locations and assets.
- Select the **Tree View** tab and drill down to the **Asset** context menu to create the work order.

Also, the **Functional Process** zone on the **Maintenance** tab of the **Asset Location** record displays all of the functional processes associated with a particular asset location.

Functional Process Hierarchy

A functional process has its own hierarchy. The selected asset locations for the functional process can include or not include their child locations. An asset location can be associated with many functional processes irrespective to where it sits within the hierarchy.

Refer to Maintaining Functional Processes in the **Business User Guide** for more information.

Refer to Understanding Functional Process Types in the **Administrative User Guide** for more information.

Maintaining Asset Locations

This portal is used to display and maintain asset location records.

Refer to About Asset Locations for more information.

You can access the portal from **Menu**, select **Asset Management**, then select **Asset Location**. You are brought to a query portal with options for searching for a specific asset location. Once an asset location has been selected, you are brought to the maintenance portal to view and maintain the selected record.

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The following zones may appear as part of the portal's **Main** tab page:

- **Asset Location**: This zone provides details about the physical location where the assets are installed.
- **Currently Installed Assets**: This zone provides a list of all the assets currently installed at this location.
- **Service Point Installed Assets**: This zone provides a list of all the assets installed at this service point.
- **Asset History**: This zone provides log details for the assets installed at this location.
- **Asset Summary**: This zone lists the number of assets, by asset type, that are currently associated with the asset location.
- **Child Locations/Organizations**: This zone lists the child locations and organizations associed with the asset location or organization.
- **Attachments**: This zone enables users to manage all types of attachments for the asset location record.
- **Notes**: This zone lists any notes that have been added for the asset location record

The following zones may appear as part of the **Maintenance** tab page:

- **Service History**: This zone displays a log of the service histories recorded for the asset location. Also, new service history can be created from this zone.
- **Activity History**: This zone provides a log of the activities that have been performed at this asset location.
- **Permit**: This zone displays permit information for this asset location.
- **Permit Service History**: This zone displays a list of the permits that have been associated with assets at this location.
- **Functional Process**: This zone displays all of the functional processes associated with a particular asset location.
- **Asset Location Business Flag**: This zone displays the most recent business flags for the Asset Location which were created in last 30 days.

The following zones may appear as part of the **Tree View** tab page:

- **Location Hierarchy**: This zone broadcasts a hierarchy view of the asset location.
- **Organization/Location Hierarchy**: This zone provides an alternative hierarchy view that displays a configurable number of child nodes for each expanded organization or location and lets users load additional child nodes as needed. It expands the path to the current asset location. By default, this zone is configured to not be displayed. To display this zone, update the applicable portal configuration to display the **Organization/Location Hierarchy** zone instead of the existing **Location Hierarchy** zone.
- **Currently Installed Assets**: This zone provides a list of all the assets currently installed at the location.

The following zones may appear as part of the portal’s **Statistics** tab page:

- **Asset Location Cost Summary**: This zone displays a table of maintenance, renewal, and operational cost per cost category over the life of the asset. Costs buckets for each cost category are **Month To Date**, **Year To Date**, and **Lifetime** costs.
- **Cost by Service Class**: This zone displays the total cost breakdown by service class for this asset.

The following zones may appear as part of the portal’s **Log** tab page:

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- **Asset Location Log**: This zone displays log information for the current asset location record.
- **Location Sync Requests**: This zone lists data synchronization requests for the asset location.

Maintaining Contacts

The **Contact** portal is used to display and maintain contacts.

Refer to About Asset Locations for more information.

You can access the portal from **Menu**, select **Asset Management**, then select **Contact**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Contact**: This zone displays information about the contact.
- **Location Referencing Contact**: This zone displays location information for the contact.
- **Contact Relationship**: This zone displays information on all the records associated with the contact.
- C**ommunication Log**: This zone displays a log of the contact's communications.

Maintaining Assets

This portal is used to display and maintain asset records.

Refer to About Assets for more information.

You can access the portal from **Menu**, select **Asset Management**, and then select **Asset**. You are brought to a query portal with options for searching for a specific asset. Once an asset has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **360** tab page:

- **Asset**: This zone provides details about the asset, such as asset type, asset number, badge, and serial number as well as having a **View in Map** and **Other Action** buttons.
- **Insights**: This zone displays the information related to the condition of the asset, maintenance triggers, and active warranty.
- **Current Activities**: This zone provides a list of non-final activities associated with the asset.
- **Attachments**: This zone enables users to manage all types of attachments for the asset.
- **Asset Cost Breakdown by Service Class**: This zone displays the asset cost breakdown based on service class.
- **History**: This zone displays service histories, measurements, permits, and a list of activities, including final activities, associated with the asset.
- **Asset Type Cost Breakdown by Service Class**: This zone displays the asset type cost breakdown based on service class.

The following zones may appear as part of the portal's **Main** tab page:

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- **Asset**: This zone provides details about the asset, such as the badge number, disposition, and status as well as any contextual insights if configured.
- **Connected Assets**: This zone displays connected asset locations associated with this asset record.
- **Attached Components**: This zone provides a list of components that are installed on the asset.
- **Asset Attributes**: This zone displays a list of attributes for the asset.
- **Attachments**: This zone enables users to manage all types of attachments for the asset record.
- **Asset Warranty**: This zone provides warranty information for the asset.
- **Asset — Notes**: This zone enables users to enter additional notes for the specific asset.

The following zones may appear as part of the **Maintenance** tab page:

- **Asset Service History**: This zone displays a log of the service histories recorded for the life of the asset. Also, new service history can be created from this zone.
- **Measurements**: This zone provides a log of measurements created for the life of this asset.
- **Maintenance Trigger**: This zone displays a log of preventive maintenance triggers that are associated to the maintenance schedule identified on the maintenance specification on the asset header.
- **Asset List Maintenance Trigger**: This zone displays a log of location specific maintenance triggers where the asset's location is present on a template activity's location list of the template work order identified on the PM trigger.
- **Maintenance Schedule Forecast**: This zone displays a log of maintenance schedules forecasted for the asset.
- **Activity History**: This zone provides a log of the activities that have been performed on the asset over the life of the asset.
- **Hazardous Materials**: This zone displays a list of hazardous materials associated with the asset.
- **Permit**: This zone displays permit information for this asset.
- **Permit Service History**: This zone displays a list of the permits that have been associated with the asset.
- **Asset Business Flag**: This zone displays the most resent business flags for the asset.
- **Functional Process**: This zone displays the functional processes associated with the current asset record.

The following zones may appear as part of the **Tree View** tab page:

- **Asset Hierarchy**: This zone displays a hierarchy view for the asset.
- **Currently Installed Assets**: This zone displays a list of currently installed assets at this location.

The following zones may appear as part of the portal's **Statistics** tab page:

- **Asset Cost Summary**: This zone displays a table of maintenance, renewal, and operational cost per cost category over the life of the asset. Costs buckets for each cost category are **Month To Date**, **Year To Date**, and **Lifetime** costs.
- **Cost by Service Class**: This zone displays the total cost breakdown by service class for this asset.

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- **Asset Condition Score Breakdown**: This zone displays a list of assessment scores for each assessment type for the asset.

The following zones may appear as part of the **Asset Disposition** tab page:

- **Disposition History**: This zone displays all of the status and location changes that have occurred during the life of the asset.
- **Components History**: This zone displays all the components that were and are currently attached to the selected asset during it's life.

The following zones may appear as part of the portal's **Asset Performance** tab page:

- **Asset Performance**: This zone provides asset and performance information about the asset that can be used for planning purposes.

The following zones may appear as part of the portal's **Log** tab page:

- **Asset Log**: This zone displays log information for the asset.
- **Asset Sync Requests**: This zone displays sync requests associated with the asset.
- **Asset Shipping Memos**: This zone lists the shipping memos associated with the asset.

Asset Summarization

Asset Summarization uses generative Artificial Intelligence (GenAI) models to compile and provide a summary of essential asset information in a succinct summary that allows asset managers to understand an asset's current state, performance, and issues quickly.

> **Note**
>
> Asset Summarization is available **only** in Oracle Utilities Work and Asset Cloud Service.

Click **Summarize** to view the **Asset Summary**, which provides a summary of the critical insights and trends for the asset, as well as some key observations.

See Configuring and Enabling the Asset Summarization Feature for more information about enabling this feature.

Notes:

- Asset Summarization is available under Limited and Controlled Availability for select Early Adopters in approved regions.
- Asset Summarization relies on generative AI models that must be deployed as part of your cloud service implementation. Please contact your Oracle Customer Success Manager if you wish to use Asset Summarization.
- Asset summaries are prepared by generative AI. Carefully review and verify them against trusted sources, as they may include out-of-date, inaccurate, or incomplete information.

Maintaining Asset Replications

This portal is used to display and maintain large quantities of assets or other devices by batch.

Refer to About Assets for more information.

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You can access the portal from **Menu**, select **Asset Management**, then select **Asset Replication**. You are brought to a query portal with options for searching for asset replication information. Once an asset replication has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Asset Replication**: This zone provides details about the replicated assets, asset controls, and new asset IDs.
- **Completion Event**: This zone displays the completion events associated with the replicated assets.

The following zones may appear as part of the portal's **Log** tab page:

- **Activity Log**: This zone displays log information for the asset replication record.
- **Related Stock Transactions**: This zone displays the related stock transactions associated with the asset replication record.

Maintaining Operational Readings

The **Operational Reading** portal is used to display and maintain an operational read record.

Refer to About Operational Devices for more information.

You can access the portal from **Menu**, select **Asset Management**, and then select **Operational Reading**. You are brought to a query portal with options for searching for a specific operational read. Once the read has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Measurement**: This zone displays information about the operational reading.
- **Measurement Activity**: This zone lists the measurement activities associated with the operational reading.

Maintaining Specifications

This portal is used to display and maintain specification records.

Refer to About Assets for more information.

You can access the portal from **Menu**, select **Asset Management**, then select **Specification**. You are brought to a query portal with options for searching for a specific specification. Once the specification has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Specification**: This zone provides details about the specification.
- **Specification Attributes**: This zone displays a list of attributes for this specification. The asset type defines valid attributes for specifications of this type. Press the **Edit** icon to add or change the attribute's value. Press the **Clear** icon to clear its value. Click the **Edit** link in the zone header to edit multiple attributes at one time.
- **Warranty Term**: This zone lists the warranty terms associated with the specification.

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- **Specification Assets**: This zone provides information about the asset associated with the specification.
- **Attachments**: This zone enables users to manage all types of attachments for the specification record.

Maintaining Functional Processes

The **Functional Process** portal is used to display and maintain functional processes.

Refer to About Functional Processes for more information.

You can access the portal from **Menu**, select **Asset Management**, and then select **Functional Process**. You are brought to a query portal with options for searching for a specific functional process. Once the functional process has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Functional Process**: This zone displays general information about the functional process.
- **Functional Process Location**: This zone lists the asset locations, with an indicator if child locations are included, associated with the functional process.
- **Attachments**: This zone enables users to manage all types of attachments for the functional process record.

The following zones may appear as part of the **Maintenance** tab page:

- **Maintenance Trigger**: This zone displays a list of maintenance triggers for the asset locations associated with the functional process. Broadcasting a maintenance trigger populates the **Activity History** zone search fields to display the PM work orders for that trigger at that asset location and for that asset.
- **Asset List Maintenance Trigger**: This zone displays a list of location specific maintenance triggers where the asset's location is present on a template work order identified on the PM trigger. Also, broadcasting an asset list maintenance trigger populates the **Activity History** zone search fields to display the PM work orders for that trigger at that asset location and for that asset.
- **Work Creation**: This zone enables work to be created for the asset location associated with the functional process.
- **Activity History**: This zone provides a list of all the activities that have been performed at the asset location over the life of the asset for this functional process. This zone also displays a filtered list of activities once the user broadcasts a line from the **Maintenance Trigger** zone or from the **Asset List Maintenance Trigger** zone.

The following zones may appear as part of the portal's **Tree View** tab page:

- **Functional Process Hierarchy**: This zone displays a hierarchy view of asset locations, assets, and components associated with the functional process.

The following zones may appear as part of the portal's **Statistics** tab page:

- **Functional Process Cost Summary**: This zone displays a summary of the actual maintenance, renewal, and operational costs per expense category for the functional process. Cost data is segregated based on cost category and broken down by **Month To Date**, **Year To Date**, and **Lifetime** costs.

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- **Functional Process Period Cost**: This zone displays the actual maintenance and renewal costs which have been charged to the associated asset locations for the functional process for a specified period by *From* and *To* date.

Maintaining Warranties

The **Warranty** portal is used to display and maintain a warranty record.

Refer to About Assets for more information.

You can access the portal from **Menu**, selec**t Asset Management**, and then select **Warranty**. You are brought to a query portal with options for searching for a specific warranty. Once a warranty has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Warranty**: This zone lists information about the warranty and associated asset.
- **Attachments**: This zone enables users to manage all types of attachments for the warranty record.
- **Warranty - Notes**: This zone displays notes associated with the warranty.

Maintaining Warranty Terms

The **Warranty Term** portal is used to display and maintain a warranty term record.

Refer to About Assets for more information.

You can access the portal from **Menu**, select **Asset Management**, and then select **Warranty Term**. You are brought to a query portal with options for searching for a specific warranty term record. Once a warranty term has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Warranty Term**: This zone displays information about the terms of the warranty.
- **Warranty**: This zone lists information about the warranty and associated asset.
- **Attachments**: This zone enables users to manage all types of attachments for the warranty term record.

Mass Asset Disposition Update

The Mass Asset Disposition Update portal is used to move many assets of the same type from one asset location to another asset location. The target location is always a single asset location. For example, if a pallet of meters has been received in the receiving asset location, mass disposition can be used to move this batch of assets to a storage asset location or an out of service location. You can also use Mass Asset Disposition Update to retire tracked assets or to put a tracked asset into a storeroom location such as a repair shop.

Refer to About Assets for more information.

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> **Note**
>
> Assets that are inventory tracked (managed as stock items via inventory control) cannot be moved in or out of inventory storerooms using mass asset disposition update. In this case, the asset must be moved using stock transactions.

You can access the portal from **Menu**, select **Asset Management**, and then select **Mass Asset Disposition Update**. You are brought to a query portal with options to change the status and location of multiple assets at one time. Select the appropriate assets and click the **Change Disposition** button to execute the change.

Operational Reading Alert Review

The **Operational Reading Alert Review** portal is used to review operational reading alert records.

Refer to About Operational Devices for more information.

You can access the portal from **Menu**, select **Asset Management**, then select **Operational Reading Alert Review**. You are brought to a query portal with options for searching for operational reading alerts by measurement type. Select the appropriate reading alerts and click the **Remove Alert** button to remove the alert.

360 Degree Search

The **360 Degree Search** portal is used to search for assets, components, specifications, location, and contacts.

Refer to About Operational Devices for more information.

You can access the portal from **Menu**, and then select **360 Degree Search**. You are brought to a query portal with options for searching for a specific object record.

From the search results list, you can navigate to the selected portal to view data for the object.

This feature is only used in **Oracle Utilities Operational Device Management**.

GIS Map Viewer

The GIS Map Viewer is embedded within the Work and Asset Management application and provides a method to view WAM assets and work information based on geospatial mapping. This means that once the GIS Map Viewer is opened in the application, users can go directly from either the Asset, Asset Location, Work Activity, Work Request, or Service Call portals from the **View in Map** button, or from the **Add Design Element (Map)** button from the Work Design to the map. Maps generally consist of a base map plus feature layers which can overlay the base to show various map features such as work locations, infrastructure, and assets.

You can access the portal from **Menu**, then click **GIS Map Viewer**. You are brought to a map with options for searching and viewing work, assets, work locations, and so on.

Common Tools

Common tools for navigating the Map Viewer are as follows:

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- **Zoom In / Zoom Out** lets the user zoom in to the map to see more mapping details around the current location and zoom out gives a broader high-level view of the current location and surrounding areas.
- **Zoom to Previous / Zoom to Next** works similarly to the **History** button in the **Work and Asset Management** application in that it takes the user to and from previous map location extents.
- **Overview Map** displays when an arrow in the upper right hand corner of the map is clicked. Click the **Maximize** icon in the overview window to expand the map to your current view. Click the icon again to restore the display to the map overview. Overview Map provides a larger context of the user's current position on the map. User can click a new location within the overview map and, the highlighted box as well as their current map view will move to the new location.
- **Home** returns the user to their default map position and extent.
- **Save Extent** saves the current map extent and zoom setting as the user's default **Home** extent.
- **Select** provides options for the selection of assets on the map. The **Select** icon changes to whatever option is selected, for example, changes to polygon icon when polygon is selected. To relocate the popup on the map, press and hold the Select popup header bar and drag the popup to a new location. Select options are as follows:
  - **Rectangle** provides selection of assets in a rectangular area to display in the list (default setting).
  - **Freehand** provides selection of assets the user chooses to display in the list.
  - **Polygon** provides selection of assets in a polygon area to display in the list.
  - **Location** provides selection of assets in a particular location to display in the list.
  - **Create New Selection/Add to Current Location** provides ability to add or remove selected objects from the current selection or to create a new selection. Selection is made by going to the map and pressing down to start the selection and letting go to finish the selection.
- **Drop Pin** enables selection of an exact point or location on the map. Selecting the **Drop Pin** option enables a Work Location row on the Asset panel where users are provided options to either create a **New Location** or select an **Existing Location** in which to create work:
  - Clicking **New Location** prompts the user to drop a pin at a new location on the map. New locations display a lat/lon in the work location row and from here the user can create a work request, create a service call, or click **Choose an Action** at the bottom of the page to create a work order or work activity. All work created for a new location will include the lat/lon coordinates and create the new work location.
  - Clicking **Existing Location** prompts the user to drop a pin at an existing work location on the map. Existing locations display the work location info string in the work location row and from here the user can create work by selecting the work request or service call icons or by selecting **Choose an Action** at the bottom of the page to create a work order or work activity. All work created for an existing location will include the work location.
- **Clear List** removes work or assets that are listed and any highlighted objects from the map.
- **Search** is a local and global search box. Users can use the Search drop-down to query their local GIS data, such as poles, hydrants, and substations, or search globally for any address or for the name of a place depending on the search map url domain that is used. Multiple search map url domains can be configured and will display in the list however, if

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none are configured, the default search map url domain (https://geocode.arcgis/rest/services/World/GeocodeServer) can be used. The system also supports the use of coordinates, such as latitude, longitude, or x,y, to navigate to search locations using the configured service capabilities.

The address search is especially useful in cases where users need to find a location based on a customer's description. For example, if a customer calls in about a trouble situation (for instance, a water leak, live electricity, and so on), the user can enter the address details provided by the customer to pinpoint the location of the issue. The work that is created can then be attached to the closest asset in the proximity of the issue.

Dashboard Panels

Dashboard panels enable users to take various actions based on individual panels within the map viewer.

Asset Panel enables display and management of assets that were selected using one of the *Select* options listed under the **General Tools** section. Once selected, these assets are highlighted on the map in the color defined for *Selected Assets* in the Esri WAM Master Configuration. Hovering over an asset record in the Asset panel also highlights that asset on the map in the color defined for *Highlighted Assets*. Selecting an asset directly on the map highlights the asset on the map, brings that asset record and any related assets to the top of the **Asset** panel, and also enables a separate popup on the map which is populated with a variety of asset and location details provided by Esri. The map popup is controlled from the **Layers** panel and displays for any given layer only when enabled. Each asset record listed in the **Asset** panel has its own link that navigates the user to the maintenance portal for the asset. The **Asset** panel also displays actions that are applicable for the list of assets as a whole as well as for individual assets within the selected group.

- **Group Actions**
  - **Sort** menu provides ascending or descending sorting options of asset's info string or asset's high or low condition rating. Default sort order has the asset info string displayed first in the list and then locations without assets at the bottom.
  - **Filters** option limits the list of assets and locations meeting the specific criteria. Filters can be set to view only assets of a particular asset type, badge number, location type, or condition rating or range. The filter can be saved so it can be used again, set as the user's default filter, or deleted if no longer needed. Filters also include a **Show Advanced Filter Options** hyperlink that enables a popup providing for additional characteristics filter criteria. If there is no active selection, clicking the **Apply** button in filters will automatically select all the assets and locations in the current map extent (To enable this automatic selection feature, set the **Enable Auto Load** option in the **User Characteristics** to *Yes*).
  - **Edit List Data** brings up an editable listing of the group of selected assets. Additional assets can be added to this list or existing assets can be removed from the list. When the user is ready, buttons at the bottom of the list let the user *Save* the list, *Create a Work Order* for the listed assets, *Create a Work Activity* for the listed assets, or *Cancel* out of the list altogether.
  - **Choose an Action** button at the bottom of the **Asset** panel is used to either create a work order or to create a work activity for the group of assets listed in this panel.
- **Individual Actions**
  - **Remove Row** removes the asset from the list. Asset is highlighted on the map, prior to removal, so the user can see which asset is affected.
  - **Show More Options** can be used to *Zoom To* the asset location on the map, *Quick View* displays a popup populated with the asset's header details, *Create Work*

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Request, *Create Service Call*, and *Create Work Order from Template* enables the user to create those objects for the selected asset, and *Details* displays a popup populated with the asset's item details.

Work Activity Panel is used to display and manage the work activities selected directly from the map or populated indirectly as a result of the **Asset** panel selection. These work activities display in the **Work Activity** list panel and are highlighted on the map. Selecting any work activity in the list will highlight its related asset on the map. Selecting any one of these assets on the map highlights the asset in a separate color on the map and brings all the related work activity records to the top of the **Work Activity** panel and highlights them. It also enables a separate popup on the map which is populated with a variety of asset and location details provided by Esri. Each work activity record has its own link that navigates the user to either the maintenance portal for the activity or maintenance portal for the asset. The **Work Activity** panel also displays actions that are applicable for the list of activities as a whole as well as for individual assets within the selected group.

- **Group Actions**
  - **Sort** menu provides ascending or descending sorting options of activity information or the work activity's high or low work priority rating. Default sort order is A-Z based on the work activity info string.
  - **Filters** option limits the list of work activities meeting the specific criteria. Filters can be set to view work activities having a particular work order number, priority, status, and To and From dates with options to **Apply** the filter to the map, **Reset** the filter, or **Cancel** the filter altogether.
- **Individual Actions**
  - **Zoom To** icon zooms in to the work location.
  - **Show More Options** displays a *Quick View* popup populated with the work activity details, *Highlight Related Assets* displays all the related assets to the activity in a different color on the map, and *Details* displays a popup populated with the activity details and other activities around that location.

Work Request Panel is used to display and manage the work requests selected directly from the map or populated indirectly as a result of a selection from another panel. These work requests display in the **Work Request** list panel and are highlighted on the map. Selecting any work request in the list will highlight its related asset on the map. Selecting any one of these assets on the map highlights the asset in a separate color on the map and brings all the related work request records to the top of the **Work Request** panel and highlights them. It also enables a separate popup on the map which is populated with a variety of asset and location details provided by Esri. Each work request record has its own link that navigates the user to either the maintenance portal for the request or maintenance portal for the asset. The **Work Request** panel also displays actions that are applicable for the list of requests as a whole as well as for individual requests within the selected group.

- **Group Actions**
  - **Sort** menu provides ascending or descending sorting options of work request information or the work request's high or low work priority rating. Default sort order is A-Z based on the work request info string.
  - **Filters** option limits the list of work requests meeting the specific criteria. Filters can be set to view work priority, status, and To and From dates with options to **Apply** the filter to the map, **Reset** the filter, or **Cancel** the filter altogether.
- **Individual Actions**
  - **Zoom To** icon zooms in to the work location.

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- **Show More Options** displays a *Quick View* popup populated with the work request details and *Details* displays a popup populated with work request details and other work activities around that location.

Service Calls Panel is used to display and manage the service calls selected directly from the map or populated indirectly as a result of a selection from another panel. These service calls display in the **Service Call** list panel and are highlighted on the map. Selecting any service call in the list will highlight its related asset on the map. Selecting any one of these assets on the map highlights the asset in a separate color on the map and brings all related service call records to the top of the **Service Call** panel and highlights them. It also enables a separate popup on the map which is populated with a variety of asset and location details provided by Esri. Each service call record has its own link that navigates the user to either the maintenance portal for the service call or maintenance portal for the asset associated with the call. The **Service Call** panel also displays actions that are applicable for the list of service calls as a whole as well as for individual service calls within the selected group.

- **Group Actions**
  - **Sort** menu provides ascending or descending sorting options of service call info or the service call's high or low work priority rating. Default sort order is A-Z based on the service call info string.
  - **Filters** option imits the list of service calls meeting the specific criteria. Filters can be set to view service category, status, and To and From dates with options to **Apply** the filter to the map, **Reset** the filter, or **Cancel** the filter altogether.
- **Individual Actions**
  - **Zoom To** icon zooms in to the service call location.
  - **Show More Options** displays a *Quick View* popup populated with the service call details and *Details* displays a popup populated with details about the service call and other service calls around that location.

Layers Panel the map. The **Show More Options** menus for each layer displays a *Zoom To* option which is used to zoom the map to the full extent of that particular layer, *Transparency* changes the opacity or transparency of that particular layer shown in the map, and *Disable Popup* enables or disables the popup for the particular layer.

- **Select WebMap** provides the type of operational mapping features that will be visible on the map. For example, a water distribution WebMap might display layers for hydrants, valves, and pumps while an electric distribution WebMap might show poles, transformers, and substations. Each operational layer associated with the selected WebMap is populated on the **Layers** panel and can be toggled on and off using the appropriate selection boxes.

Map Notes Panel provides a way to call attention to objects on the map. For example, if an asset needs painted or a manhole cover is missing. Map note information can be accessed by clicking on the map note in the map.

> **Note**
>
> One thing to be mindful of is that Map Notes is a layer in the map and this panel allows for the addition, deletion, or updating of map notes features which are stored in GIS. Map Notes can be hidden or displayed using the selection box in the **Layers** panel, but they will remain in the GIS database until they are deleted by the user.

- **Tooltips** is located under the **Settings** option and works as a toggle to turn on or off a tooltip for a map note that is being created. When the tooltip feature is enabled, the user

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can see the size and scale of the map note as it is being created and make adjustments. This feature does not display once the map note is created.

- **Edit features** provides the **Select** option for managing the updating and deleting of existing map notes.
  - To **Update** the map note, click **Select** under **Edit features**,go to the map and click the map note (This highlights the note on the map). Edit the information on the map note and then click **Update** and then click the page back panel button to finish.
  - To **Delete** the map note from the map, click **Select** under **Edit features**,go to the map and click the map note (This highlights the note on the map). Select **Delete** to remove the note from the system. Note that the **Delete** option gives a warning to ensure whether the map note should be deleted.
- **Create features** enables filtering of note templates defined within the **Map Notes** section of the **Map Notes** panel (Note this section label equals the layer name). An example in using one of these templates would be, user enters **Damaged Asset** as the filter type and only the **Damaged Asset** template will display in the **Map Notes** section.

  Map Notes is a predefined list of map note templates that work similarly to a toggle. When a particular map note is selected, it enables the map note to be created on the map. This map note will continue to create map notes until the user reselects that particular map note template again, which will turn that map note off.
  - Add a map note by clicking one of the listed icons in the **Map Notes** section of the panel, go to the map and start clicking the map according to the object you selected, then double-click to finish. For example, if you selected an oval, you would start clicking around the circumference of the object you want the map note to reference and if you selected a line you would start your click on one endpoint and then the other endpoint. (Map note on the map is highlighted and the *Add*, *Update*, or *Delete* panel displays to allow specific comments and other information to be entered).
  - Click **Create** when finished (Map note is created on the map and the information is saved to the GIS database).
  - Reselect the previously selected Map Note template on the panel to toggle off the feature.
- **Export to file** creates a snapshot of the map for export. Selection of **Export to file** enables a popup where the user can give the export a title and select from a variety of different layouts and formats based on print service options. When ready, the user can click on Export to render the file for view.

Draw Graphics Panel provides eight temporary graphics that can be used to make notations or highlight areas on the map. Selection of a graphic works similarly to that of map notes in that when a particular graphic is selected, it enables creation of the graphic on the map and continues to create the graphic on the map until the user reselects that particular graphic to turn it off. Each graphic is unique and includes additional options, such as Color, Text Size, Outline Width, and so on, that can be used to highlight the graphic on the map.

Two additional options are provided for editing and deleting the graphics on the map as well as an **Export to file** button.

- An **Edit Graphics** icon is available if the graphic needs to be updated with a special toggle to Preserve the Aspect Ration of the graphic on the map.
- **Delete** graphic can be used to remove all graphics on the map for that session.
- **Export to file** creates a snapshot of the map for export. Selection of **Export to file** enables a popup where the user can give the export a title and select from a variety of different layouts and formats based on print service options. When ready, the user can click on Export to render the file for view.

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General Highlighting Details

Custom colors for Selected Assets, Assets with Work, Highlighted Assets, and Highlighted Related Assets are configured in the Master Configuration.

- Hovering over a result in the Asset panel displays the result on the map in the color configured for Highlighted Assets on the map.
- Selecting results from the **Asset** panel displays map features that have a corresponding Asset Location in **Work and Asset Management** application. The selected assets are displayed in the color configured for *Selected Assets*. However, map features will not display if the asset location is not found in **Work and Asset Management**.
- If you make a selection on the **Asset** panel and then navigate to one of the work panels, the selection from the **Asset** panel is maintained. The assets that have related work created are displayed in the color configured for *Assets with Work*. For example, if you are on the **Asset** panel and use the selection to select 20 map features but only 12 are mapped in Work and Asset Management, the 12 features will be highlighted in the *Selected Assets* color. If you click on one of the work panels, the 12 features will be retained. If 4 of the 12 features have related work, then the 4 features will be highlighted in the *Assets with Work* color. The remaining 8 features will remain highlighted in the *Selected Assets* color. If you click back to the **Asset** panel, all 12 features will be highlighted in the *Selected Assets* color.
- Assets that are associated with an activity record in one of the work tabs are highlighted in the *Highlighted Related Assets* color on the map. The related assets for an activity can be highlighted using the *Highlighted Assets* icon, which appears for each of the activity records in any of the work panel results.
- If you make a selection on one of the work panels and then navigate to the **Asset** panel, the system will retain the selection if the selected assets have associated work. For example, You are on one of the work panels and use **Select** to select 20 map features (out of which work is created and matched with the filter criteria for only 8 features in Work and Asset Management). The 8 features are highlighted in the *Selected Assets* color and there is no feature selection for the rest of the GIS assets. When you click the **Asset** panel, the 8 highlighted features are retained. If all 8 features are mapped assets in Work and Asset Management, the *Selected Assets* color will be applied to the 8 features updating the asset information in **Asset** panel results. If you click back on one of the work panels, all 8 features will remain highlighted in the *Selected Assets* color.
- Selecting results from one of the work panels displays map features that have work created (the underlying map feature has a corresponding asset location in Work and Asset Management and has a work record that matches the default filter criteria. For the rest of the features, no selection color is displayed).
- If you select one or more assets from the map and then navigate to one of the work panels, the map viewer only looks for linked work for the selected assets.

GIS Work List Companion

The GIS Work List Companion is used in conjunction with the Work List to enable users to plot objects, such as assets, activities, work orders, and so on, in the GIS Map Viewer.

> **Note**
>
> GIS Work List Companion is available only if your system is configured for GIS.

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An example of how this might be used is as follows:

- Query the system for the objects to be plotted. For example, perform a search in either the **Assets** or **Activity** portal to retrieve a list of search results.
- Click the **Work List** icon to move the objects of the search results to the **Work List Dashboard** zone.
- **View Work List in Map** button is enabled in the **Work List Companion** zone on the **Dashboard**.
- Click **View Work List in Map** to plot the objects.

About Asset 360 Portal

The **Asset 360** portal provides a centralized page for viewing all relevant information associated with a specific asset. **Asset 360** portal consists of multiple zones that include events, actions, and insights for the selected asset.

Setup is required to get the full **Asset 360** experience. Please refer to Asset 360 Configuration in the **Administrative User Guide** for detailed steps.

The following zones are available on the **Asset 360** page:

- **Asset**: This zone displays common actions that can be taken for the asset, along with key asset and location information. Additionally, it provides insights related to Asset Criticality and Asset Risk.
- **Insights**: This zone displays visual insights for Condition Rating, Confidence Rating, Maintenance Trigger, Asset List Maintenance Trigger, and Warranty. Each insight includes a badge, and all except Condition Rating show a list of common actions.
- **Current Activities**: This zone displays up to five current (non-final) activities ordered by Total Risk Priority (highest first) and Required by/Activation date (oldest first) for the asset.
- **Attachments**: This zone displays an image of the asset along with up to eight attachments.
- **Asset Cost Breakdown by Service Class**: This zone displays the total lifetime cost of the asset, as well as the cost per service class.
- **Asset Type Cost Breakdown by Service Class**: This zone displays the total lifetime cost of the asset type, as well as the cost per service class.
- **History**: This zone displays the asset's activities, measurements, and service histories. Only 8 records are shown at a time, with pagination enabled to view additional records.

Operational Device Management

- About Operational Device Management
- About 360 Degree Search
- About 360 Degree View
- About ODM Configurations
- About ODM Configuration Reports
- About ODM Firmware

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- About Activity Generators
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- Maintaining ODM Configuration Reports
- Maintaining ODM Activity Generators

About Operational Device Management

Oracle Utilities Operational Device Management provides functionality to handle large volumes of assets and to manage the receipt, installation, maintenance, tracking, and removal of those assets. Oracle Utilities Operational Device Management is purchased as a separate license to further enhance Oracle Utilities Work and Asset Management. However, since these two products are typically always sold together, this guide includes seamless documentation for both products. Contact your sales representative or Oracle Support for more information.

The system supports the following business processes:

- Capturing device attributes and supporting any type of device
- Supporting integration with other utility applications requiring Device information and configuration
- Supporting detailed smart device attributes
- Supporting detailed location management and tracking of individual devices throughout their lifecycle
- Capturing device configurations, settings and calibrations
- Tracking firmware and firmware versions on smart devices
- Managing configuration between devices, components and software
- Validating devices at the time of receipt
- Scheduling and capturing data related to periodic inspection history over time
- Defining cycle information to schedule inspections
- Defining procedures to follow when performing inspections
- Using field activities to track and manage the electronic or in-field maintenance of devices
- Creating field activity documents to be used in the field for inspection work
- Defining a field activity life cycle

Refer to the Understanding Financials section in the **Administrative User Guide** for configuration guidelines.

About 360 Degree Search

The **360 Degree Search** portal is used to search for assets, components, specifications, locations and contacts. Users can also search on other identifiers or characteristics as defined by your organization.

Refer to About Operational Device Management for more information.

You can access the portal from **Menu**, then select **360 Degree Search**. You are brought to the 360 Degree Search portal with options for searching.

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Selecting different **Search By** criteria from the portal's **Main** tab page will change the search fields to present different options. From the search results list, you can navigate to the selected portal to view data for the object.

This feature is only used in **Oracle Utilities Operational Device Management**.

About 360 Degree View

The **360 Degree View** feature allows users to view data for assets, components, contacts and locations from a single set of portals.

Refer to About Operational Device Management for more information.

The **360 Degree View** has a separate portal for each type of object:

- Asset Information
- Asset ID
- Asset Specification
- Asset Location Information
- Storeroom Information
- Location ID
- Contact Name

Once you select one object, the **360 Degree View** provides related information so that you have full visibility into all information about that object. For example, if you select Asset Information and search on an asset type, the resulting view portal shows the components, service history, activity history, and location information for assets of that asset type.

This feature is only used in **Oracle Utilities Operational Device Management**.

About ODM Configurations

A single asset or component can have many parameters and only certain combinations of parameter values that are allowed. Multiple assets and components may work together as a group with only certain combinations of settings that are allowed or supported.

Configurations document and manage the valid set ups for assets and components. This includes a specification for each asset or component in the configuration as well as the valid value for each parameter, such as the firmware version of each asset.

Configuration reports can be generated to provide a summary of any currently installed configurations. These reports show whether the configuration in an installation is valid or invalid, they show the identifiers and values being used, and they display all of the assets, components, and other elements that make up the installed configuration.

If a configuration is found to be invalid or in need of reconfiguration, field activities can be created based on configuration criteria. Configuration functionality can also be tied in with specifications to manage firmware version testing and upgrades.

Configuration Statuses

Configurations also allow you to define particular statuses. Applicable statuses include:

- Pending

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- Under Testing
- Rejected
- Approved
- Deprecated
- Obsolete

Use actions in the **Record Actions** section to transition the configuration to the appropriate status.

About ODM Configuration Reports

Configuration reports provide a summary of any currently installed configurations.

These reports show whether the configuration in an installation is valid or invalid, the identifiers and values being used, and display all of the assets, components, and other elements that make up the installed configuration. If the configuration is invalid, the configuration column is blank in the report results. Navigate to the configuration itself to review the set up. A button next to each configuration also allows you to generate a field activity to correct, re-configure, or otherwise maintain any of the configurations.

Configuration reports are defined by the following:

- **Reporting Mode**: The mode in which the report is run (One Time or Recurring). Batch processing and the setting of the **Reporting Mode** field on a report determines when a configuration report is generated after it is submitted. If a report is set to generate one time, the report status is set to *Pending* after it is generated and it will not be updated again until a user manually submits the report. If the report is recurring, the report is updated every time batch processing runs.
- **Status**: The current status of the report (Pending or Submitted)
- **Report Criteria**: Specific information used to establish the filter criteria when generating the report, such as the assets and components involved, the firmware, characteristics, identifiers and other important information.
- **Report Result**: Specific information for each configuration, including the number of configurations, the assets and components involved, and the specifications and firmware versions of each. If the configuration is invalid, the **Configuration** column is blank in the report results. Users can navigate to specific valid configurations to review and edit the setup as needed. In addition, users can generate a field activity to correct, reconfigure, or otherwise maintain any of the configurations by clicking **Generate Activity**.

Base Package Configuration Reports

The base package includes a number of configuration reports, each based on one of the supported configuration classes (see Understanding Configuration Types).

The table below lists the configuration reports and the business object for each.

Configuration Report	Business Object
Single Asset Configuration Report	W1-SingleAssetCfgRpt
Asset/Component Configuration Report	W1-AssetCompCfgRpt
Asset to Asset Configuration Report	W1-AssetToAssetCfgRpt
Asset/Component to Asset Configuration Report	W1-AssetCompToAssetCfgRpt

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Configuration Report	Business Object
Asset to Asset/Component Configuration Report	W1-AssetToAssetCompCfgRpt
Asset/Component to Asset/Component Configuration Report	W1-AssetCompToAssetCompCfgRpt

About ODM Firmware

After a firmware is released from the vendor, new firmware may need to be tested and validated then either approved or rejected for roll out. The system provides the needed functionality to support validating and updating firmware versions as needed.

Associating Firmware and Firmware Versions to Assets

In most business processes, firmware and firmware version is entered as part of the manufacturer settings when assets are created. This information appears in the **Settings** section on the asset. Also during asset creation, a basic business process would associate an asset specification to the asset to keep track of detailed manufacturer information which might also include the firmware. Attached, as a child to that specification, would be another specification that indicates the firmware versions that are available.

As firmware versions change the child specification is updated with new versions. These versions can then be tested and accepted or rejected using the lifecycle functionality on the specification.

Next, field activities can be created directly from the **Field Activity** portal or by using the **Activity Generator** to update the firmware version on the assets that are associated with those specifications. For example, your business process might require that you create an *Asset Criteria Generator* type record to create a list of assets based on firmware as the selection attribute. The system would then apply the updates from the record to any assets that meet that criteria (for example, that have that firmware type or version).

Firmware Management

You can use the system to manage firmware in the following ways:

- **Create firmware groupings**: Record firmware versions into groupings or "families" on specifications so that related versions can be easily managed together.
- **Add firmware to assets**: Use peer specifications to associate assets to these firmware groups.
- **Review firmware**: Review firmware distribution and status in the **Firmware Deployment** and **Firmware Version Dispositions** zones on specifications.
- **Document firmware**: Manage related release notes or manufacturer information by creating attachments directly on the specification.
- **Test firmware**: Track testing and roll out of new firmware versions including the ability to approve or reject firmware version deployments.
- **Update firmware**: Create field activities to update firmware versions on assets.
- **Reject firmware versions**: After testing, set the firmware version to an inactive status to indicate that the firmware version cannot be used for assets.

The **Configurations** portal manages asset to component to firmware configurations that determine which versions are valid for which assets. **Configuration Reports** can be used to obtain details about the configurations and verify that the correct versions are in use.

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Firmware on Specifications

The **Firmware Deployment** section on specifications provides statistics on the number of assets that are on each version of the firmware that is applicable to the specification. Click the pie chart for a version to see the number of assets on that versions grouped by the asset state.

The **Firmware Versions** section lists the firmware that has been added using the specification. Use the **Add Firmware Version** link in the zone to add a new version. Click on one of the listed versions to open a screen with more details about the firmware. This screen can also be used to add attachments for the specific firmware version. For example, you might attach the release notes that were delivered with the firmware release. On this screen, the **Firmware Version Dispositions** section lists the assets that use the firmware version indicated, if any.

Firmware Version Lifecycle

Statuses for firmware version updates can be managed on the specification by selecting the actions in the **Record Actions** section. Valid statuses include:

- Active Statuses
  - created
  - under testing
  - approved
- Intermittent Statuses
  - deprecated
  - quarantined
- Inactive Statuses
  - rejected
  - obsolete

If the firmware version is in an intermittent status, assets or components can reference that version. In general, these statuses are for documentation purposes. for example, an organization might use the **Deprecated** status to indicate that they do not want to roll out new meters on that version any longer, however, existing meters that are on that version are still valid. No assets or components can have the version associated if the version is in one of the inactive statuses.

About Activity Generators

Activity generators are used for mass generation of activities. An Activity Generator business object is selected when creating activity generators, and is used for entering the criteria values for searching assets and asset locations that will be linked to the activities to be created. Such criteria includes location type, asset identifiers, location identifiers, address components, asset disposition, indication if asset is installed or not, asset type, specification and among others. Required information also includes, the activity type, disposition of the created activities, maximum number of activities that will be created, and an indication if the activities will be created via batch processing.

The base package includes the following set of activity generator business objects containing the various criteria:

- **Asset Criteria** (W1–AssetCriteriaActGenerator): used to define asset-related criteria used to select the assets for which activities will be created (for example, activities for all assets

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for a certain asset type, a specified current disposition or condition, or whose identifiers contain specific characters, and so on).

- **Asset List** (W1–AssetListActGenerator): used to define a list of assets for which activities will be created.
- **Component Criteria** (W1–CompnCriteriaActGenerator): used to define component-related criteria to select the components for which activities will be created (for example, asset inspection activities for all assets for a certain component type, a specified current disposition or condition, or whose identifiers contain specific characters, and so on).
- **Component List** (W1–CompnAssetListActGenerator): used to define a list of components for which activities will be created.
- **Location Criteria** (W1–NodeCriteriaActGenerator): used to define location-related criteria to select the asset locations for which activities will be created (for example, activities for all locations where assets are current installed, locations of a specific type, or whose identifiers contain specific characters, and so on).

Activity generators are defined by:

- **Status**: The current status of the activity generator.
- **Batch Generation Requested**: A flag that indicates if the activities created by the asset activity generator should be generated using batch processing.
- **Generator Information**: Details related to the specific activity generator business object (Asset List, Asset, Location, and so on) used by the asset activity generator.
- **Activity Information**: Details for the types of activities created by the asset activity generator, including activity type, default disposition, activation and work lead days (defaulted from the asset activity type), and the maximum number of activities to be created.

Specific activity generators contain additional information based on their business object. For instance, activity generators based on the **Location Criteria** business object includes **Location Information** and **Address Information** sections.

Maintaining ODM Assets

This portal is used to display and maintain ODM asset records.

Refer to About ODM for more information.

You can access the portal from **Menu**, select **Asset Management**, and then select **Asset**. You are brought to a query portal with options for searching for a specific asset. Once an asset has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Asset**: This zone provides details about the asset, such as the badge number, disposition, and status as well as any contextual insights if configured.
- **Connected Assets**: This zone displays connected asset locations associated with this asset record.
- **Attached Components**: This zone provides a list of components that are installed on the asset.
- **Asset Attributes**: This zone displays a list of attributes.

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- **Attachments**: This zone enables users to manage all types of attachments for the record.
- **Asset Warranty**: This zone provides warranty information for the asset.
- **Notes**: This zone enables users to enter additional notes for the specific asset.

The following zones may appear as part of the **Tree View** tab page:

- **Asset Hierarchy**: This zone displays a hierarchy view for the asset.

The following zones may appear as part of the **Asset Disposition** tab page:

- **Disposition History**: This zone displays all of the status and location changes that have occurred during the life of the asset.
- **Components History**: This zone displays all the components that were and are currently attached to the selected asset during it's life.

The following zones may appear as part of the portal's **Log** tab page:

- **Asset Log**: This zone displays log information for the asset.
- **Asset Sync Requests**: This zone displays sync requests associated with the asset.
- **Asset Shipping Memos**: This zone lists the shipping memos associated with the asset.

Maintaining ODM Configuration Reports

This portal is used to display and maintain configuration reports.

Refer to About ODM for more information.

You can access the portal from **Admin**, select **Configuration Report**, then select **Configuration Report**. You are brought to a query portal with options for searching for configuration reports. Once the report has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Configuration Report**: This zone provides details about the report.

Maintaining ODM Activity Generators

The **Activity Generator** portal is used to display and maintain activity generators.

Refer to About Activity Generators for more information.

You can access the portal from **Menu**, select **Work Management**, and then select **Activity Generator**. You are brought to a query portal with options for searching for a specific asset. Once a record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Activity Generator**: This zone displays the basic attributes of the activity generator record.
- **Activity Information**: This zone displays summary information about the activities created by the activity generator.
- **Notes**: This zone lists any notes that have been added for the activity generator record.

The following zones may appear as part of the **Activities** tab page:

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- **Activities**: This zones displays a list of the activities created by the activity generator.

The following zones may appear as part of the **Cost** tab page:

- **Work Order cost Summary**: This zone displays a summary of costs associated with the activity generator record.

The following zones may appear as part of the portal's **Log** tab page:

- **Activity Generator Log**: This zone displays log details for the activity generator.
- **Related Stock Transactions**: This zone displays the related stock transaction information for the activity generator.

Inventory

- About Inventory
- About Material Disposition
- About Shipping Memos
- Maintaining Stock Items
- Maintaining Stock Item Details
- Maintaining Stock Transfers
- Stock Transaction Log Portal
- Maintaining Physical Inventories
- Maintaining Receipts
- Maintaining Shipping Memos
- Maintaining Returns
- Maintaining Material Issue
- Maintaining Material Requests
- Maintaining Material Request Templates
- Maintaining Material Returns
- Maintaining Material Dispositions
- Maintaining Bill of Materials
- Maintaining BOM Parts
- Maintaining Reorder Reviews
- Reorder Review Mass Approval

About Inventory

Inventory is tracked, ordered, and received from vendors and allocated in the inventory system. As inventory is allocated to work, the system passes this information back to the work management system so that maintenance managers and crews know that their parts are available.

- Stock Items

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- Stock Item Details
- Physical Inventory
- Inventory Adjustments
- Stock Transfers
- Receiving Inventory and Non-Inventory Services
- Returns

Stock Items

Stock items are defined as material resources that are held in storerooms and issued to activities that require the materials to be completed. The stock item record determines whether or not the type of stock can be purchased, repaired, tracked, is a hazardous material, and so on. A tracked stock item considered to be hazardous material can be flagged as such on the stock item record and will be viewable from the Asset record's **Maintenance** tab through the linking of the tracked stock item on the Specification record associated with the Asset record.

As stock items leave the storeroom, a reorder of stock items will become necessary. Some stock items get purchased when the reorder points, defined on the stock item detail, are reached. Other stock items need to be ordered only when there is a demand for them. The system is able to create a reorder review record for “On Demand” stock items whenever the quantity of stock items needing to be “On Hand” exceeds the total quantity of that stock item in inventory.

The stock item record can also provide a list of vendors and manufacturers who provide the item as well as appropriate alternative stock, as applicable. Only stock items in an “active” status can be purchased or entered as a material requirement on an activity. When they are entered in the system, stock items are categorized in some of the following ways:

- **General**: Regular stock items are kept in inventory until they are needed.
- **Direct Purchase**: Direct purchase stock items can only be directly purchased when needed for work.
- **Trackable**: Trackable stock items merit being individually identified and followed from initial receipt on-site through complete usage. These are typically large, expensive, or specialized assets or materials which are inspected when they are received into inventory, repaired if they break, or installed on other assets, and are otherwise carefully dispositioned in the system.
- **Lot Managed**: Lot managed items are tracked in a special way in the system. These types of items are fabricated, sold, and delivered in “lots” or “batches” of the item. This is significant when there are qualities of details about the item that might vary between lots. If this item is lot managed, the system tracks a lot number with any transaction that changes the quantity of the item for the storeroom. Since each received lot also has its inventory tracked independently, lot managed item details all have “child” stock item details for each lot that is received. This means a “master” stock item detail that is classified as “lot managed” on its stock item detail may have many “lot” stock item details (one for every lot that is received). When an activity references lot managed items as a resource requirement, the master stock item detail is referenced. Lots only become relevant when material is issued from or received into inventory. This means the material issue for lot managed stock items reference a lot stock item detail, but the planned activity references the master stock item detail. During receiving of a lot managed stock item, the system verifies whether or not the storeroom has a lot specific Stock Item Detail (SID) for that lot number and creates one if one does not exist.

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- **Capital Spare**: Capital Spare items are identified during accept and return as fixed assets so that an external Fixed Asset Management System can maintain their depreciation. A property unit is required on capital spare items.

Some stock items, such as Lot Managed stock items, should be inspected when they are received from the vendor. The “Accept on Receipt equals No” setting on the stock item record forces the inspection of the stock item upon receipt. This setting also enables a shipment deficiency to be created when there is an issue with the shipment. The deficiency can then be displayed in the **Shipping Deficiency** zone of the **Receipt Line** portal.

When a stock item is maintained in the inventory of a storeroom, a corresponding **Stock Item Detail** record must be created. Stock item details define how the stock item is managed in the storeroom and contain storeroom-specific information for the stock item such as pricing, reorder information, unit of issue, unit of purchase, expense code, and so on.

One stock item might be stored in multiple storerooms. When it is needed, stock transfers can be used to move items between storerooms. For example, an organization might have a central storeroom from which satellite storerooms request stock.

Stock Item Details

Stock Item Detail (SID) records define how a stock item is managed in the storeroom as well as tracking quantities for stock items. Each record contains storeroom-specific information for the stock item such as pricing, reorder information, unit of issue, unit of purchase, expense code, and so on.

Every stock item that is to be maintained in the inventory of a storeroom must have a corresponding **Stock Item Detail** record.

The Stock Item Detail record determines whether or not the type of stock can be purchased, repaired, tracked, and so on. Stock items that need to be ordered only when there is a demand for them require some configuration:

- Configure the following values in the **Reorder Information** zone of the stock item detail:
  - Auto Reorder: *Yes*
  - Order On Demand: *Yes*

A SID is a particular stock item in a particular storeroom. For example, in one storeroom, a particular stock item might be stored whereas in another storeroom that same stock item might only be direct purchased. The item would have a different SID in each storeroom. In cases where an item can only be direct purchased for activities, the storeroom only acts as the receiving dock and courtesy storage location until the workers from the activity come to pick them up.

The **Stock Item Inventory** section provides a graphical representation of what is in stock with lines representing maximum quantity and reorder quantity. Use the filters to change the display on the chart. This chart can be changed to show projected inventory (taking into account pending purchases and pending activities), or historical inventory (showing actual inventory use and receipts).

Inventory Details

Inventory Details is an individual widget displayed within the **Dashboard** which displays the inventory quantities for the selected stock item detail record. Inventory and AUP values are derived from the tracked assets when at an *In Stores* status in that storeroom. All other remaining values are derived from the Stock Transaction (W1_STOCK_TRANS) table.

- **Inventory** is the quantity currently in the storeroom.

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- **Average Unit Price (AUP)** is the average unit price of the stock item detail, rounded for display purposes (defined for the **Currency Code** specified in **Installation Options**)
- **Reserved** is the physical amount of stock items reserved in inventory. If it is not in inventory, it cannot be reserved.
- **On Demand** amounts are used in determining whether inventory can meet future needs. Amounts included in **On Demand** are “Active” activities with resource requirements and material requests, not referencing an activity, that are in a "Ready to Issue" state.
- **Pending Demand** indicates that an “Approved” activity includes a resource requirement.
- **In transfer** means stock is being transferred from one storeroom to another. The stock is considered “In Transfer” for the target storeroom after the originating storeroom completes their issue and before the target storeroom actually receives the stock.
- **On Order** is the amount derived from an “Issued” purchase order. This is before it has been received and accepted into inventory.
- **Pending Order** is the amount derived from an “Approved” purchase requisition before it is turned into a purchase order.
- **Available Quantity** is the amount of a stock in inventory plus what is due in (Pending Order, On Order, In Receipt, and In Transfer) and subtracting what is due out (On Demand and Reserved).

Physical Inventory

Physical inventory is an auditing procedure within **Inventory Management** which your organization can use to ensure that the physical quantities of items, materials, and stock that are housed in your storerooms match the actual stock totals recorded within the system. This basically allows your organization to verify the accuracy of your inventory quantities and values.

Begin a count by selecting the storeroom used for the count, the number of items to create, and the type of inventory to be counted. Click **Generate Count List** to enable the system to begin the count. The system uses the **Days Since Last Inventory** parameter, if available, or the **Creation Date** parameter to ensure that the items that have not been counted in a while are retrieved first and displays them at the top of the list. The list is then sorted with the **Physical Count Master/Line Info** as the first column, sorted first by **Primary Bin** and then by **Stock Item** code.

The **Items Summary** zone is visible only when the Physical Inventory header is in a *Stock Items Selected*, *Count In Progress*, or *Completed* status and displays both the count of all selected items for the Physical Inventory header, regardless of their status, and the number of selected items in a cancelled (Discard) status

If actual counts are found to be out of sync with system inventory counts, they can be reconciled based on pre-defined tolerance thresholds. Storeroom personnel can print a report of the physical inventory items listed for the storeroom. The listing displays the physical inventory number, storeroom, bin, and list of stock items physically available in the storeroom.

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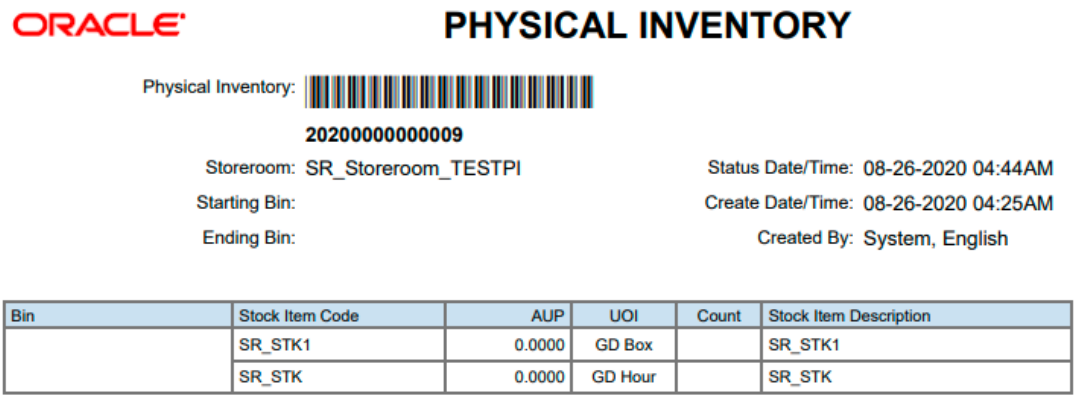

ORACLE

PHYSICAL INVENTORY

Physical Inventory: 20200000000009

Storeroom: SR_Storeroom_TESTPI
Starting Bin:
Ending Bin:

Status Date/Time: 08-26-2020 04:44AM
Create Date/Time: 08-26-2020 04:25AM
Created By: System, English

Bin	Stock Item Code	AUP	UOI	Count	Stock Item Description
	SR_STK1	0.0000	GD Box		SR_STK1
	SR_STK	0.0000	GD Hour		SR_STK

Inventory Adjustments

Inventory adjustments can be used to adjust inventory counts or price of stock items.

When inventory is adjusted, stock transactions are created to adjust the price and quantity of the items being adjusted. Assets that are tracked are adjusted differently in that the unit price is directly adjusted and financial transactions are created if the total inventory value is changed (based on the relative price/quantity adjustment).

Stock Transfers

Stock transfers are used to move stock from one storeroom to another; essentially one store room is ordering stock from another. The ordering storeroom is considered as the receiving storeroom, and the source storeroom is considered as the issuing storeroom. Only items with the same stock type can be transferred.

Receiving Inventory and Non-Inventory Services

The receiving process is used to track purchases that are received as the result of a purchase order by recording basic information such as the quantity received, receiving location, packing slip details, carrier, and so on.

When regular inventory items and non-inventory items, such as labor or miscellaneous services, are delivered to your organization, they must be added into the system by creating a receiving record. The system uses the *Require Receipt for Services* parameter in the Purchasing Master config to determine which purchase lines are displayed in the picklist prior to accepting the inventory and non-inventory items and services.

- If the parameter is set to *YES*, then all inventory and non-inventory line items are included in the picklist.
- If the parameter is set to *No*, then only the inventory line items are included in the picklist; labor and miscellaneous non-inventory type services are excluded.

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> **Note**
>
> There may be some instances where a vendor may send an invoice prior to an item being shipped or received. In cases such as this, an invoice for the purchase order line item can be created however, the invoice cannot be processed until the line item is received.

Once the picklist is created with the appropriate line items, the user would then select the items in the picklist to create the receipt lines. A detailed description of the receiving process is described below.

The receiving process tracks delivery of inventory items and non-inventory services through several distinct steps from the time of arrival until they are entered into the system in. The steps in the process allow for the actual receipt, inspection of items and services, and acceptance. The process steps include:

- Record the delivery of items or services — create a receipt record which holds basic delivery information. This step does not include details about the items or services.
- Match items or services to the purchase order — review items and services on the purchase order and select, from a pick list, the items and services that were delivered. Items and services are counted and compared to what was ordered.
- Receive and accept the items — On the Receipt record the user has the option to select either the "Receive All and Accept" or the "Receive All and Accept (Batch)" hyperlink as long as an item and service in the **Open Receipt Lines** zone is not tracked or lot managed. Selecting the "Receive All and Accept" hyperlink tells the system to set ALL regular inventory and non-inventory services to a *Received* status and then to look at the "Accept on Receipt" value defined on the stock item or service for that receipt line.
  - Receipt lines where the stock item record or service indicates an “Accept on Receipt” value set as ***Yes*** are automatically accepted into the system which completes the acceptance process for those receipt lines.
  - Receipt lines where the stock item record or services indicates an "Accept on Receipt" value set as ***NO*** display in a pick list. For these receipt lines the user selects which receipt lines to accept. Clicking **Accept** indicates the selected lines are accepted into the system. Clicking **Cancel** indicates the selected receipt lines are not accepted and are moved to the **In Receipt Lines** zone of the **Receipt** record and the user will need to manually accept the receipt line. Also, receipt lines not selected when either **Accept** or **Cancel** are clicked are not accepted and will need to be manually accepted.

> **Note**
>
> Receive All and Accept (Batch) hyperlink works the same way as described above but is done through batch processing. This option is suggested if a lot of inventory or non-inventory services are being received at one time.

> **Note**
>
> The system adjusts inventory quantities for the items and non-inventory services accordingly. Depending on your system configuration and business practices, the system may also include taxes for stock items, labor, and miscellaneous services at the time of receipt.

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- (alternate) Create a shipping deficiency entry for receipt line items when there is a problem with materials or services received in the shipment. The deficiencies can be edited, added to, or resolved directly from the **Shipment Deficiency** zone of the **Receipt Line** record.
- (alternate) Return the items — As needed, return items for replacement or credit. When returns are processed, the appropriate cost adjustments can be made for both non-inventory and regular inventory to credit the accounts.
- Complete the Receipt Header - this can be performed when there are no more *Open* Receipt Lines. EXCEPTION: Receipts with *Open* lines can be completed IF the Open Receipt Line has *Cancelled* Accept Lines. Cancelled Accept Lines return the Receipt Quantity back to zero.

Quick Receive

Your organization may not require a multi-step processing to receive items into your inventory. In these cases, the system includes a feature to receive and accept the items in one step. This feature is only available if it is enabled in your system implementation. If the stock item has “Accept on Receipt” set as *Yes*, one-step receiving is allowed.

Forced Complete

In some cases, the quantity ordered on the purchase order may never be fulfilled. For example, if your organization ordered a quantity of 10 of items that were discontinued and the vendor only had 5 to send to fulfill the order. The system provides the ability to receive the five items then to force the system to consider the order complete. This processing flags the system that the line item receipt quantity is complete so that the purchase order does not stay open. After receiving partial items, select the **Force Complete** action on the **Receipt** record. Completing this action marks the purchase order line item as **Fully Received** and transitions it to the **Closed** state.

Returns

Returns track inventory that must be retuned to a vendor. Returns are tracked in relationship to the purchase order for the original receipt of the items.

Note that this processing is different from a *material return* in that the items are being returned to an outside vendor rather than adjusting quantities in internal storerooms.

About Material Disposition

Asset disposition is a process designed to track repairable assets and stock items. The process tracks the asset or component from when it is removed fro service to where it is either retired, scrapped, or repaired and returned to availability for re-use.

Material disposition processing involves creating a work order to remove then replace a broken asset or component. The asset must be flagged as repairable.

In creating the work order and related activities, the resource requirements must indicate that a replacement asset must be checked out from a storeroom to replace the broken one. In order to fulfill these requirements, users must create a material request and material issue for the asset. A **Material Disposition** record is automatically created as a result of these material requirements being fulfilled, and the replacement asset and the broken asset are added on the material disposition as line items. Note that new records are not created directly in the **Material Disposition** portal. They must be generated automatically by this processing.

The person responsible for material disposition should navigate to the **Material Disposition** portal to complete the steps within the system to remove the broken asset and move it to a pending disposition status while moving the replacement asset to an installed status. This is

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done using the **Complete Exchange** option. When completing the complete exchange process, the system prompts for information such as the actions to perform on the assets, status reason, new storeroom as applicable, and dispositioning dates and times.

The actual assets should also be swapped as applicable toward completing the initial work order and activity.

Your business process may then require that you create a follow up work order to repair the broken asset using the **Create Work Order** action from within the **Material Disposition** portal.

Once a ‘repairable’ asset has been pulled from the field and repaired through Material Disposition, it can be returned to a storeroom with a new valuation. The stock item detail for the asset will show a repaired price, as applicable.

You can review the costs and other statistics related to the replacement and repair of assets by reviewing the actual **Asset** record in the **Cost Information** section.

- Material Requests
- Material Issue
- Material Returns
- Material Request Templates
- Bill of Materials

Material Requests

Material requests, or checkout requests, manage the process of specifying the need to issue stock items from a storeroom.

When an activity needs stock items, a material request can be created. The request includes a list of all the items that the activity needs from the storeroom with the stock code, the storeroom, and the needed quantity specified. Storeroom personnel can print a report that lists the stock items needed for pickup or delivery. The report includes the material request number, storeroom, and delivery locations. Also, stock items are displayed with barcodes, if applicable.

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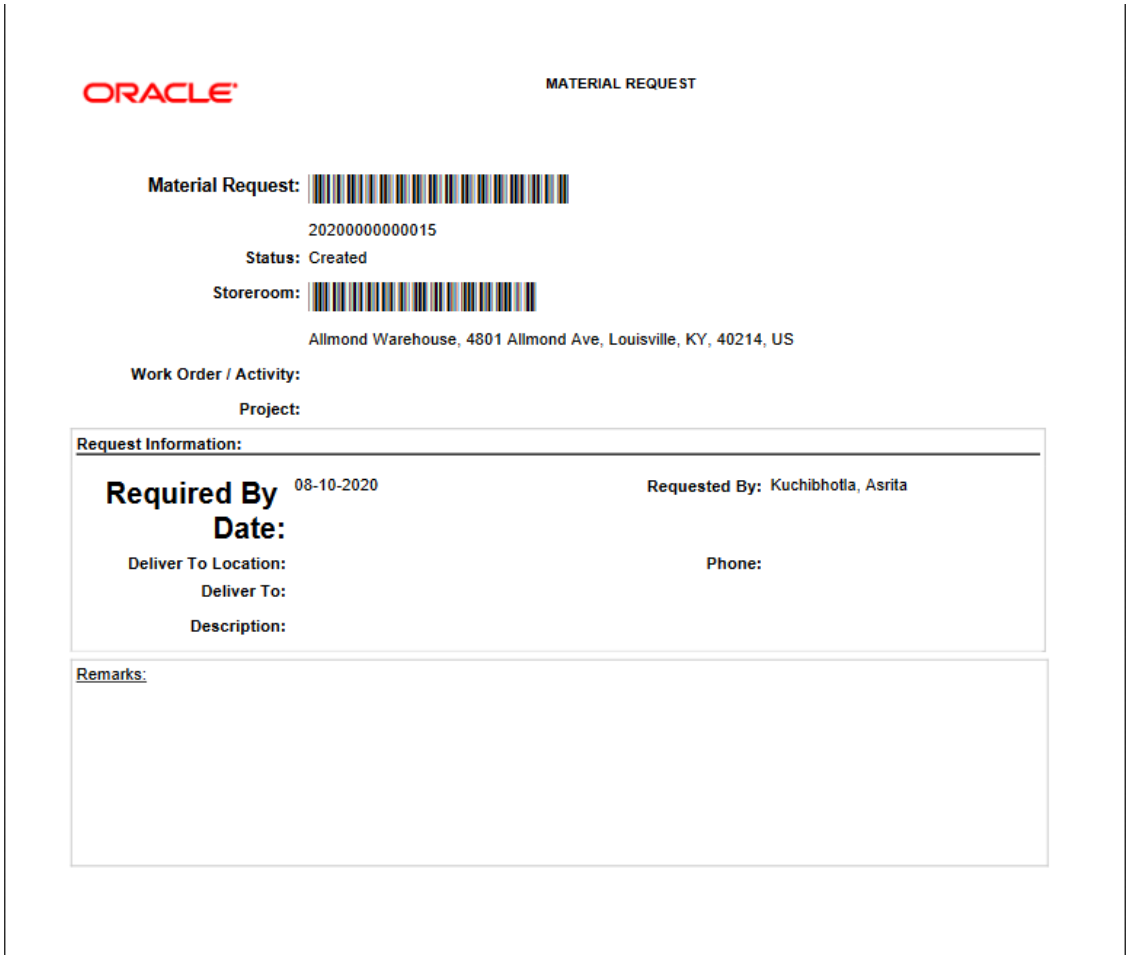

MATERIAL REQUEST

Material Request: 20200000000015

Status: Created

Storeroom: Allmond Warehouse, 4801 Allmond Ave, Louisville, KY, 40214, US

Work Order / Activity:

Project:

Request Information:

Required By Date: 08-10-2020

Requested By: Kuchibhotla, Asrita

Deliver To Location:

Phone:

Deliver To:

Description:

Remarks:

The following processing must be completed:

- Create the material request
- Add line items for the stock items to be issued. Line items can be added manually or from a material request template.
- Prepare the material request for issue
- Issue the materials (Materials may be issued fully or partially)

Material Issue

Material issue, or stock checkout, manages the process of pulling and releasing stock items from a storeroom.

Material issue processing occurs as follows:

- The person from the issuing storeroom can verify availability within the system then release (issue) the items. The material issue is processed using the originating **Material Request** record.
- The system calculates the inventory count to decrease it accordingly.
- Issued items are be charged to the activity.

It is also possible to issue materials without a relationship to an activity. In this case the user must provide the accounting information that will be charged for the materials

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Material Returns

Material returns manage the process of returning excess stock items that were previously issued to the storeroom.

Material return processing occurs as follows:

- A material return is created by navigating to the related material request and clicking the Return button for the relevant line item.
  This can also be done by creating a new record in the **Material Return** portal which references the originating material request.
- Warehouse personnel check the quality of the stock item being returned. If it is in good condition, the item is accepted and returned to the storeroom.
- The system calculates the inventory count to increase it accordingly.
- Returned items are credited back to an account or work order activity.

Material Request Templates

A material request template is a collection of stock items that is used to easily populate a material request. For example, a template could exist for “office supplies” that contains the collection of office supply stock items that the user can add to the request. Likewise, you might have a template to request all of the items on a bill of materials.

- Each storeroom can have multiple templates.
- Only stock items in inventory (both Lot Managed and Not-Lot Managed) and tracked assets can be specified on a template. The stock items must have a stock item detail at the storeroom.
- Direct purchase stock items cannot be referenced on a material request template.
- An expense code, if populated on the material request template, overrides the expense code from the Stock Item Detail and will be populated on the request.
- A default count can be included on the template to indicate the default request quantity of the stock item. For example, your organization might always request the same amount of the stock item. This can be specified on the template.

After a material request is created, the line items can be added by referencing the template then selecting items from a picklist.

Bill of Materials

Bills of materials are used to simplify the identification of materials when planning work.

A Bill of Material (BOM) is a list containing a hierarchy of component parts that make up a piece of equipment or asset. The component parts, also known as BOM Parts, are the individual stock items or an assembly of stock items included in the BOM. An example of a BOM might be an Apple iMac computer. The BOM parts identified for this particular BOM might include a Monitor, Keyboard, mouse, and so on. Another example might be a BOM for a carburetor. The BOM parts included on the BOM might be a carburetor rebuild kit.

Your organization can build a BOM or define a BOM part and reference it on an asset, component, or fleet asset (vehicles). The BOM or BOM part can then be used as search criteria when searching for an asset.

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A bill of materials can be a great advantage for maintenance personnel when they are planning or working on an asset. The bill of materials can be used to easily find the stock items related to component parts of the assets that need to be worked on. This relieves planners from doing extensive research to find the correct related stocked and non-stocked items needed. As needed, you have the ability to add materials to activities from the asset's Bill of Materials. Selecting the add from BOM action opens a dialog where you can choose items from the BOM pick list.

Bills of materials can be multilevel, with a list of components and lists of parts for the components, lists of parts that make up the parts, and so on. The level of detail you build into them depends on your organization's resources and needs.

A Bill of Materials is similar to a **Specification** in that the same Bill of Material can be created as one source for specific criteria needed to maintain the asset, which is then referenced on many assets.

Bills of materials are classified in the following ways:

- General Stock Item Part — Defines a general piece of stock or equipment. A generic stock item BOM is automatically generated by the system when a stock item is created.
- Independent Part — Defines a generic part which is not a stock item, but can be composed of many parts. For example, a truck would be defined as an asset, not a stock item, but might reference a BOM with independent parts. These must be created manually.

Access the **Bill of Materials** tab on applicable stock items to review the associated **Bill of Materials** tree or the **BOM Part** record for the stock item.

About Shipping Memos

Shipping memo is the record of stock items being shipped from an internal storeroom, whether from storeroom to storeroom or from storeroom to vendor.

Shipping memos can be created for both standard and tracked stock items and enables storeroom managers and shipping clerks a way to manage and track stock items being shipped between locations.

Some uses for shipping memo include the following:

- Tracking stock items returned to vendors for credit, replacement, or repair
- Help manage the return of repaired or replacement stock items back into Inventory

There are four categories of shipping memos:

- **General** is the default shipping memo category that should be used when creating a shipping memo manually.
- **Repair** is used when returning stock items from a purchase order needing reconditioning or repair to a vendor.
- **Return** is used when returning stock items from a purchase order to a vendor for credit or replacement.
- **Transfer** is used when creating a Stores Transfer (transferring stock items between storerooms) to reference on the shipping memo.

Shipping memos can be created from various places in the system, such as Menu, Purchase Order, Return, Stock Transfer, and so on.

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Maintaining Stock Items

The **Stock Item** portal is used to display and maintain a stock item record.

Refer to About Inventory for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Stock Item**. You are brought to a query portal with options for searching for a specific stock item. Once a stock item has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Stock Item**: This zone displays information about the selected stock item.
- **Stock Item Availability**: This zone enables broadcasting of stock item availability per storeroom for the stock item record.
- **Unlink Specification**: This zone removes the specification from the stock item record.
- **Link Specification**: This zone links the specification to the stock item record which enables the stock item to be used to track the associated asset.
- **Attachments**: This zone enables users to manage all types of attachments for the stock item record.
- **Standard Notes**: This zone lists the standard notes associated with the stock item record and enables the viewing of standard note information.
- **Notes**: This zone displays any notes associated with the stock item record.
- **Referencing Compatible Units**: This zone lists the compatible units that reference the current compatible unit.

The following zones may appear as part of the portal's **Bill of Materials** tab page:

- **BOM Tree**: This zone displays a hierarchy tree view of the stock item.
- **Bill Of Materials**: This zone displays information about the bill of material associated with the selected stock item record.
- **Referencing BOM's**: This zone enables broadcasting of referenced parts for the stock item.
- **Attachments**: This zone enables users to manage all types of attachments for the stock item record.
- **Notes**: This zone displays any notes associated with the BOM associated with this stock item record.

Maintaining Stock Item Details

The **Stock Item Detail** portal is used to display and maintain a stock item detail record.

Refer to About Inventory for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Stock Item Detail**. You are brought to a query portal with options for searching for a specific stock item detail. Once a stock item detail has been selected, you are brought to the maintenance portal to view and maintain the selected record.

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The following zones may appear as part of the portal's **Main** tab page:

- **Stock Item Detail**: This zone displays information, such as purchase details, reorder information, and buyer information, for the selected stock item detail record.
- **Stock Item Detail Lots**: This zone lists the status and inventory quantity for lot managed stock items.
- **Inventory Adjustment**: This zone lists adjustments to inventory, such as price or quantity, for this stock item detail.
- **Stock Item Detail Direct Purchase**: This zone displays specific direct purchase records and their associated work activities and work orders for this stock item detail record.
- **Attachments**: This zone enables users to manage all types of attachments for the stock item detail record.
- **Notes**: This zone displays any notes associated with the stock item detail record.

The following zones may appear as part of the portal's **Availability** tab page:

- **Stock Item Availability**: This zone displays information, such as purchase details, reorder information, and buyer information, for the selected stock item detail record.
- **Stock Item Inventory**: This zone displays inventory quantity information for the selected stock item detail record.

Maintaining Stock Transfers

The **Stock Transfer** portal is used to display and maintain a stock transfer records.

Refer to About Inventory for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Stock Transfer**. You are brought to a query portal with options for searching for a specific stock transfer record. Once a stock transfer record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Stock Transfer**: This zone displays information about the selected stock transfer.
- **Stock Transfer Quick Add**: This zone enables the addition of stock to the transfer request.

The following zones may appear as part of the portal's **Stock Transfer Receipt** tab page:

- **Stock Transfer Receipt Header**: This zone displays general receipt header information.
- **Open Stock Transfer Receipt Lines**: This zone displays the open receipt lines for the stock transfer.

Stock Transaction Log Portal

The **Stock Transaction Log** portal is used to search for stock transactions related to processes that involve inventory stock items.

You can access the portal from **Menu**, select **Inventory**, and then select **Stock Transaction Log**. You are brought to a query portal with options for searching for a specific stock transaction log. Once a record has been selected, you are brought to the transaction log for the stock item where you can view financial transactions and other details for the selected record.

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The zones on the portal's **Main** tab page will vary according to the related process.

The following zone appears as part of the portal's **Financial Transaction** tab page:

- **Financial Transaction**: This zone displays details about the financial transaction for this stock item transaction.

Refer to About Inventory for more information.

Maintaining Physical Inventories

The Physical Inventory portal is used to display and maintain a physical inventory record.

Refer to About Inventory for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Physical Inventory**. You are brought to a query portal with options for searching for a specific record. Once a record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Physical Inventory Header**: This zone displays basic information about the selected physical inventory record as well as zones for **Required** and **Optional** criteria, **Items Summary**, and **Other Information**.
- **First Count Information**: This zone displays the inventory count records that have been generated.
- **Recount Information**: This zone displays the list of Physical Inventory Count records along with additional fields for entering the Recount value and a First Count field displaying the First Count value.
- **Completed Count Information**: This zone displays the list of completed Physical Inventory Count records.

Maintaining Receipts

The **Receipt** portal is used to display and maintain receipts.

Refer to About Inventory for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Receiving — Receipt**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Receipt Header**: This zone provides information about the receipt, such as receipt information, purchase order information, additional processes, and a receipt line status summary.
- **Open Receipt Lines**: This zone enables a search for open receipt lines filtered by storeroom and resource type.
- **In Receipt Lines**: This zone displays the in receipt lines in a table format. Users are also able to search by storeroom and resource type to filter the results.

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- **Accept/Return Detail**: This zone displays the receipt line information that has been accepted or returned. Receipt lines also display deficient in red text in the info string if the receipt line includes a deficiency.
- **Notes**: This zone lists the notes associated with this entity.
- **Attachments**: This zone lists the attachments associated with this entity.

The following zones may appear as part of the portal's **Activity** tab page:

- **Purchase Order Line Activity**: This zone displays the purchase order lines and receipt lines associated with the purchase order line activity.

Maintaining Shipping Memos

The **Shipping Memo** portal is used to display and maintain shipping memos.

Refer to About Shipping Memos for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Shipping Memo**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Shipping Memo**: This zone provides information about the shipping memo, such as shipping category, shipping memo number, ship to details, and tracking information.
- **Shipping Lines**: This zone provides links to the shipping line and stock items associated with the shipping memo.
- **Attachments**: This zone enables users to manage all types of attachments for the shipping memo record.
- **Notes**: This zone displays any notes associated with this shipping memo record.

Maintaining Returns

The **Return** portal is used to display and maintain receipt return records.

Refer to About Inventory for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Receiving — Return**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Return**: This zone provides information about the return record, such as purchase order, stock item detail, type of return, and the quantity.
- **Shipping Memos**: This zone displays any shipping memos associated with the return record.

The following zones may appear as part of the portal's **Financial Transaction** tab page:.

- **Financial Transaction**: This zone provides information about the shipping memo, such as shipping category, shipping memo number, ship to details, and tracking information.

The following zones may appear as part of the portal's **Log** tab page:.

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- **Return Log**: This zone displays log details for the return.
- **Related Stock Transactions**: This zone displays the related stock transaction information for the return.

Maintaining Material Issue

The **Material Issue** portal is used to display and maintain material issue records.

Refer to About Material Disposition for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Material Issue**. You are brought to a query portal with options for searching for a material issue record. The query search displays a list of material requests. Once a material request record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

Maintaining Material Requests

The **Material Request** portal is used to display and maintain a material request record.

Refer to About Material Disposition for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Material Request**. You are brought to a query portal with options for searching for a specific material request record. Once the record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Material Request Header**: This zone displays information about the selected material request record.
- **Material Request Quick Add**: This zone enables the addition of stock items to the material request.
- **Open Request Lines**: This zone displays the open request lines associated with the material request.
- **Closed Request Lines**: This zone displays the closed request lines associated with the material request.
- **Canceled Request Lines**: This zone displays the canceled request lines associated with the material request.
- **Stock Item Inventory**: This zone displays stock item inventory information after broadcasting an open request line.
- **Stock Item Availability**: This zone displays upon broadcasting an open request line and displays stock item information per storeroom.

Maintaining Material Request Templates

The **Material Request Template** portal is used to display and maintain a material request template record.

Refer to About Material Disposition for more information.

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You can access the portal from **Menu**, select **Inventory**, then select **Material Request Template**. You are brought to a query portal with options for searching for a specific material request template. Once the template has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Material Request Template Display**: This zone displays information about the selected material request template record.

Maintaining Material Returns

The **Return** portal is used to display and maintain receipt return records.

Refer to About Material Disposition for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Material Return**. You are brought to a query portal with options for searching for a material return record. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Return**: This zone displays information about the material return.
- **Material Return Quick Add**: This zone enables the addition of material to be returned.
- **Open Return Lines**: This zone displays the open return lines associated with the material return.
- **Rejected Return Lines**: This zone displays the rejected return lines associated with the material return.
- **Closed Return Lines**: This zone displays the closed return lines associated with the material return.
- **Stock Item Inventory**: This zone displays stock item inventory information after broadcasting an open return line.
- **Stock Item Availability**: This zone displays upon broadcasting an open return line and displays stock item inventory information per storeroom.

Maintaining Material Dispositions

The **Material Disposition** portal is used to display and maintain material disposition records.

Refer to About Material Dispositions for more information.

You can access the portal from **Menu**, select **Work Management**, then select **Material Disposition**. You are brought to a query portal with options for searching for a material disposition record. Once a record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Material Disposition**: This zone displays asset disposition information.

Maintaining Bill of Materials

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The **Bill of Materials** portal is used to display and maintain a bill of material record.

Refer to About Material Disposition for more information.

You can access the portal from **Menu**, select **Asset Management**, then select **Bill of Materials**. You are brought to a query portal with options for searching for a specific bill of material. Once a bill of material has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **BOM Tree**: This zone displays a hierarchy view of the selected BOM and BOM parts.
- **Bill of Materials**: This zone displays information about the bill of material record.
- **Referencing BOM's**: This zone lists the BOMs that reference this particular BOM record.
- **Attachments**: This zone enables users to manage all types of attachments for the BOM record.
- **Notes**: This zone displays any notes associated with the bill of material record.

Maintaining BOM Parts

The **BOM Part** portal is used to display and maintain a bill of material parts record.

Refer to About Material Disposition for more information.

You can access the portal from **Menu**, select **Asset Management**, then select **BOM Part**. You are brought to a query portal with options for searching for a record. Once a record has been selected, you are brought to the **Bill of Materials** tab on the **Stock Item** record to view and maintain the selected record.

The following zones may appear as part of the portal's **Bill of Materials** tab page:

- **Bill of Materials**: This zone displays information about the component parts for the particular stock item.
- **Referencing BOM's**: This zone lists the BOMs that reference this particular BOM part.
- **Attachments**: This zone enables users to manage all types of attachments for the BOM part.
- **Notes**: This zone displays any notes associated with the BOM part record.

Maintaining Reorder Reviews

The **Reorder Review** portal is used to display and maintain a reorder review record.

Refer to About Inventory for more information.

You can access the portal from **Menu**, select **Inventory**, then select **Reorder Review**. You are brought to a query portal with options for searching for a specific reorder review. Once a reorder review has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Reorder Review**: This zone displays information, such as reorder details and vendor information, for the selected reorder review record.

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- **Notes**: This zone lists any notes that have been added for the reorder review record.

The following zones may appear as part of the portal's **Availability** tab page:

- **Stock Item Inventory**: This zone displays information about inventory quantity for the selected reorder review record.
- **Stock Item Availability**: This zone enables broadcasting of stock item availability per storeroom for the reorder review record.
- **Storeroom Alternative Stock Items**: This zone displays once a storeroom is broadcast from the **Stock Item Availability** zone and provides a list of alternate stock items.
- **Storeroom Stock Item Lots**: This zone displays once a storeroom, having inventory lot managed records, is broadcast from the **Stock Item Availability** zone. The zone displays the expiration date, lot stock item detail, and inventory quantity for the corresponding lot records.
- **Material Issue History Summary**: This zone displays a summary of all the material issued for the current stock item.

Reorder Review Mass Approval

The **Reorder Review Mass Approval** portal is used to search for reorder review records ready for approval.

You can access the portal from **Menu**, select **Inventory**, and then select **Reorder Review Mass Approval**. You are brought directly to the **Reorder Review Mass Approval** page.

The portal's **Main** tab page enables users to filter search criteria by Purchase Commodity, Buyer, or Create Date Range. User can select any number of reorder review records and click **Approve** to mass approve the records.

Refer to About Inventory for more information.

Purchasing

- About Purchasing
- Maintaining Purchase Orders
- Maintaining Purchase Order Lines
- Maintaining Purchase Requisitions
- Maintaining Purchase Requisition Lines
- Maintaining Expedite Purchase Orders
- Maintaining Blanket Contracts
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- Maintaining Vendors
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About Purchasing

Oracle Utilities Work and Asset Management uses purchasing functions to plan, initiate, and process purchases and purchasing contracts. It also manages vendors, designated buyers, and stock items.

- Manufacturers
- Vendors
- Vendor Locations
- Purchase Orders
- Purchase Requisitions
- Blanket Contracts
- Blanket Contract Usage
- Invoices
- Expedite Purchase Orders

Manufacturers

Use the **Manufacturer** portal to define attributes for product manufacturers.

The use of this portal depends heavily upon your business practices, however, in general the manufacturers listed can be associated to specifications which can then be included on assets or components to provide additional reference information related to those objects. The manufacturer usually provides specification information for assets and components. **Manufacturer Specifications** defines a list of asset specifications that belong to the manufacturer.

A manufacturer might also be referenced on regular stocked inventory.

Vendors

Vendors are responsible for providing goods and services to your company.

Use the **Vendor** portal to maintain information about vendors, including their capabilities, payment terms, delivery terms, and various vendor sites. The vendor location distinguishes between multiple sites for one vendor.

Vendor Locations

One or many vendor locations are defined for each vendor to distinguish between multiple vendor sites. Each location provides more detailed information about the vendor site such as address, capabilities, payment details, contacts, and so on.

For example, it may be valuable to understand which location is shipping the goods that you have ordered from the vendor. Also, some vendors might ship from one site, but your payment terms are set with an alternate site. Capabilities would provide information such as when one location offers pick up at that location whereas another location may not.

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When a vendor has multiple locations, alternate locations are listed in the **Vendor Locations** zone on the vendor record.

Purchase Orders

Purchase orders are contracts placed with vendors for the purchase of materials or service. Purchase order records contain general information about the purchase including the requestor, when items are required, the vendor, and more.

Details about each item or service are entered and maintained on purchase order line items. Your system configuration determines which stock items, services, and other types of items can be added as line items, how tax rates are handled for each line item, and so on.

Additional processing and record actions on the purchase order allows you to print the purchase order record, create a new revision, create a shipping memo, issue the purchase order to the vendor, expedite the purchase order, complete a **Revision to the PO**, and submit the purchase order for approval. After the purchase order is approved within your organization and issued to the vendor, next steps involve waiting for the items to be received, receiving items into the system, and creating invoices for purchase order line items. Refer to Receiving Inventory and Non-Inventory Services for more information.

When changes are made to the purchase order, the document may or may not need to re-enter the approval process depending on your business practices and system settings. Your system may also be set so that the purchase order will transition directly to the approved or issued state, for instance, if the order was created by batch stock reorder. Note that only certain fields can be edited on an issued purchase order. If further updates are needed, such as changes that affect the pricing or quantity ordered, you have to create a new revision and resubmit to the vendor. Refer to Understanding Purchasing for more information.

Purchase orders affect the **On Order** quantity for stock.

Common purchasing terms indicated on purchase order and purchase order line items include:

- **Unit of Purchase**: The unit of purchase for the item, such as “each”, “box”, “gallons”, or “cubic feet”..
- **Unit of Issue**: The way in which the item is issued in your storerooms.
- **Purchase to Issue Ratio**: The difference between how you buy the item and how you issue it. You may, for instance, issue in individual items but order the items by the box where one box would contain 10 individual items. The **Unit of Purchase** would then be *box*, the **Unit of Issue** would be *each*, and the **P/I Ratio** would be *10*. The system uses the **Unit of Purchase**, **Unit of Issue**, and **Purchase to Issue Ratio** information to maintain quantities as parts are issued and new parts are received.

Purchase Requisitions

Purchase requisitions are used to store and track requests for material resources and services.

Requests can be created manually or by the system for the following situations:

- For work orders that require materials or services
- By the batch stock reorder process when the number of items fall below the reorder point
- Manually to replenish stock

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After the purchase requisition is reviewed and approved, it can be transitioned to a purchase order to initiate the actual purchase with the vendor. Requisitions can also be used to create blanket contracts.

While purchase orders can be created without a purchase requisition, the requisition can be used according to your business practices to formalize the purchasing process or to create a more stringent chain of approvals for auditing or other purposes.

Purchase requisitions affect **Pending Order** quantity for stock.

Blanket Contracts

A blanket contract is a purchasing agreement that your organization makes with a vendor to pre-plan the purchase of materials or services. These contracts typically contain multiple delivery dates over a period of time, often negotiated to take advantage of predetermined pricing.

Blanket contracts are also often used when there is a recurring need for expendable goods or when your organization buys large quantities from one vendor. Based on the purchase request or purchase order, invoice items can be created as needed until the contract is fulfilled.

As long as the blanket contract is in an *Active* status, it can be referenced by new purchasing documents to order materials or services. Contracts can be set to a *Suspended* status so that they are temporarily unavailable for new purchases. This might be used while re-negotiating terms with a vendor, if you are researching new vendors for a particular item or service, or for other business requirements.

The following sections further describe concepts related to blanket contract management.

Blanket Contract Access Lists

The Blanket Contract Access List identifies a list of users who are automatically approved up to their individual limit to create and issue Purchase Orders against a Blanket Contract.

When a blanket contract is being applied toward creating a purchase order, the *Evaluate Purchase Order's Blanket Contract for Approval* (W1-EVPOBCAPR) algorithm verifies that the user is valid based on this list and that the person’s purchasing limit is not exceeded.

Your system can be configured with lists of users who are authorized to issue purchasing documents against a blanket contract. Settings on the blanket contract determine whether or not the contract is restricted to a particular access list, which list of users has access or, if no access list is indicated, a default dollar value limit for the contract. When an access list is in use, a limit can be set for each individual user.

Vendor Bid Download

Vendor bid download can be used as a way to request new bids for vendor materials and services prior to the expiration of the blanket contract.

Users can click on the **Explorer Zone Menu** icon and select **Export** to retrieve the CSV file which lists the current bid on materials or services. This file needs to be formatted and then sent out to have vendors populate the “Quoted” columns with new bid information. When the bids are returned, they would need to be manually assessed and the winning quotes uploaded, by selecting the “Upload Lines From File” hyperlink in the **Additional Process** section, to a new BC Header to create the line items. Selecting the *Upload Lines From File* hyperlink triggers the W1-BSLUP batch to automatically process the request.

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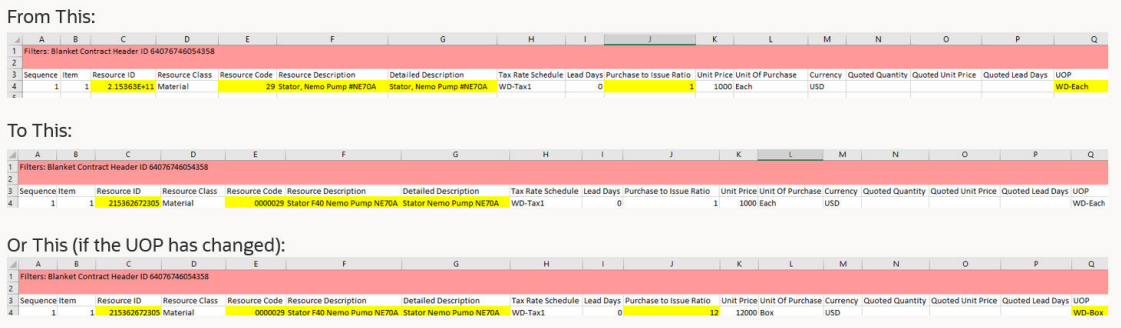
If there are no current bids defined, you can use the vendor bid download to create a file with no data, but with the necessary column headers. In this case, if you do not populate **Resource ID**, you must populate **Resource Class** and **Resource Code**. The combination of the latter two is used to find the **Resource ID**. You should populate **Resource Class** with either *Material, Craft, Equipment*, or *Miscellaneous Resource*.

Formatting the Vendor Bid Download CSV file

File should be formatted in the following manner:

- Format *Column C* (**Resource ID**) data into a number (not Exponential form). However, if there are leading zeroes, you will need to format it as text, not a number.
- Format *Column E* (**Resource Code**) data into text if there are leading zeroes.
- Remove any commas and double quotes in *Column F* (**Resource Description**)or in *Column G* (**Detailed Description**). Commas are treated like a column break.
- Ensure that the **Quoted Unit Price**, **Quoted Lead Days**, and **UOP** columns are populated prior to uploading to the new blanket contract.
- If the **UOP** has changed, make sure you have the correct **Purchase to Issue Ratio**.



After doing the export, make sure you use **Save As** to save the file specifically as a csv comma-delimited file with file type .csv.

> **Note**
>
> Whenever you reopen your file and save, verify that the **Resource ID** and **Resource Code** column formatting has not changed.

Blanket Contract Usage

Spending against each blanket contract is tracked and able to be viewed using the **Limit Used** indicator on both the **Main** tab and **Activity and Usage** tab. The indicator bar displays the usage derived from purchase orders in Oracle Utilities Work and Asset Management.

- For a Blanket Purchase Agreement (Blanket Contract with Lines), only the purchase order line items referencing any of the blanket's line items are included in the used amount calculation.
- For a Contract Purchase Agreement (Blanket Contract with No Lines), all line items of the purchase order referencing the blanket are included in the used amount calculation.

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Invoices

Invoices are used for entering and processing bills for materials or services. They ensure that the quantities being billed do not exceed what has been received and that the prices at which they are billed match what is on the originating purchase order.

The invoice also specifies payment information such as the purchase order number, the vendor, any discounts that have been applied and so on. Cost allocation information indicates the taxes, freight, and any other additional costs or discounts applied to the invoice.

The invoice amount is the quantity multiplied by the unit price. Unit price is locked down to latest posted invoice if there is one, otherwise it comes from the purchase order. If the invoice line is derived from the purchase order line and involves inventory, then changes to the **Discount**, **Freight**, or **Extra Cost** fields would affect the AUP (Average Unit Price) because of the changes in price. If master configuration settings trigger an error, the invoice will go into pending resolution status. The tolerance value indicated in Purchasing Master Configuration regulates this behavior.

Line Items

Invoice line items are the detailed cost and transactional information associated with each of the purchased items and services being billed.

Invoice line items must conform to the following rules:

- If the invoice header references a purchase order, then all purchase order lines added to the invoice must reference that same purchase order.
- If the invoice header does not reference a purchase order, then multiple invoice line items can be added to the invoice using the **Invoice Line** zone.
- If the invoice header does not reference a purchase order because it references multiple purchase orders, the purchase order line items can be added for each purchase order using the **Purchase Order Line** zone on the invoice record for each of the invoice lines.
  - If an invoice references a purchase order, the total invoiced for a purchase order line item cannot exceed the receipt quantity. If the invoice quantity is more than the net received, the invoice goes into “pending resolution” state.
  - If a unit price is not the same as last posted invoice price, if any, invoice will also go into pending resolution.
  - Also, when the invoice amount does not match the PO amount within a certain range defined in master configuration, the user will see a warning or error (also based on setting in master configuration).

Credit Invoice or Credit Memo

Invoices or invoice line items can be adjusted to give discounts, adjustments in freight charges, or for extra costs when a refund from the vendor is needed. Adjustments in freight, discounts, and extra cost is made in the **Cost Allocation** zone at either a *General* level, where the cost gets applied to the invoice as a whole, or at the *Line* level, where costs posted to the invoice are prorated down across the invoice line items. To grant a vendor discount, the **Discount** field should be set to a positive number. To return freight charges or reimburse extra cost, the **Freight** or **Extra Cost** fields should be set to a negative number.

Creating an Invoice Prior to Receipt

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Invoices can be created prior to receiving the line item however, the *Require Receipt for Services* setting in the **Purchasing Master Configuration** determines how the invoice will be processed for non-material items (The system does not look at this parameter for material items since a receipt is always required). If this setting is set to *Yes*, then the purchase order line items must be received for the invoice to complete. If this setting is set to *No*, the purchase order line items cannot be received and so the invoice will complete without a receipt.

Invoice Groups

Invoice groups can be used to group invoices together before they are sent to Accounts Payables (A/P). They can be used as an intermediate step to review a set of invoices before those invoices are processed for payment. If no invoice group is configured on the invoice header, individual invoices post as soon as they are approved.

Automatic Invoicing

In order for the system to complete automatic invoicing against a purchase order, the **Auto Pay** setting on both the vendor's location and on the purchase order must be set to *Yes.* After items are received against the purchase order, the system automatically creates an invoice with line items. When an invoice is automatically created, no additional line items can be added to the invoice and none of the line items can be deleted. If the receipt included more items received than ordered, these invoice line items are placed in a *Pending Resolution* status when the invoice is submitted for approval. An authorized user must then change the quantity on the purchase order before the invoice can be reprocessed successfully.

Related Financial Transactions

All invoice line items result in a financial transaction. As the financial transactions are created they zero out the clearing account and make up differences, if any, if information such as the price or tax amount on the invoice is different from the purchase order.

Converted Total and Exchange Rates

Note that if your organization works with foreign currencies, there may be a discrepancy shown in the **Invoice Summary** section on the Invoice header between the converted total on the invoice header and the converted total calculated by totaling the line items. The converted total is derived by multiplying the invoice total by the exchange rate. This header value might be off by $.01 or more due to the slight offset that results from rounding each individual line item then calculating the header converted total. You can see a more accurate converted total by reviewing each line item individually.

Expedite Purchase Orders

The expedite order process helps buyers and other purchasers to ensure that required goods arrive at the appointed date in the agreed quality at the agreed location.

The **Expedite Order** portal is used to track purchase order items that have not yet been received. It allows users to modify select information on an issued purchase order without needing to create and process a **Revision to the PO**. It is typically used when locations and delivery dates need to be altered, not when there are changes that would affect the cost of items or the total amount for the purchase order.

Maintaining Purchase Orders

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The **Purchase Order** portal is used to display and maintain a purchase order record.

Refer to About Purchasing for more information.

You can access the portal from **Menu**, select **Purchasing**, then select **Purchase Order**. You are brought to a query portal with options for searching for a specific purchase order. Once a purchase order has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Purchase Order**: This zone displays information about the purchase order, such as cost information, order line item information, and accounting information.
- **Purchase Order Lines**: This zone lists the purchase order line items associated with the purchase order record.
- **Blanket Contract Lines**: If the purchase order is associated with a blanket contract, this zone lists lines from that contract that are not already included in the purchase order. You may use this zone to add additional lines to the purchase order. As such, the zone is only visible while lines can still be added.
- **Purchase Order Transactions**: This zone lists all transactions for all revisions of the purchase order record.
- **Related Purchase Requisitions**: This zone lists purchase requisitions related to the purchase order record.
- **Notes**: This zone displays any notes associated with the purchase order record.
- **Attachments**: This zone enables users to manage all types of attachments for the purchase order record.

The following zones may appear as part of the portal's **Expedite** tab page:

- **Purchase Order**: This zone displays information about the purchase order.
- **Expedite Activity**: This zone lists the expedited activities associated with the purchase order.

The following zones may appear as part of the portal's **Revision History** tab page:

- **Purchase Order**: This zone displays revision history information about the purchase order.
- **Purchase Order History**: This zone displays history information associated with the purchase order.

The following zones may appear as part of the portal's **Log** tab page:

- **Purchase Order Header Log**: This zone displays log details for the purchase order.
- **Approval Request History**: This zone displays approval history for the purchase order.

Maintaining Purchase Order Lines

The **Purchase Order Line** portal is used to display and maintain a purchase order line record.

Refer to About Purchasing for more information.

You can access the portal from the **Purchase Order** portal when reviewing a specific line.

The following zones may appear as part of the portal's **Main** tab page:

- **Purchase Order Line**: This zone displays information about the purchase order line.

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- **Related Purchase Order Lines**: This zone displays other lines from the purchase order.
- **Attachments**: This zone displays attachments related to this purchase order line record.
- **Standard Notes**: This zone displays standard notes related to this purchase order line record.
- **Notes**: This zone displays additional notes related to this purchase order line record.

The following zones may appear as part of the portal's **Expedite** tab page:

- **Purchase Order Line**: This zone displays information about the expedited purchase order line.
- **Expedite Activity**: This zone displays the expedited activity information associated with the expedited purchase order line.

The following zones may appear as part of the portal's **Log** tab page:

- **Purchase Order Line Log**: This zone displays log details for the expedited purchase order line.
- **Related Stock Transactions**: This zone displays the related stock transaction information for the purchase order line.

Maintaining Purchase Requisitions

The **Purchase Requisition** portal is used to display and maintain a purchase requisition record.

Refer to About Purchasing for more information.

You can access the portal from **Menu**, select **Purchasing**, then select **Purchase Requisition**. You are brought to a query portal with options for searching for a specific record. Once a purchase requisition has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Purchase Requisition**: This zone displays information about the purchase requisition, such as vendor information, requisition information, and accounting information.
- **Open Purchase Requisition Lines**: This zone lists all the open purchase requisition lines.
- **Blanket Contract Lines**: If the purchase requisition is associated with a blanket contract, this zone lists lines from that contract that are not already included in the purchase requisition. You may use this zone to add additional lines to the purchase requisition. As such, the zone is only visible while lines can still be added.
- **Closed Purchase Requisition Lines**: This zone lists all the closed purchase requisition lines.
- **Related Purchase Orders**: This zone lists the related purchase orders.
- **Purchase Requisition Header Notes**: This zone displays any notes associated with the purchase requisition record.
- **Notes**: This zone displays any notes associated with the purchase requisition.
- **Attachments**: This zone enables users to manage all types of attachments for the purchase requisition record.

The following zones may appear as part of the portal's **Log** tab page:

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- **Purchase Requisition Log**: This zone displays log details for the purchase requisition.
- **Approval Request History**: This zone displays approval request histories for the purchase requisition.

Maintaining Purchase Requisition Lines

The **Purchase Requisition Line** portal is used to display and maintain a purchase requisition line record.

Refer to About Purchasing for more information.

You can access the portal from the **Purchase Requisition** portal when reviewing a specific line.

The following zones may appear as part of the portal's **Main** tab page:

- **Purchase Requisition Line**: This zone displays information about the purchase requisition line.
- **Tax Calculation Details Info**: This zone displays tax information related to the purchase requisition line.
- **Related Purchase Requisition Lines**: This zone displays other lines from the purchase requisition.
- **Attachments**: This zone displays attachments related to this purchase requisition line record.
- **Standard Notes**: This zone displays standard notes related to this purchase requisition line record.
- **Purchase Requisition Line Notes**: This zone displays additional notes related to this purchase requisition line record.

Maintaining Expedite Purchase Orders

The **Expedite Purchase Order** portal is used to display and maintain expedited purchase order records.

Refer to About Purchasing for more information.

You can access the portal from **Menu**, select **Purchasing**, then select **Expedite Purchase Order**. You are brought to a query portal with options for searching for a specific record. Once an expedited purchase order has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Expedite**: This zone displays expedite information associated with the purchase order.

Maintaining Blanket Contracts

The **Blanket Contract** portal is used to display and maintain a blanket contract record.

Refer to About Purchasing for more information.

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You can access the portal from **Menu**, select **Purchasing**, then select **Blanket Contract**. You are brought to a query portal with options for searching for a specific record. Once a blanket contract has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Blanket Contract Header**: This zone displays information about the blanket contract, such as contract and vendor information.
- **Blanket Contract Lines**: This zone lists the blanket contract lines associated with the blanket contract record.
- **Blanket Contract Header Notes**: This zone displays any notes associated with the blanket contract record.
- **Attachments**: This zone enables users to manage all types of attachments for the blanket contract record.

The following zones may appear as part of the portal's **Activity and Usage** tab page:

- **Blanket Contract Header**: This zone displays information about the blanket contract.
- **Blanket Contract Activity**: This zone lists the purchasing activities associated with the blanket contract.
- **Blanket Contract Usage Summary**: This zone displays a summary list of orders associated with the blanket contract.

The following zones may appear as part of the portal's **Revision History** tab page:

- **Blanket Contract Header**: This zone displays information about the blanket contract.
- **Blanket Contract Header Revision History**: This zone lists all revisions associated with the blanket contract.

The following zone appears as part of the portal's **Vendor Bid Download** tab page:

- **Blanket Contract Lines Download**: This zone allows you to download blanket contract lines information.

Maintaining Blanket Contract Lines

The **Blanket Contract Line** portal is used to display and maintain a blanket contract line record.

Refer to About Purchasing for more information.

You can access the portal from the **Blanket Contract** portal when reviewing a specific line.

The following zones may appear as part of the portal's **Main** tab page:

- **Blanket Contract Line**: This zone lists the blanket contract lines for the blanket contract. This zone provides multi-select capability for blanket contract lines, creation of purchase requests and purchase orders, and re-sequencing of blanket contract lines.
- **Attachments**: This zone displays attachments related to this blanket contract line record.
- **Standard Notes**: This zone displays standard notes related to this blanket contract line record.

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Maintaining Invoices

The **Invoice** portal is used to display and maintain an invoice record.

Refer to About Purchasing for more information.

You can access the portal from **Menu**, select **Purchasing**, then select **Invoice**. You are brought to a query portal with options for searching for a specific record. Once an invoice has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Invoice Header**: This zone displays information about the invoice, such as payment information, cost allocation, and tax information.
- **Invoice Lines**: This zone lists the invoice lines associated with the invoice record.
- **Notes**: This zone displays any notes associated with the invoice record.
- **Attachments**: This zone enables users to manage all types of attachments for the invoice record.

The following zones may appear as part of the portal's **Financial Transaction** tab page:

- **Invoice Header Financial Transaction**: This zone lists the financial transactions associated with the invoice record.

Maintaining Invoice Groups

The **Invoice Group** portal is used to display and maintain an invoice group record.

Refer to About Purchasing for more information.

You can access the portal from **Menu**, select **Purchasing**, then select **Invoice Group**. You are brought to a query portal with options for searching for a specific record. Once an invoice group has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Invoice Group**: This zone displays information about the invoice group.
- **Invoices**: This zone lists the invoices associated with the invoice group record.
- **Tag Invoices**: This zone enables the user to tag invoices to this invoice group.

Maintaining Manufacturers

The **Manufacturer** portal is used to display and maintain a manufacturer record.

Refer to About Purchasing for more information.

You can access the portal from **Menu**, select **Asset Management**, then select **Manufacturer**. You are brought to a query portal with options for searching for a specific manufacturer. Once a manufacturer has been selected, you are brought to the maintenance portal to view and maintain the selected record.

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The following zones may appear as part of the portal's **Main** tab page:

- **Manufacturer**: This zone displays information about the manufacturer.
- **Manufacturer Specifications**: This zone lists the specifications associated with the manufacturer record.

Maintaining Vendors

The **Vendor** portal is used to display and maintain a vendor record.

Refer to About Purchasing for more information.

You can access the portal from **Menu**, select **Purchasing**, then select **Vendor**. You are brought to a query portal with options for searching for a specific vendor. Once a vendor has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Vendor**: This zone displays information about the vendor.
- **Vendor Location**: This zone lists the locations associated with the vendor record.

The following zones may appear as part of the portal's **Blanket Contracts** tab page:

- **Vendor Active Blanket Contracts**: This zone lists the blanket contract for this vendor record.

The following zones may appear as part of the portal's **Open Purchase Requisitions** tab page:

- **Vendor Open Purchase Requisition**: This zone displays the open purchase requisitions associated with this vendor record.

The following zones may appear as part of the portal's **Purchase History** tab page:

- **Vendor Purchase Order History Summary**: This zone displays a summary of purchase orders associated with this vendor record. To view details for a summary, click the **Broadcast** icon. Details for the selected summary will appear in the **Vendor Purchase Order History Detail** zone.
- **Vendor Purchase Order History Detail**: This zone displays details for a selected purchase order summary associated with this vendor record.

Maintaining Vendor Locations

The **Vendor Location** portal is used to display and maintain a vendor location record.

Refer to About Purchasing for more information.

You can access the portal from **Menu**, select **Purchasing**, then select **Vendor**. You are brought to a query portal with options for searching for a specific vendor. Once on the **Vendor** portal, scroll to the **Vendor Locations** zone and select the appropriate vendor location hyperlink where you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

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- **Vendor Location**: This zone displays general vendor location information as well as location, purchasing, payment, and pay to vendor details.
- **Notes**: This zone displays any notes associated with the vendor location record.
- **Attachments**: This zone enables users to manage all types of attachments for the vendor location record.
- **Related Vendor Location**: This zone displays all vendor locations associated with the current vendor location record.
- **Contractor Bids**: This zone lists contractor bids associated with the vendor location record.

The following zones may appear as part of the portal's **Blanket Contracts** tab page:

- **Vendor Active Blanket Contracts**: This zone lists the active blanket contracts associated with the current vendor location record.

The following zones may appear as part of the portal's **Open Purchase Requisitions** tab page:

- **Vendor Open Purchase Requisition**: This zone displays the open purchase requisitions associated with this vendor location record.

The following zones may appear as part of the portal's **Purchase History** tab page:

- **Vendor Purchase Order History Summary**: This zone displays a summary of purchase orders associated with this vendor location record.

The following zones may appear as part of the portal's **Shipping Deficiencies** tab page:

- **Shipment Deficiencies**: This zone lists the shipment deficiencies associated with this vendor location record.

The following zones may appear as part of the portal's **Commodities** tab page:

- **Vendor Location Commodities**: This zone lists the commodities associated with the current vendor location record.

Service History

- About Service History
- Maintaining Service History

About Service History

Service history is information regarding some type of service or maintenance performed on an asset. Information typically associated with service history include record inspection feedback, pass/fail details, downtime, parts failure information, maintenance or service logs, or other information regarding service on the asset.

Service history can create follow-up actions, such as work orders or work activities, when work for an originating issue needs to be monitored. An example of follow-up activities to an originating gas leak call might be to monitor, repair, and to verify repairs were made. Service history can also create follow-up actions to stop or cancel follow-up activities once the problem has been fixed or the severity level has changed.

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Service history can be created as part of the work activity completion process to indicate the types of actions or services performed during the completion of the activity. The location (either asset location, work location, or both) is derived from the Asset record or from the Activity record and defaulted to the Service History record upon creation. If you do not want the asset or location information defaulted when the service history record creates, deactivate the "Default Location from Asset or Activity on Service History (W1-DEFLOCASH)" algorithm.

To de-activate the algorithm:

1. Go to **General Service History** (W1-ServiceHistoryWam) BO.
2. In the **Options** tab, click **Edit** and then click **Add** icon to add a new **Option Type**.
    - **Option Type**: *Inactive Algorithm*
    - **Sequence**: *10*
    - **Option Value**: *W1-DEFLOCASH*
3. Save the BO.
4. Repeat steps 2-3 for **Questionnaire Service History** (W1-QuestionnaireSvcHist) BO.

- Downtime
- Failures
- Inspections
- Condition Assessments
- Service History Questionnaires

Downtime

Downtime is a period of time when an asset or item is not in active service. Downtime can occur as a result of an unexpected asset failures or downtime can be planned as with assets taken out of service for planned upgrades, repairs, or routine maintenance.

Failures

Failures describe an asset or item that is no longer working as designed. For example, a relief valve that does not close and blows all the time would be considered as having failed. Failed assets or items can either be exchanged for a properly functioning replacement or repaired on site.

Inspections

Inspections of assets can occur throughout an asset’s lifecycle; when the asset is received from the manufacturer, when alert is raised for failing high or low readings, routine inspections, and so on.

Inspections are performed to assess the condition of the asset. A monitor algorithm (W1CALASRTNGS: Calculate Ratings for Asset - Asset Condition and Confidence) on the base asset business object is used to calculate an asset's condition score and confidence rating whenever an inspection service history event is created or completed or when the W1-ASSET batch process is run. If an implementation does not want to use service history to acquire a condition score and confidence rating, then leave the **Assessment Class** value on the **Asset Type** blank.

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Refer to Condition Assessments for more information.

Service history is used to record inspection events for the asset.

Condition Assessments

Service history questionnaires are created to address typical inspection points, concerns, or issues based on the kind of asset, type of inspection, and so on, and is used by the system to assess the condition of the asset.

See Service History Questionnaires for more information.

Technicians would enter answers to the predefined questions on the service history record. Answers are typically chosen from a set of pre-defined values that are configured when the questions are designed for the assessment. Answers must be provided for questions that are marked as being *Required*. **Condition Assessment Groups** and **Condition Assessment Classes** are used to 'bundle' the various kinds of inspections that are available for an asset. All of the data that is collected is used to calculate a final condition score.

Condition scores are on a 1–5 scale where 1 is Very Good and 5 is Very Poor. Also, scores have an associated "confidence rating" which drops as the input data ages. This is based on the premise that the older the data, the less reliable it is.

Refer to Understanding Asset Types in the **Administrative User Guide** for more information about **Condition Assessment Classes** and **Condition Assessment Groups**.

There are four kinds of condition assessment types that can be performed:

- **Percent of New** (maps a percent value to the 1-5 scale): The condition of the asset is based on passing or failing characteristics of a new asset. A "like new" asset would pass all characteristics and be awarded the maximum points resulting in a 100% rating. A severely broken asset would fail all characteristics of a new asset and be awarded zero points resulting in a 0% rating.
- **General Weighted** : The condition of the asset is based on a general assessment of potential defects using a weighted scale of 1 - 5. Each potential defect is assigned a weight value based on the impact to the service level. A potential defect that has significant impact on the service level will have a higher weight value than a potential defect with minimal impact on the service level. A "like new" asset would exhibit none of the potential defects and be awarded the minimum points resulting in a rating of 1. A severely broken asset would exhibit the highest severity of each potential defect and would be awarded the maximum points resulting in a rating of 5.
- **Deficiency Scoring** (noting various defects on the asset, which can be summed): The condition of the asset is based on accumulated defect points. As with the general weighted method, each potential defect is assigned a weight value based on the impact to service level. Then each defect is broken down into specific severity levels with a point value assigned to each. The more severe the nature of the defect, the higher the associated point value. Normally, the point scale is a range of 1 - 10, allowing for at least 10 different definitions or levels of severity. Unlike the general weighted method, each defect and severity identified during inspection is accumulated for the final "deficiency score". That is, if there are 5 defects with a severity of 2 points each, then the deficiency score for the asset would be 10. A "like new" asset would exhibit none of the potential defects and be awarded a deficiency score of 0 (i.e., absolutely no defects were noted). A severely broken asset would exhibit the highest severity of each potential defect, probably numerous times, and would be awarded a higher deficiency score.

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- **Reset Condition Rating**: After the asset is rebuilt or renewed it is treated as if it were a new asset. The assessment process is started over and the condition of the asset is based, once again, on the passing or failing characteristics of a new asset.

Service History Questionnaires

Service History questionnaires are a previously defined set of questions and answers used to guide inspectors and field personnel through the inspection process of an asset.

See Understanding Service History Questionnaires for more information.

Maintaining Service History

This portal is used to display and maintain service history records.

Refer to About Service History for more information.

You can access the portal from the **Menu**, select **Asset Management**, then select **Service History**. You are brought to a query portal with options for searching for a specific service history. Once a service history has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Service History**: This zone supplies details about the service history for an asset.
- **Attachments**: This zone enables users to manage all types of attachments for the service history record.

Work Management

- About Work Management
- About Field Activities
- About Work Orders
- About Work Activities
- About Work Requests
- About Work Creation Using Asset Search
- About Work Planning
- About Permits
- About Communication Logs
- About Service Calls
- Maintaining Field Activities
- Maintaining Work Orders
- Maintaining Template Work Orders
- Maintaining Template Activities
- Maintaining Work Activities

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- Maintaining Work Activity Resource Requirements
- Maintaining Work Categories
- Maintaining Work Classes
- Maintaining Work Requests
- Maintaining Work Creation Using Asset Search
- Maintaining Work Location
- Maintaining Projects
- Maintaining Permits
- Maintaining Service Calls
- Work Planning Dashboard
- Maintaining Activity Generators

About Work Management

Work and Asset Management (WAM) application is able to support the performance of work by crews in the field through the use of activities. An activity is a task used to track changes and other actions performed in the field, such as inspections, changes to assets, or even tree trimming and, if configured, initiates a completion event to perform the appropriate change to the data in the system.

Activities are categorized into three broad classes of work:

- Field Activity
- Work Activity
- Construction Work Activity

All three activity classes share the same Activity Type business object which specifies definitions, such as default service class, scheduling information, handling of errors or exceptions, completion details, and so on, for activities of that type. The uniqueness between each of the activity classes is derived from the Activity BO linked to the activity type. The Activity Type business object includes two flags, the **Work Role** flag and the **Track Cost** flag, that are hard-coded on the BO Schema and used to differentiate between the activity classes whether planning and approval is required:

- For Field Activity, the Work Role flag is set to “*No*” and the Track Cost flag is set to “*No*”.
- For Work Activity, the Work Role flag is set to require planning and the Track Cost flag is set to "*Yes*".
- For Construction Work Activity, the Work Role flag is set to require planning and the Track Cost flag is set to "*Yes*".

> **Note**
>
> Both flags should be set to *No* for **Operational Device Management** only customers.

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> **Note**
>
> Also note that customers that use both **Operational Device Management** and **Work and Asset Management** have the option to set the Track Cost flag for field activities only to *Yes*.

See **Understanding Activity Types** in the **Admin Guide** for more information.

All activities share some common details across all activity classes:

- **Unique ID**: The system creates a unique number that identifies the individual activity and enables the system to track the activity details.
- **Work Location**: An activity's work location is used to describe the physical location of where the work is to be performed. This can include such information as main or sub addresses, building or room numbers, and intersections, cross streets, or a latitude and longitude. For example, a college campus might have a main address for the entire campus but the work location of the work to be done would be at a particular building on campus.
- **Schedule Details**: The system looks to the Schedule Details for determining when the work is scheduled to start and end.
- **Attachments**: Activities can include schematics, pictures, procedures, notations, and more, in the form of documents or attachments, to assist crew members with additional information about the work to be performed.
- **Completion Events**: Completion events are used to execute the business processes resulting from the activity, such as asset updates, status transitions, and so on.

Activities also include some behaviors that are unique to the individual class of activity. See the individual activity topic for more information.

- See **About Field Activities** for more information about field activities.
- See **About Work Activities** for more information about work activities.
- See **About Construction Work** for more information about construction work activities.

The system makes a large number of processing decisions as the status of these activities move through their lifecycle. Therefore it is important to not degrade the system by associating large volumes of activities to a single work order because of the affect it will have on the performance of the system. Processing large numbers of activities on a single work order could eventually slow the system to the point where it times out as performance worsens.

About Field Activities

Field Activity is used primarily by Operational Device Management (ODM) users to perform basic activities that do not require any resource requirements.

Work is accomplished by creating either an emergency field activity or a regular type field activity to accomplish the work relative to the originating activity, asset, or project.

This section describes concepts related to Field Activities.

Please see Work Management for more information.

- Planning Field Activities
- Approvals for Field Activities

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- Scheduling Field Activities
- Field Activity Cost
- Field Activity Workflow

Planning Field Activities

This class of activity is a very basic and independent type of activity. Field activities are not related to any work orders nor require any resource requirements so do not require any advanced planning.

Approvals for Field Activities

Field activities do not follow an approval process since no resource requirements or work orders are planned for a field activity.

Scheduling Field Activities

Schedule Details can be defined for field activities however, it is expected that the external integration will perform the work of scheduling the field activities.

The disposition of the field activity indicates when the activity is ready to be worked. Setting the disposition of a field activity to “On Hold” means that the activity is not yet ready to be activated for work. Setting the disposition to “Released” means that the activity is active, work can start, and completion events can be processed.

Field Activity Cost

There are no cost estimates associated with field activities because they do not include resource requirements.

Field Activity Workflow

The following is the typical workflow states of a field activity:

Pending

- This is the initial status of the activity

Validated

- This status validates the activity disposition value

Validation Error

- This status indicates there is a problem with the information on the activity

Sent

- This status indicates the activity has been sent to the external system

Resend

- This status indicates the activity has been resent to the external system

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Send Error

- This status indicates there was error in sending the activity to the external system

Execute Completion Event

- This status indicates the work has been finished and the completion events are being executed

Completion Error

- This status indicates there was an error in processing the completion events

Executed

- This status checks for the required completion events and completes the activity

Completed

- The activity is set to the *Completed* state once the work is performed and the completion information is recorded

Discarded

- This status indicates the activity was discarded

About Work Orders

Work orders group similar activities and are used to manage activities to perform any kind of work such as inspection, install, replacement, upgrade, and so on. They are mainly used to facilitate approval processing for work projects.

Work orders might also be created to manage a set of activities where the activities are manually linked to the work order. Completion events are used on activities to document and process the work that was done and to update data associated to the activity. Work orders also provide summary information about the various activities and the assets that are being worked on those activities.

A work order and an associated work activity can be created directly from an approved work request.

- To create a work order and the initial activity, click the **Create Work Order** button on the approved work request. If only one work order business object exists, the user is immediately prompted to select an appropriate activity type. If more than one work order business object exists, select *work order* as the **Work Order Business Object** and then select the appropriate **Activity Type**. As long as either the Asset/Asset Location or Supplemental Work Location is defined, the system will automatically create the work order and the first activity, populating the activity with information from both the work request and work order.
- To create a work order and the initial activities from a template, click the **Create Work Order from Template** button on the approved work request and search for and select the desired template work order. Next, select the appropriate template work activities from the list of activities displayed on the template work order. Keep in mind that an Asset/Asset Location or Supplemental Work Location and a Cost Center is required in order for the system to automatically create the work order and activities from the template. Selecting the **Copy Cost Center from Asset Location** box will automatically populate the cost center information defined on the asset location to the template activities when created, otherwise, the cost center information defined on the template activities will be used.

Work Order Templates

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It is possible to create templates from most types of work orders so that the general work model can be reused. Work order templates can also be referenced for scheduled maintenance.

Refer to Template Work Orders for more information.

Activity Information

The **Activity Information** zone provides summary information regarding the activities that are included on the work order.

Refer to the About Asset Activities section for more information and field definitions.

Unplanned Work

Since unplanned work simplifies small, uncomplicated, and one-time jobs, foregoing planning can be effective when the task to be completed is straightforward and does not involve many details.

Completing Work Orders

Work orders are automatically completed when every activity linked to the work order arrives at a final state based on the completion events for the activities.

Work Priority/Asset Location Criticality/Total Risk Priority

Work orders contain a work priority value that, when used in conjunction with other values, calculates an overall criticality value for accomplishing the work. The following fields are used to perform those calculations:

- **Work Priority** defines the importance of the work in terms of the potential impact of not addressing issues. For example, emergency type work is a higher priority than routine maintenance work.
- **Asset Location Criticality** defines the importance of the location in terms of the potential impact of having issues or problems at that location. For example, a hospital might have a high criticality rating since losing power there might result in the death of patients and a city park would have a low criticality since there are few consequences if the lawns are not mowed on time.
- **Total Risk Priority** provides a total risk value in terms of scheduling work at a particular location. Total risk is calculated as work priority multiplied by asset location criticality. For example, if **Work Priority** is *6* and **Asset Location Criticality** is *7*, then **Total Risk Priority** equals *42 (6 x 7 = 42)*. This value can be overridden by the user.

  Field is able to be updated to any value up to 99.

  If a user overrides the value, then **Total Risk Priority Source** flag changes from *System* to *User Override*.

Please see Work Management for more information.

- Work Order Includes One or More Activities
- Work Order Workflow
- Template Work Orders
- Work Categories
- Work Classes
- Projects

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Work Order Includes One or More Activities

Work orders include one or more activities. Each activity identifies a specific task to be performed at a particular location and includes all the information that the crew will need to complete the job.

Work Order Workflow

Work orders are used to plan for all types of work that need to be performed. The following is the typical workflow of a work order:

Planning

This is the initial status of a work order and includes all the requirements needed to complete the type of work being planned. Requirements, such as activities, checklists, permits, attachments, resource requirements, and dependencies are all considered during the planning stage of the work order. If the work order references a work request, many of the work order fields are pre-populated by the system.

Pending Approval

This status indicates that the planning of the work order is finished and ready to be submitted to an approver.

Approved

This status indicates that the approver has reviewed the work order details and has approved the work to be done.

Active

This status sets the work order and associated work activities to active so the work can be performed and the activity can accept charges. Only activities where the **Activation Date** has passed are set to *Active*.

Reopened

This status indicates that a previously closed work order is now reopened.

Rejected

This status indicates that the work order was not approved but rejected by the approver.

Completed

This status indicates that all work activities associated with the work order have been completed and all completion details have been entered.

Closed

This status indicates that work order and ALL associated work activities is complete and no more work is to be done.

Canceled

This status is used to indicate that the work should not be performed.

Template Work Orders

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Template work orders, or benchmark work orders, are work orders that can be re-used to help your organization avoid repeating planning the same work for similar jobs. They can be used for basic work planning, but are also typically used with preventive maintenance.

The template work order contains header work order details. Template activities and template activity resource requirements are used to plan those aspects of the work plan.

- **General Template Work Orders** are used to plan for activities and resources which can be common to assets regardless of the asset disposition. This type of template can be used in any type of Preventive Maintenance Trigger.
- **Asset Location Specific Template Work Orders** are used to plan for activities and resources which are specific to a list of locations where the assets are installed. Some refer to the list of locations as a route. A work order created from this type of template will automatically populate assets, of the asset type, if specified, installed at the locations. This type of template can only be used on Calendar Anniversary Preventive Maintenance Triggers and Calendar Interval Preventive Maintenance Triggers.

The template work order provides users with the ability to create a work order directly from the template work order and then update the work order with the selected activities from the work order template. Refer to About Work Orders for information on how to create a work order and associated activities at the same time from a template.

Preventive Maintenance

Template work orders are used with preventive maintenance and event-based maintenance to create new work orders when the maintenance is triggered. The appropriate work order template is referenced on the maintenance trigger so that the appropriate work records are automatically created when the trigger is cycled.

Usually, the work orders that are created from the template can be modified to represent the actual work requirements. For example, modifications may be needed if the requirements from the template don't match the exact requirements for the execution of the work.

Work Categories

A work category represents a broad grouping of work. Some examples of work categories can include replacements, repairs, periodics, vandalism, regulatory, and inspections.

Work categories, in conjunction with work classes, enable users to filter their work by the work category. For example, if a particular work class is selected, a user will only see the related work categories associated with that particular work class. Users are also able to generate reports on each of the work categories.

Work Classes

A work class represents a broad category of work. Some examples of work classes may be planned, unplanned, or capital. Users can use Work Classes as a way to drive a specific list of available Work Categories.

Some of the main uses for work class are as follows:.

- Users are able to filter their work by work class. For example, to see only planned work or capital jobs for that day.
- Reports can be generated for the individual work classes.

Refer to Work Categories for more information on work categories.

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Projects

Projects provide a way to group work so that it can be planned and charged against large efforts. Typically, a project will be a task that is out of the ordinary, or that requires extra planning and resources. Examples would be adding new facilities or conducting a major overhaul of an assembly line.

When a project is initiated and funds are approved, the project can be broken down into a hierarchical arrangement of smaller subprojects. Each subproject represents a controllable unit of work within the project. The ability to enter and manage information for the units of work, scheduling details, cost estimates, and target dates for each project and subproject forms the basis for planning the project and monitoring its progress to completion. Work orders and activities can be associated to the project and are automatically included in the cost of the project.

Projects can also be divided into subprojects – facilities construction, wiring, installation of equipment, testing of automated systems, shakedown, and so on. You can then plan, budget, and individually authorize each subproject.

Projects can be configured to go through regular approval processing, so that after the project is created it must be submitted for approval then approved.

A project can transition to a *Completed* status once all subprojects associated with the project is complete, however, projects are able to be transitioned back to a *Started* status if additional work or costs are still outstanding.

Allow Charge

When the **Allow Charge** indicator is set to “yes”, other records can charge against the project. The project must be in *Approved*, *Started*, or *Complete* state for charges to be applied against it. For example, a resource, such as a craft or equipment, might reference the Project ID under the accounting information.

Note that if subprojects are planned, the project itself should have **Allow Charge** set to “**No”**. Charges should be tracked by subproject.

Project Categories

Your organization can define project categories to create classifications for projects such as maintenance, capital, construction, and so on. Project categories are initially created in an *Active* status but can be toggled to an *Inactive* status or back again to *Active*, depending on their future use.

About Work Activities

Work activities are work tasks that need to be completed and originate from a work order or a work order template. As examples, activities may be created for maintenance and inspection of assets, to create service history, and to install or exchange devices.

Work Activities can be created at the same time as the work order when the **Create Work Order** button on the approved work request is selected. Refer to About Work Orders for more information.

Work activities can also be moved between work orders as long as the activity is in a *Planning* status and the work order the activity is being moved to is in either a *Planning*, *Approved,* or *Active* status. As a result of the move, the status of the new work order will revert to a "Planned" status and current workflow processing occurs.

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The Work Activity portal enables planners to manage such details as resource requirements, permits, materials, labor, and much more that control key aspects of how the work activity is managed.

Many settings are shared between the activity classes because they share the same activity type BO however, a setting unique to work activities and construction work activities is the “Construction Related” flag which defines whether the activity is to be a regular activity or a construction work activity.

See the various sub-topics in this section for concepts related to the management of work activities.

- Planning Work Activities
- Resource Requirements
- Approving Work Activities
- Scheduling Work Activities
- Work Activity Cost
- Checklists
- Work Activity Workflow
- Work Activity Templates

Planning Work Activities

Planners control key aspects of how a work activity is managed:

- The type of work to be performed, for example, maintenance, installs, replacements, and inspections.
- Where the work is to be performed.
- The types of resources that are required; labor, equipment, materials, and so on.
- List of assets the work is to be performed against.
- Checklist of tasks to be performed against the work activity or permit.
- Whether or not to create service history.

> **Note**
>
> The benefit of using activities to process work is to keep a history of the work being done. Users can specify on the work order activity and template work order activity whether a service history for a specific service history type should be mandatory or optional. If set as mandatory, the service history would need to be completed before the work order can be closed. This history can then be used for tracking and auditing.

Resource Requirements

Every work activity is defined with one or more resource requirements. Resource requirements are the material, crafts, equipment, and other miscellaneous resources needed to complete the work.

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- Material requirements specify materials or stock items to be used for the activity (pipe, pump, bolt, and so on). Material requirements might also be fulfilled using the procurement process.
- Labor requirements, or crafts, specify the type of skills needed for the activity (technician, plumber, electrician, and so on). This might include premium or regular labor.
- Equipment requirements specify the machinery, tools or other equipment required for the activity (crane, bulldozer, drill, and so on).
- Other requirements cover miscellaneous requirements for the activity (meals, miles, hotel stay, and so on).

The activity resource requirement portal is accessible only by selecting an activity resource requirement from the Resource tab of either the Construction Work Activity portal or Work Activity portal. Refer to Maintaining Activity Resource Requirements for more information.

Note the following with respect to activity resource requirements:

- Material requests (issues and returns) can be applied against the resource requirement when the activity is active.
- If materials are not in stock and need to be purchased to fulfill the requirement, a purchase order or requisition might be issued. These materials are typically tracked as direct purchases.
- Timesheets are used to track labor requirements. The labor requirement establishes an estimated number of work hours required. As timesheets are created and posted, the actual work hours are tracked.
- Other direct charges are used to track equipment and other requirements.

Approving Work Activities

Typically, planned work orders specify resource requirements on the related activities. Once planning is complete the planner can submit the work order and related work activities to an authorized approver to verify the requirements before any work or purchases are submitted. Authorized approver can **Approve** the work order, **Withdrawal the Approval Request**, or edit the resource requirements and approve the changes. Also, approved work orders can be reopened to add new activities and resource requirements and then resubmitted for approval. The status of the related work activities is changed based on the state of the work order, for example, Approving the work order automatically sets the status of the related work activities to **Approved** also.

Scheduling Work Activities

Work activities can be scheduled by an external system (determined by the existence of an external system defined on the work activity type) or from within the Work and Asset Management application. Within Work and Asset Management, a **Scheduling** portal is used to schedule the labor requirements associated with a work activity.

Scheduling accomplishes this in the following way:

- Looks at the service class listed on the work activity and matches that service class with a crew shift having the same service class.
- Matches the labor requirements and estimated duration of the activity with a crew shift having those same capabilities.

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- Work activities that are not completed on the current shift are reassigned to the next available shift.
- The system is queried for new activity labor requirements and any unfinished backlog of work.

Once the shift assignments are complete, the schedule is activated.

A dispatcher may override scheduler decisions at any time.

Work Activity Cost

The system tracks usage and reports the costing associated with that usage against the total cost of completing the activity.

Resource Estimates

Activity resource requirements determine the original estimates or planned amount for labor, equipment, materials and other on activities. Even canceled activity resources requirements are calculated as part of the original estimate. The original estimate is the value of the resource requirement at the time the work order was initially approved and is snapshot into a separate column when the initial approval happened. If an approved work order is reopened to add new activities and resource requirements and resubmitted for approval, those new resource requirements won't have an initial estimate (it will be zero). The system calculates a revised estimate to reflect the current value of the resource requirement. For example, a resource requirement was initially planned for 10 pumps at $10.00 each. Upon the initial approval, the initial estimate will be stamped with $100.00 and the revised estimate is also $100.00. If the planner changes the requirement to 15 pumps instead, the original estimate will stay at $100.00 and the revised estimate will be $150.00. Canceled requirements are not calculated as part of the revised estimate.

Committed Amount

Committed amount is the total of costs applied to the activity due to direct purchase costs that are committed when a purchase order is issued. This value uses the issued amount, not closed or completed, since the costs are considered as committed once the purchase order is issued to the vendor. This amount reflects the total due to the vendor, as full or partial invoice amounts are closed. It does not reflect amounts that are completed or closed.

For example, a purchase order line has been issued for 10 pumps at $10 each. Assume 4 pumps were received and a partial invoice line of $40 was issued for the 4 items. This partial invoice for $40 reduces the committed amount — $100 minus $40 = $60. Once the other 6 items are received, the purchase order line moves to closed status and it does not have an impact on the committed amount.

Unplanned Resources

Unplanned resources are defined as issued or returned materials or timesheet entries that were not part of the original resource requirements or estimates. Activities include a zone which lists any unplanned activity resources.

Fulfilling Material Requirements

Material requirements can be fulfilled in the following ways:

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- For inventory, if the issued quantity is greater than or equal to the planned quantity, the system automatically changes the resource requirement to Fulfilled. This happens in cases where the crew has checked out all the planned quantity from the storeroom.
- For direct purchased material, if the received quantity is greater than or equal to the planned quantity, the system updates the resource requirement to Fulfilled. This method of automatic fulfillment is only applicable to material.
- For inventory material, when the resource requirement is approved (as part of the WO approval), the system puts the quantity as Pending Demand on the storeroom. Once the activity material requirement becomes Active, that quantity becomes On Demand (and Pending Demand is closed out or becomes zero).
- Materials can also be “reserved”. If the storeroom has enough quantity, then that quantity becomes reserved for the given amount. The “reserved” material can still be issued to a different activity since it is only an indicator and not “On Hold”. The reserved quantity provides storeroom managers with visibility into what is to come so they can order materials accordingly.

Note that, although it may not be part of work, when material is issued from a storeroom, material issue will reduce demand by the issued quantity or the original planned quantity, whichever is less. This is to prevent a negative on demand quantity (if the issue quantity is more than the planned quantity).

When an activity is completed, it updates all its resource requirements, including material requirements, to Fulfilled to close out any remaining **On Demand/Reserved** quantity.

Checklists

Checklists are forms that define the prerequisites or procedural steps that need to be accomplished during the lifecycle of another object. For example, checklists can be used for managing permits, information purposes only, or contain the actual steps the user must take prior to completing work in the field.

Planners can use the activity portal to manage checklists directly from the activity record. Here’s how it works:

- A checklist type can contain one to many checklist line items.
- Planner creates a checklist for the activity using a checklist type.
- A checklist cannot be completed until all the mandatory items have been marked as complete.
- An activity cannot proceed to certain status until all the required checklists have been completed.

There are two classes of checklist enabled for work activities in the base product:

General Checklist

General checklists are previously defined sets of details or steps. Each line item in the checklist is just a description. All mandatory line items in a checklist must be marked as complete before the user can complete the checklist.

For example, Circle of Safety Checklist

- Park vehicle on level surface.
- Place cones on front, side, and rear of vehicle.
- Turn on emergency lights.

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> **Note**
>
> Each of the bulleted items would appear in the checklist in sequence and have a Mandatory definition (Yes/No).

Permit Item Only Checklist

Permit checklist is a new class of checklist to manage permit requirements. Each line item of this checklist refers to a permit.

Permit checklists have additional rules that govern how and when the checklist or checklist items can be completed. A checklist item can only be marked as complete when its associated permit has been activated.

Permit checklists are available for both work activities and construction work activities and are managed from the activity's **Permit Checklist** zone on a separate **Permit** tab.

Though it's probably unlikely, you can also enable such checklists for other objects, just like the General Checklist above. Please refer to WAM Implementer training for how to enable checklists for other objects.

Work Activity Workflow

Work order activities are associated with a work order and are the tasks and resources required for completing the work. The following is the typical workflow states of a work activity:

Planning

This is the initial status of the work activity which includes all the resource and cost information needed to complete the type of work being planned for and to appropriately charge cost centers for resources and materials. Activities in this status can move between work orders.

Pending Approval

This status indicates that the planning of the work activity is finished and ready to be submitted to an approver.

Approved

This status indicates that the approver has reviewed work activity details and has approved the tasks to be done.

Active

This status sets the work activity to active so the work can be performed and the activity can accept charges.

In Progress

This status indicates the work activity has been started by the crew but the work is not yet finished

Finished

This status indicates the crew has finished the work

Execute Completion Events

This status indicates the work is finished and the completion events are being executed.

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Completion Error

This status indicates there was an error in processing the completion events.

Completed

The activity is set to the *Completed* state once the work is performed and completion information is recorded

Canceled

This status is used to indicate that the task should not be performed

Rejected

This status indicates that the work activity was not approved but rejected by the approver.

The following statuses are only applicable to “outbound” activities:

Sent

This status indicates that the activity has been sent to an external system for scheduling and processing, for example, **Oracle Field Service** (OFS).

Resend

This status indicates an error was corrected and resent to the server.

Send Error

This status indicates that the activity does not have all the necessary details to enable it to be properly scheduled in an external system.

Work Activity Templates

Template activities are the activities generated as part of a template work order. In this way, template activities can be re-used to help your organization avoid repeat planning of the same work for similar jobs. Template activities can be used for the planning of basic work but are also typically used for preventive maintenance.

Template activities are part of a single template work order and cannot be re-used by multiple template work orders.

Template Activity Resource Unit Price

Resource cost estimates on a template activity can change over time and should be updated to reflect the current pricing for each resource. The system uses a Batch Controls W1-TMPWO periodic monitor batch process to obtain the current pricing for resources.

Asset Location Specific Template Activities

Template activities that reference an asset location can be set in advance to trigger preventive maintenance work. A list of asset locations can be added to the template activity which can later be used as a route for preventive maintenance with costs for performing the work distributed across both primary and secondary assets. The percentage of cost distribution across all the assets must equal 100 percent.

About Work Requests

Work Requests are used to request various types of work or services to be performed.

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Work requests can be indirectly linked to a new activity when the activity adds a work order that is linked to a work request. Work requests can be created manually, as a follow-up to an activity, or by an external system. Work requests are mainly used to implement an approval chain for the requested work.

When a work request is created it is reviewed to determine if the request is valid and can be turned into a work order. If the work request is rejected or canceled the work requestor is notified and the work request can be resubmitted. If the work request is approved, the planner can either add the request to an existing work order as a new activity or create a new work order and work activity specifically for the work being requested.

Once approved, users can select **Create Work Order** and select the appropriate work order business object and the associated activity type to automatically create both the work order and the first work activity which is then populated with information linked to and obtained from the work request. Cost Center details and at least one of the following is required to create the work order and work activity:

- Asset Location
- Work Location
- Asset

The system retrieves the cost center information, if populated, from the following:

- Asset location specified on the work request
- Template work order
- If not populated, the work activity is rendered and cost center information can be entered directly

If necessary, it is possible to create a work order directly if you have the proper authorization.

Possible Duplicate SC/WR/WO/Activity

The system identifies any records which could possibly be duplicate service calls, work requests, work orders, or activities in this zone. Any work records that are in “non-final” statuses (such as *created*, *pending approval*, *approved, active, in progress, or finished*) with the same asset and location (including address) of the current work request are listed as duplicates. You can choose to include or exclude work records related to preventive maintenance. If a record is found to be a duplicate, the work request can be canceled under **Record Actions**.

About Work Creation Using Asset Search

Work Creation Using Asset Search portal is used to search for assets you want to create work orders and activities for. Once opened, the portal provides various fields of criteria that can be used to search for assets. Selecting **Search** retrieves a list of results that are returned as a picklist within the portal itself, where users can select one or more assets and then select what type of work to create.

The portal provides the following options for creating work:

- Create Work Order
- Add Activity to Existing Work Order
- Create Work Order From Template
- Update Existing Activity

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There is a *Create individual Activity per Asset* (*Yes*/*No*) flag available for the first three work options that determine whether an individual activity for each of the selected assets is created (*Yes*) or a single activity listing all the selected assets under the **Asset List** zone is created (*No*).

> **Note**
>
> Users must have *Add* privileges in the **Work Order** portal in order to use this feature.

About Work Planning

Work Planning is a portal for those employees responsible for planning work. This portal contains a variety of zones that enable planners to view multiple summary graphs for open work activities and to search for, update, and schedule multiple work activities at one time. Planners can use this portal to manage their long to mid-term planning needs while also resolving any backlog of activities.

The **Work Planning** portal shows planners the number of open work activities in a variety of graphical views:

- Open Work Activity by Status
- Open Work Activity by Status (Without Planner)
- Open work Activity by Phase
- Open Work Activity by Held for Parts grouped by Required by Date

Planners can help coordinate many types of specialized activities and manage many other types of work activities by using the various search criteria inherent in this portal:

- Activity Information
- Activity Work Windows
- Activity Checklist Information
- Activity Permit Information
- Activity Maintenance Information
- Activity Labor Requirement Information
- Previously Scheduled Unfinished Work

Planners can also use the results of the search to select multiple activities and mass update activity values at one time:

- Work Window Start and End Date
- Phase
- Work Priority
- Work Class
- Work Category
- Planner
- Outage Type

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The search results can also be used to select multiple activities with labor requirements and schedule them directly to a crew shift.

Planners can also use the Log Entry to add notes in the audit log.

Please see Work Management for more information.

About Permits

A permit is a form of documentation that proves a company has met certain safety or regulatory requirements before any work has begun.

Some examples of this kind of work might be tasks that require OSHA certification or specialized handling of hazardous waste materials or specialized equipment.

Planners decide what permits are needed for the work activity and then adds the required permits using a special type of checklist. Refer to Checklist Types andUnderstanding Permit Templates for more information.

Although configurable, most often no work activity can start until the permit has been obtained and activated.

This section describes concepts related to managing permits.

Please see Work Management for more information.

About Communication Logs

Communication logs show all the communications made against a work document and its related work documents. For example, the Communications Log zone on a work request will display communication details when a service call led to the creation of that work request.

Communication logs are displayed on a variety of work records, such as work designs, work requests, work orders and construction work orders, and service calls. Log details provide users with the date and contact person who created the communication, any comments or responses, and the ability to view pertinent files and attachments. Users are able to add new, edit existing, or completely delete communication logs as additional information is received.

Refer to About Construction Work for more information.

About Service Calls

A service call enables work to be created when a call from either an internal or external resource is received by a company representative.

Some examples of these types of calls would be as follows:

- Customer calls in to report a streetlight out, odor in area, sewage overflow, service run to new home, etc.
- Contractor requests new service to be run for a new subdivision or a business requests an upgrade in service for an expansion project.
- Field employee finds an additional problem after responding to an original call.

Service calls can be created by navigating to **Menu**, click **Work Management**, and click **Service Call** or directly from the **Contact** record. Users can avoid creating duplicate service

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calls by checking the **Possible Duplicate SC/WR/WO/Activity** zone on the work request or from the **Service Call** record itself.

Work records, such as work designs, work requests, work orders, and work activities, can all be created as a result of the service call. Work records initiated from or associated with the service call will display in the **Service Call Related Documents** zone of the **Related Documents** tab where users can click on the work document hyperlink and go directly to the individual work record. Users can create contacts and view and manage service call details, such as a description of the service call, contacts, attachments, and so on, directly from the work record. Also, the **Possible Duplicate SC/WR/WO/Activity** zone on the service call record displays any service calls that are duplicates.

Service calls are able to be linked and unlinked to other service calls.

Configure Service Category and Service Code objects to automatically create follow-up documents such as work requests and work orders.

Refer to the Understanding Service Call section of the **Administrative User Guide** for more information on service categories and service codes.

Please see Work Management for more information.

Maintaining Field Activities

The **Field Activity** portal is used to view and maintain field activities.

Refer to About Field Activities for more information.

You can access this portal from **Menu**, select **Work Management**, then select **Field Activity**. You are brought to a query portal with options for searching for specific record. Once the field activity has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Field Activity**: This zone displays general information, such as location, asset, service class, and so on about the selected field activity record.
- **Completion Information Entry**: This zone displays a list of completion events for the field activity.
- **Activity Service Histories**: This zone displays all the service histories associated with the activity and the asset.
- **Attachments**: This zone enables users to manage all types of attachments for the field activity record.

The following zones may appear as part of the portal's **Cost** tab page:

- **Activity Cost Summary**: This zone displays a summary of costs associated with the field activity record.
- **Activity Cost Detail**: This zone displays cost details associated with the field activity record when a row from the Activity Cost Summary zone is broadcast.

The following zones may appear as part of the portal's **Log** tab page:

- **Activity Log**: This zone displays log details for the field activity.
- **Related Stock Transactions**: This zone displays the related stock transactions for the field activity.

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Maintaining Work Orders

The **Work Order** portal is used to view and maintain work orders.

Refer to About Work Orders for more information.

You can access this portal from **Menu**, select **Work Management**, then select **Work Order**. You are brought to a query portal with options for searching for specific record. Once the work order has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Work Order**: This zone provides information about the selected work order record, such as work details and accounting information.
- **Activity Info**: This zone lists the activities associated with the work order.
- **Follow Up Work Order and Work Request**: This zone lists all follow up work orders and work requests associated with the work order record.
- **Activity Dependency**: This zone lists the activity dependencies for the current work order record.
- **Notes**: This zone lists any notes that have been added for the work order record.
- **Attachments**: This zone enables users to manage all types of attachments for the record.
- **Scheduled Activities**: This zone displays a list of the scheduled activities associated with the work order record.
- **Contact Relationship**: This zone displays contact information associated with the work order record.
- **Communication Log**: This zone displays any communications associated with the work order record.

The following zones may appear as part of the portals **Cost** tab page:

- **Work Order Cost Summary**: This zone displays a summary of costs associated with the work order record.
- **Work Order Cost Detail**: This zone displays upon broadcast from the Work Order Cost Summary and displays a hyperlink to the work activity.

The following zones may appear as part of the portals **Activity Resource Tree** tab page:

- **Activity Resource Requirement Tree**: This zone displays a tree view of required resources for the work order.

The following zones may appear as part of the portals **Log** tab page:

- **Work Order Log**: This zone displays log details for the work order.
- **Approval Request History**: This zone lists approval history for the work order.

Maintaining Template Work Orders

This portal is used to view and maintain template work orders.

Refer to About Work Orders for more information.

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You can access this portal from **Menu**, select **Work Management**, then select **Template Work Order**. You are brought to a query portal with options for searching for specific work order templates. Once the template has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Template Work Order**: This zone provides information about the selected template and enables user functions to define projects, work priorities, work order approval profiles, and more.
- **Template Activity**: This zone lists the template activities associated with the work order template.
- **Notes**: This zone lists all the notes that have been added for the work order template.
- **Attachments**: This zone enables users to manage all types of attachments for the record.

The following zones may appear as part of the portals **Cost** tab page:

- **Template Work Order Cost Summary**: This zone displays cost summary information associated with the selected work order template.

Maintaining Template Activities

The **Template Activity** portal is used to display and maintain template activities.

Refer to About Work Activities for more information.

You can access this portal from the **Template Work Order** portal when reviewing or adding a template activity.

The following zones may appear as part of the portal's **Main** tab page:

- **Template Activity**: This zone provides information about the selected template activity record, such as planned service history, checklist types, template activity dependencies, and accounting information.
- **Template Work Order Activity**: This zone lists the work order activities associated with the selected template activity.
- **Notes**: This zone lists notes associated with the template activity.
- **Attachments**: This zone enables users to manage all types of attachments for the template activity record.

The following zones may appear as part of the portal's **Resources** tab page:

- **Quick Add**: This zone enables additional resources to be added to the work activity record.
- **Template Activity Resource Action**: This zone displays the template activity's resources. Users can select the resource hyperlink and go to the template activity's resource requirement to make changes.

The following zones may appear as part of the portal's **Cost** tab page:

- **Template Activity Cost Summary**: This zone displays a summary of costs associated with the work activity record.
- **Activity Cost Detail**: This zone displays the cost details associated with the work activity record when a row from the **Template Activity Cost Summary** zone is broadcast.

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Maintaining Work Activities

The **Work Activity** portal is used to view and maintain work activities.

Refer to About Work Activities for more information.

You can access this portal from **Menu**, select **Work Management**, then select **Work Activity**. You are brought to a query portal with options for searching for specific record. Once the work activity has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Work Activity**: This zone provides information about the selected work activity record, such as schedule details, special handling, and accounting information.
- **Asset List**: This zone lists the assets associated with the work activity.
- **Checklists**: This zone displays all checklists associated with the work activity record.
- **Work Order Activities**: This zone displays when there is more than one activity on the work order.
- **Completion Events**: This zone lists completion event records that may have been initiated by processing completion information sent from an external system.
- **Outstanding PM Activity**: This zone displays any outstanding preventive maintenance activities associated with the work activity record.
- **Notes**: This zone lists notes associated with the work activity.
- **Attachments**: This zone enables users to manage all types of attachments for the work activity record.
- **Asset Attachments**: This zone lists attachments associated with any of the activity's assets.
- **Active Warranty**: This zone displays the active warranties associated with the work activity record.
- **Active Dependency**: This zone lists the active work activities that are dependent on the current work activity record.
- **Scheduled Labor Requirements**: This zone displays the scheduled labor requirements associated with the work activity record.
- **Activity Service Histories**: This zone displays all the service history records associated with the work activity. Asset information is also displayed if the service history is associated with an asset. This zone is always displayed, regardless if the activity has an asset on it or not.
- **Follow Up Work**: This zone displays the activities created from a service history associated with this work activity.

The following zones may appear as part of the portal's **Resources** tab page:

- **Quick Add**: This zone enables additional resources to be added to the work activity record.
- **Activity Resource Action**: This zone displays the activity's resources. Users can select the resource hyperlink and go to the activity's resource requirement to make changes.

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- **Activity Resource Detail**: This zone displays resource details associated with the activity record.
- **Unplanned Activity Resource**: This zone displays resource details generated from actual charges, like timesheets that were not planned or estimated.

The following zones may appear as part of the portal's **Cost** tab page:

- **Activity Cost Summary**: This zone displays a summary of costs associated with the work activity record.
- **Activity Cost Detail**: This zone displays the cost details associated with the work activity record when a row from the **Activity Cost Summary** zone is broadcast.

The following zones may appear as part of the portal's **Permit** tab page:

- **Activity Permit Checklists**: This zone displays any permit checklists associated with the work activity.
- **Permit Attachments**: This zone displays permit attachments associated with the work activity.
- **Service History Type**: This zone lists planned service history types for the activity, indicating for each service history type whether it is required to be filled out or not. When an asset is in context the list shows all valid service history types for the asset.
- **Service History**: This zone lists service history records associated with the activity and the asset in context.

The following zones may appear as part of the portal's **Completion** tab page:

- **Asset List**: This zone lists locations and assets associated with the activity, including assets installed, removed or attached as part of this activity. The zone only appears for an asset related activity. Broadcasting an asset and location row in this list sets it as the current context.
- **Completion Actions**: This zone displays valid completion related actions that may be performed on the activity, asset and location in context.
- **Activity Service Histories**: This zone displays all the service history records associated with the work activity. Asset information is also displayed if the service history is associated with an asset. This zone is always displayed, regardless if the activity has an asset on it or not.
- **Service History Types**: This zone lists all the planned service history types for the activity. When an asset is broadcasted, all the valid service history types and condition assessment service history types associated to the assessment class for the asset in context are also displayed in the zone.
- **Asset Service Histories**: This zone displays only those service history records for the broadcasted asset or asset locations in context. The zone is visible once an asset or location is broadcasted.
- **Measurements**: This zone lists measurements associated with the activity and asset in context. The zone appears only if recording measurements is applicable to the asset in context.

Maintaining Work Activity Resource Requirements

The **Activity Resource Requirement** portal is used to display and maintain activity resource requirements for work activities and for construction work activities.

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Refer to Resource Requirements for more information.

You can access this portal by clicking on any activity resource requirement in the **Resources** tab of the **Work Activity** or **Construction Work Activity** portals.

The zones on the portal's **Main** tab page will change based on the selected resource requirement:

- **Material** Resource Requirements
  - **Resource Requirement**: Displays general information for the material, such as Direct Purchase, material, accounting, and reservation information,
  - **Notes**: This zone enables users to add notes for the resource requirement.
  - **Attachments**: This zone enables users to manage all types of attachments for the resource requirement.
  - **Activity Resource Material Request Lines**: Displays a list of material request lines when material request lines are present on the record.
  - **Direct Purchase Request Line**: Displays a list of direct purchase request lines when a direct purchase request line is present on the record.
- **Craft** Resource Requirements
  - **Resource Requirement**: Displays labor and accounting information for the resource requirement.
  - Notes: This zone enables users to add notes for the resource requirement.
  - **Attachments**: This zone enables users to manage all types of attachments for the resource requirement.
  - **Timesheet Information Detail**: Displays timesheet details for the resource requirement.
  - **Direct Purchase Request Line**: Displays a list of direct purchase request lines when a direct purchase request line is present on the record.
- **Equipment** Resource Requirements
  - **Resource Requirement**: Displays equipment and accounting information for the resource requirement.
  - **Notes**: This zone enables users to add notes for the resource requirement.
  - **Attachments**: This zone enables users to manage all types of attachments for the resource requirement.
  - **Activity Resource Material Request Lines**: Displays a list of material request lines when material request lines are present on the record.
  - **Direct Purchase Request Line**: Displays a list of direct purchase request lines when a direct purchase request line is present on the record.
- **Miscellaneous** Resource Requirements
  - **Resource Requirement**: Displays miscellaneous resource and accounting information for the resource requirement.
  - **Notes**: This zone enables users to add notes for the resource requirement.
  - **Attachments**: This zone enables users to manage all types of attachments for the resource requirement.
  - **Activity Resource Material Request Lines**: Displays a list of material request lines when material request lines are present on the record.

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- **Direct Purchase Request Line**: Displays a list of direct purchase request lines when a direct purchase request line is present on the record.

Maintaining Work Categories

The **Work Category** portal is used to maintain work categories. A work category describes a broad category of work.

Refer to About Work Orders for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Work Category**.

The following zone may appear as part of the portals **Main** tab page:

- **Work Category List**: This zone lists all the work categories. Broadcast a record to display the details for the selected record.
- **Work Category**: This zone provides information about the selected work category.

Maintaining Work Classes

The **Work Class** portal is used to maintain work classes. A work class represents a broad category of work.

Refer to About Work Orders for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Work Class**.

The following zones may appear as part of the portals **Main** tab page:

- **Work Class List**: This zone lists all work classes. Broadcast a record to display the details for the selected record.
- **Work Class**: This zone provides information about the selected work class and in particular, the **Work Category Usage** field which displays only those work categories that are related to the selected work class when the "Only Related Work Categories" is selected.

Maintaining Work Requests

The **Work Request** portal is used to view and maintain work requests.

Refer to About Work Requests for more information.

You can access this portal from **Menu**, select **Work Management**, then select **Work Request**. You are brought to a query portal with options for searching for a specific record. Once the work request has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Work Request**: This zone provides information about the selected work request record, such as asset and contact information.
- **Work Detail**: This zone provides a hyperlink to the work order associated with the work request.

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- **Attachments**: This zone displays attachments associated with the work request record.
- **Contact Relationship**: This zone displays contact information associated with the work request record.
- **Communication Log**: This zone displays any communications associated with the work request record.

The following zones may appear as part of the portals **Possible Duplicates** tab page:

- **Possible Duplicate SC/WR/WO/Activity**: This zone enables a search for possible duplicate records.

The following zones may appear as part of the portals **Log** tab page:

- **Work Request Log**: This zone displays log details associated with the work request record.
- **Approval Request History**: This zone lists all the approval requests associated with the work request record.

Maintaining Work Creation Using Asset Search

This portal is used to search for assets to create work for.

Refer to About Work Creation Using Asset Search for more information.

You can access this portal from **Menu**, select **Work Management**, then select **Work Creation Using Asset Search**. You are brought to a query portal with options for searching for specific asset information. Once the asset information has been selected, you click **Search** and the portal returns a picklist of asset results that can be selected to create work for.

The following zones may appear as part of the portals **Main** tab page:

- **Asset Search**: This zone provides asset search criteria, buttons for creating, adding, and updating work orders or activities, and a picklist of asset results from the search.

Maintaining Work Location

The **Work Location** portal is used to display and maintain a work location record.

Refer to About Work Activities for more information.

You can access the portal from **Menu**, select **Work Management**, then select **Work Location**. You are brought to a query portal with options for searching for a specific work location. Once a work location has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Work Location**: This zone displays information about the work location, such as address and latitude and longitude coordinates.
- **Attachments**: This zone enables users to manage all types of attachments for the work location record.

Maintaining Projects

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The **Projects** portal is used to view and maintain projects.

Refer to About Work Orders for more information.

The following zones may appear as part of the portal's **Project 360** tab page:

- **Project:** This zone offers essential information about the project, including the description, project manager, status, budget, and start and end dates. It also displays a list of attachments associated with the project. Additionally, a **View in Map** button is available if any project activities can be accessed in the **Map Viewer**.
- **Hierarchy:** This zone provides a tree structure representing the project hierarchy for the current project. The display automatically includes the top-level project down to the current project. If there are 50 or fewer child projects, they will be shown automatically. Additional projects within the project tree can be accessed by manually expanding each project.
- **Cost and Scheduling:** This zone presents a graphical representation of the actual costs associated with the current project and sub-projects, compared to the budget of the displayed project. Additionally, it includes a second graph illustrating the displayed project's duration, including the start and end dates, and how these dates relate to the estimated completion date.
- **Cost by Category:** This zone provides a breakdown of the current project's and sub-projects' estimated and actual costs by cost category.
- **Reference Summary:** This zone presents a graph that illustrates the number of objects referencing the current project and sub-projects. The references for each object are categorized into three groups based on their respective business object lifecycle stages. See Reference Summary Zone for more information.
- **Reference Details**: This zone lists the actual objects referencing the current project and sub-projects. Only eight records are shown at a time with pagination enabled to view additional records.

You can access this portal from **Menu**, select **Work Management**, then select **Project**. You are brought to a query portal with options for searching for a specific record. Once the project has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Project**: This zone provides information about the project, such as whether to allow other records to charge against the project, scheduling information, and accounting information.
- **Child Project Info**: This zone lists the subprojects associated with the project.
- **Attachments**: This zone enables users to manage all types of attachments for the project record.
- **Notes**: This zone lists notes associated with the project.

The following zones may appear as part of the portal's **Cost** tab page:

- **Project Cost Summary**: This zone displays a summary of costs associated with the project record and its subprojects.
- **Project Cost Detail**: This zone is originally hidden but displays cost details for the current project and subprojects by broadcasting the cost category in the **Project Cost Summary** zone.

The following zones may appear as part of the portal's **Tree View** tab page:

- **Project Hierarchy**: This zone displays a tree structure of the project hierarchy for the current project.

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The following zones may appear as part of the portal's **Work** tab page:

- **Work Order Status Summary**: This zone displays a graph of both regular work orders and construction work orders associated with the project and subprojects in its hierarchy by status.
- **Work Order**: This zone displays both regular work orders and construction work orders for the current project and associated subprojects in its hierarchy.
- **Work Activity Status Summary**: This zone displays a graph of regular work activities and construction activities associated with the project and subprojects in its hierarchy by status.
- **Work Activity**: This zone displays a list of both regular work activities and construction activities associated with the project and associated subprojects in its hierarchy.

The following zones may appear as part of the portal's **Timesheet** tab page:

- **Timesheet**: This zone displays non-cancelled timesheet detail records associated with the current project and subprojects in its hierarchy.

The following zones may appear as part of the portal's **Work Design** tab page:

- **Work Design**: This zone displays non-cancelled work designs associated with the current project and subprojects in its hierarchy.

The following zones may appear as part of the portal's **Purchase Order** tab page:

- **Purchase Order Line**: This zone displays non-cancelled purchase order lines associated with the current project and subprojects in its hierarchy.

The following zones may appear as part of the portal's **Log** tab page:

- **Project Log**: This zone displays log details for the current project.
- **Approval Request History**: This zone lists the approval history for the current project.
- Reference Summary Zone

Reference Summary Zone

This zone presents a graph that illustrates the number of objects referencing the current project and sub-projects. The references for each object are categorized into three groups based on their respective business object lifecycle stages.

Activities

Activities refer to both Regular Work Activities and Construction Work Activities that are associated with the current project and sub-projects.

Reference Object	Category	Statuses
Regular Work Activity	Initial	Planning
	Active	Pending Approval, Approved, Rejected, Active, In Progress, Sent, In Progress (External), Finished, Completion Error
	Final	Completed, Canceled
Construction Work Activity	Initial	Planning

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Reference Object	Category	Statuses
	Active	Pending Approval, Approved, Rejected, Active, In Progress, Sent, In Progress (External), Finished, Completion Error
	Final	Closed, Canceled

Other Direct Charges (ODC)

Other Direct Charges refers to ODC Detail (Equipment and Other Resource) records that are associated with the current project and sub-projects.

Reference Object	Category	Statuses
Other Direct Charges Equipment Other Direct Charges Other Resource	Initial	Created
	Final	Posted, Canceled

Permits

Permits refer to both permits associated with the current project and permits for activities associated with the current project and sub-projects.

Reference Object	Category	Statuses
Internal Permit External Permit	Initial	Planning
	Active	Pending Approval, Rejected, Approved, Suspended, Active
	Final	Expired, Closed, Canceled

Purchase Orders

Purchase Orders refer to the purchase order lines associated with the current project and sub-projects.

Reference Object	Category	Statuses
Purchase Order Line (Craft, Equipment, Other Resource and Stock Item)	Initial	Created
	Active	Ready for Revision, Revised, Approved, Issued
	Final	Canceled, Closed

Purchase Requisitions

Purchase Requisitions refer to the purchase requisition lines associated with the current project and sub-projects.

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Reference Object	Category	Statuses
Purchase Requisition Line (Craft, Equipment, Other Resource and Stock Item)	Initial	Created
	Active	Approved
	Final	Canceled, PO Processed, Blanket Contract Processed, Sent to External System

Timesheets

Timesheets refer to the Timesheet Detail records associated with the current project and sub-projects.

Reference Object	Category	Statuses
Timesheet Detail	Initial	Created
	Active	None
	Final	Canceled, PO Processed, Blanket Contract Processed, Sent to External System

Work Designs

Work Designs refer to both Work Designs and Template Construction Work Orders that are associated with the current project and sub-projects.

Reference Object	Category	Statuses
Work Design	Initial	Created
	Active	Pending Approval, Approved, Rejected, Work Generated
	Final	Canceled, Closed
Template Construction Work Order	Initial	Created
	Active	Active
	Final	Inactive

Work Orders

Work Orders refer to both Regular Work Orders and Construction Work Orders that are associated with the current project and sub-projects.

Reference Object	Category	Statuses
Regular Work Order	Initial	Planning
	Active	Pending Approval, Approved, Active, Reopened, Rejected
	Final	Completed, Closed, Canceled
Construction Work Order	Initial	Planning
	Active	Pending Approval, Approved, Active, Rejected
	Final	Completed, Closed, Canceled

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Maintaining Permits

This portal is used to view and maintain permits.

Refer to About Permits for more information.

You can access this portal from **Menu**, select **Work Management**, then select **Permit**. You are brought to a query portal with options for searching for specific permits. Once the permit has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Permit**: This zone provides general information about the selected permit, such as permit locations, labor, and work start and end times.
- **Asset/Location**: This zone displays the asset or location information associated with the permit.
- **Permit Holder History**: This zone displays history details about the permit holder.
- **Notes**: This zone lists notes associated with the permit.
- **Attachments**: This zone displays attachments associated with the permit. Attachments added here are made available as reference information related to the permit and are available on work activity.

The following zones may appear as part of the portals **Checklist** tab page:

- **Checklists**: This zone displays the checklists associated with this permit.

The following zones may appear as part of the portals **Service History** tab page:

- **Permit Service History**: This zone displays service history and activity information associated with this permit.

The following zones may appear as part of the portals **Related Activity** tab page:

- **Permit Related Activity**: This zone displays the related activities associated with this permit.

Maintaining Service Calls

This portal is used to view and maintain service calls.

Refer to About Service Calls for more information.

You can access this portal from **Menu**, select **Work Management**, then select **Service Call**. You are brought to a query portal with options for searching for specific service calls. Once the service call has been selected you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Call**: This zone provides information about the selected service call and enables user functions to create additional contacts, create work orders, work designs, work requests, or activities.
- **Contact Relationship**: This zone lists the contacts associated with the service call.

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- **Communication Log**: This zone lists all the communications that have transpired for the service call.
- **Attachments**: This zone displays attachments associated with the service call. Attachments added here are made available as reference information related to the service call and are available on work requests, work orders, and work activities.

The following zones may appear as part of the portal's **Possible Duplicates** tab page:

- **Possible Duplicate SC/WR/WO/Activity**: This zone lists the service calls, work requests, work orders, and activities that might be possible duplicates of the service call.

The following zones may appear as part of the portal's **Related Documents** tab page:

- **Service Call Related Documents**: This zone displays hyperlinks to work documents, such as work requests, work designs, and work orders, that were initiated from or associated with the service call.
- **Associated Service Calls**: This zone displays all service calls associated with the service call record being displayed.
- **Link Service Call**: This zone links service calls to the service call being displayed.

Work Planning Dashboard

Work Planning is a portal for those employees responsible for planning work.

Refer to About Work Planning for more information.

You can access this portal from **Menu**, select **Work Management**, and then select **Work Planning**. You are brought to a Work Planning dashboard displaying summary graphs for managing the planning of work.

The following zones may appear as part of the portals **Main** tab page:

- **Open Work Activity by Status:** This zone displays a count of work activities by status for a particular planner.
- **Open Work Activity by Phase:** This zone displays a count of work activities by phase for a particular planner.
- **Open Work Activity by Status: (Without Planner).** This zone displays a count of work activities by status.
- **Open Work Activity by Held for Parts:** This zone displays a count of work activities that are Held for Parts and grouped by how many weeks they are from being overdue or if they are already overdue.
- **Work Activity Search:** This zone enables a search for activities using a variety of criteria, such as Planner, Crew, Craft, and so on.

Maintaining Activity Generators

The **Activity Generator** portal is used to view and maintain activity generators.

Refer to About Work Orders for more information.

You can access this portal from **Menu**, select **Work Management**, then select **Activity Generator**. You are brought to a query portal with options for searching for specific record.

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Once your record has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Activity Generator**: This zone displays basic attributes of the selected activity generator record.
- **Activity Info**: This zone displays summary information about the activities created by the activity generator.
- **Notes**: This zone lists any notes that have been added for the activity generator.

The following zones may appear as part of the portals **Activities** tab page:

- **Activity**: This zone displays a list of activities created by the activity generator.

The following zones may appear as part of the portals **Cost** tab page:

- **Work Order Cost Summary**: This zone displays a summary of work order costs for the activity generator.

The following zones may appear as part of the portals **Log** tab page:

- **Activity Generator Log**: This zone displays the server logs for the activity generator.
- **Related Stock Transactions**: This zone displays the related stock transactions for the activity generator.

Preventive Maintenance

- About Preventive Maintenance
- About Preventive Maintenance Process Flow
- Maintaining Maintenance Events
- Maintaining Maintenance Plans
- Maintaining Maintenance Plan Triggers
- Maintaining Maintenance Specifications
- Maintaining Preventive Maintenance Schedules
- Maintaining Preventive Maintenance Triggers

About Preventive Maintenance

Preventive maintenance programs can be utilized to keep your business in compliance with regulatory requirements and business needs. Users can define compliance rules to ensure the work, such as inspections, repairs, cleaning, part replacements, and so on, is completed in a timely manner and to track and report against compliance work.

Preventive maintenance can help your organization manage costs by reducing downtime due to unexpected asset failures, reducing incidents where maintenance is needed in response to a problem (reactive maintenance), and ensuring the proper care and maintenance of assets. One common example of preventive maintenance is routine maintenance on a pump. It is clear that proper maintenance depends on timely visual inspections and regular cleaning to prevent costly problems, failures and repairs. Preventive maintenance programs are based on time or operational usage.

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Template work orders are set up to plan detailed work requirements, and the preventive maintenance functionality manages when and how the related work orders are automatically created based on the established preventive maintenance cycles.

Maintenance Forecasts

The upcoming maintenance for an asset is forecasted based on the maintenance schedule and triggers defined for that asset. This information is displayed in the **Asset** portal on the **Maintenance Schedule Forecast** zone

Maintenance Specifications

Assets inherit their maintenance schedule from their **Maintenance Specification**. One **Maintenance Specification** can be linked to multiple maintenance schedules; one for each applicable asset situation. For example, you might configure a maintenance schedule for “In Service” and another for “Out of Service”.

Event Based Maintenance

Event based maintenance is work that is performed based on trigger dates. Events differ from maintenance schedules because the system does not manage when to cycle the work. Instead, planners decide upon the next schedule date for the event and enter it on the **Maintenance Event** record. Work performed can include inspections, repairs, replacements, and so on, but is typically associated to planned outages or other event-based maintenance. Work records are generated on the trigger date based on the indicated defaults and templates.

The maintenance event defines the trigger date on which the maintenance work orders and activities are generated according to the indicated maintenance plans associated to the maintenance event. The event also specifies the work activity schedule defaults which will be set on the generated activities when they are created.

Maintenance Plans

Maintenance plans define the event category for maintenance events where the plan is referenced. The list of plan triggers on the maintenance plan then defines what work orders are generated for the event.

Maintenance Plan Triggers

Maintenance plan triggers are used to configure a specific work order for a particular location for use by a maintenance event. They define the maintenance plan, template work order, activity type, service history type, work order defaults and asset location for the work being created for the maintenance event, as applicable. The work order template indicated on the trigger defines the pre-planned requirements for the work that is created for the event.

- Maintenance Schedules
- Maintenance Triggers

Maintenance Schedules

Preventive maintenance schedules contain a list of maintenance triggers and a schedule of when maintenance should occur based on those triggers. Maintenance schedules provide a comprehensive set of analytics which provide information on failure types, failure modes, and repairs.

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Duplicate Maintenance Schedules

The system provides a utility for duplicating a maintenance schedule and allowing the user to choose which maintenance triggers to also copy to the new schedule via a pick list. This action is available from the **Maintenance Schedule** record actions.

Maintenance Triggers

Preventive maintenance triggers indicate a certain interval which, when it occurs, maintenance should be done on an asset. For example, typical maintenance triggers would be when a vehicle reaches a certain number of miles, when a certain amount of time has passed, or when an asset reaches a certain number of hours of runtime.

Refer to Defining Compliance Types for more information about linking and unlinking preventive maintenance triggers.

Maintenance triggers are generally defined as one of the following:

- **Calendar Anniversary** is a *fixed* calendar interval type where regardless of the time lapse between the work creation and completion, the future maintenance schedule date remains the same. This type of interval scheduling is generally used to fulfill regulator compliance for inspections and licensing requirements on fixed date schedules. For example, this would trigger an inspection every three months regardless of when the last inspection was completed.
- **Runtime Anniversary** is a *fixed* interval type maintenance where regardless of the metered operation between the recent activity or service history and completion of work, the maintenance is not re-forecast. For example, this would trigger an inspection after every 100 hours of runtime service.
- **Calendar Interval** is a *fluid* interval type where the forecasted scheduled date is adjusted and re-forecast based on the completion date of the previously completed work which is managed through service history. For example, this would trigger a pump valve cleaning every 3 months with the next trigger based on the most recent cleaning. There are two different types of Calendar Interval Maintenance Triggers (General or Location Specific). The type used is based on the type of Template Work Order/Activity Type referenced on the maintenance trigger:
  - General Calendar Interval Maintenance Triggers reference a "General" type Template Work Order/Activity and use the Effective Date from the Service History created upon completion of the Work Activity referencing the Maintenance Trigger.
  - Location Specific Calendar Interval Triggers reference a "Location Specific" type Template Work Order/Activity which lists Asset Locations and Asset Types on the Activity to be added to the Work Order/Activity(ies) generated from the Maintenance Trigger. The Maintenance Trigger is re-forecast based on the Completion Date of the primary Activity on the Work Order generated from the trigger instead of the Effective Date on the Service History. The initial forecast for the Maintenance Trigger is generated using the Initial Schedule Date on the Maintenance Trigger.
- **Runtime Interval** is a *fluid* interval type where the maintenance schedule is adjusted and re-forcast based on the completion runtime readings of the previously completed activity. For example, this would trigger a pump bearing bracket cleaning every 100,000 gallons flow of water with the next trigger based on the gauge reading at the time of the last cleaning.

Maintenance Cycles

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Preventive maintenance is triggered, or cycled, based on the maintenance schedule defined for the asset type. Batch processing determines when and how to create work orders depending on whether or not non-final activities already exist for the activity type and service history detailed on the maintenance trigger. Settings on the maintenance trigger such as the **Allow Multiple In Process Activities** flag determine whether or not a new activity is triggered if there are any non-final activities for the activity type and the asset being evaluated. If new activities should be created based on all criteria being met, the system automatically creates a work order based on the template work order indicated on the maintenance trigger.

Work records automatically generated by the system can be automatically scheduled to the field. From the maintenance trigger record, users can configure the system to automatically schedule preventive maintenance work to go to one of the crew's "Weekly" shifts. Configuration for automatic scheduling of work to a crew looks for the following conditions:

- In the **Work Order Defaults** zone, **Auto Schedule** value is set to *Yes* and the **Crew** value is defined with a crew name. If the **Crew** field is vacant, scheduling looks for a crew name defined on the template work order or work activity.
- Scheduling only considers those shifts that are in a *Planning* status.
- If the generated activities have a **Required By Date,** only those shifts with a start date prior to the activity's **Required By Date** are considered. The system starts with the earliest eligible shift having enough available and remaining hours to work the job. If no shift satisfies the requirement, the system schedules the activity to the shift with the most available hours.

> **Note**
>
> This feature is not applicable for activities whose activity type specifies an external system.

Only users with the "Preventive Maintenance Trigger Force Execution" **Access Mode** of the asset maintenance object application service "W1-ASSET" are allowed to use the **Cycle Now** button to manually execute maintenance triggers. The **Cycle Now** action button is visible for these users in the **Action** column on the **Asset** portal's **Maintenance** tab for upcoming triggers.

About Preventive Maintenance Process Flow

Preventive maintenance refers to routine maintenance work, such as inspections, repairs, and replacements, which help to prevent assets from failing. Preventive maintenance work requires asset types, a maintenance specification, and maintenance schedule containing the triggers that tell the system when the asset is due for maintenance, be set up for every asset type requiring similar maintenance.

The Preventive Maintenance Process Flow utilizes two separate process flows to accomplish the maintenance of assets:

- Maintenance Specification Process Flow
- Maintenance Trigger Process Flow

Create Action Method

Action Methods are required to use the Preventive Maintenance Process Flows.

1. Select **Admin**, select **System**, then select **Action Method**, **Add**.

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2. For the Maintenance Specification Process Flow:
    a. Select *Maintenance Specification Action Method* from the **Action Method Business Object** drop-down list on the **Select Business Object** screen and click **OK**.
    The Maintenance Specification Action Method Business Object is secured by the Maintenance Specification Action Method BO application service. Users must be given access to this application service to use the Maintenance Specification Process Flow.
    b. **Action Method**: A code for your action method
    c. **Action Method Role**: Maintenance Specification Process Flow
    d. **Description**: A description of your action method
    e. **Process Flow Type**: Maintenance Specification
    f. Click **Save**.
3. For the Maintenance Trigger Process Flow:
    a. Select *Maintenance Trigger Action Method* from the **Action Method Business Object** drop-down list on the **Select Business Object** screen and click **OK**.
    The Maintenance Trigger Action Method Business Object is secured by the Maintenance Trigger Action Method BO application service. Users must be given access to this application service to use the Maintenance Trigger Process Flow.
    b. **Action Method**: A code for your action method
    c. **Action Method Role**: Maintenance Trigger Process Flow
    d. **Description**: A description of your action method
    e. **Process Flow Type**: Maintenance Trigger
    f. Click **Save**.

Initiating the Maintenance Specification Process Flow

Use the following procedure to initiate the maintenance specification process flow:

1. Select **Menu**, select **Main Menu**, select **Preventive Maintenance**, and then select **Maintenance Specification Process Flow**. The **Process Flow** page opens on the **Asset Type** panel.
2. The **Asset Type** panel is the first panel in the process.
    a. Use the **Asset Type Action** field to select either to *Create a New Asset Type* or to *Use an Existing Asset Type (Only non-ODM asset types are available for selection.)*
    Upon selection, only the fields pertinent to that selection are displayed. All required fields are marked with an asterisk.
        i. If you are selecting *Use an Existing Asset Type*, all theValid Service History Types for the selected asset type are listed in the **Valid Service History Types** list.
        You can add additional Service History Types to the list but cannot delete existing ones.
    b. Click **Next** to proceed to the next panel in the process, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.
3. The **Maintenance Schedule** panel is the second panel in the process.
    a. Select a **Maintenance Schedule Business Object**.
    b. Enter a **Description** and **Detailed Description** for either the **In-Service Maintenance Schedule** (asset is still operational while maintenance is performed) or **Out of Service Maintenance Schedule** (asset is not in operation while maintenance is performed), or both. At least one Maintenance Schedule is required.

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c. Click **Next** to proceed to the next panel in the process, click **Previous** to return to the previous panel, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.

4. The **Maintenance Specification** panel is the third panel in the process.
   a. Select a **Specification Business Object** .
   b. Enter a **Maintenance Specification Code** and **Description** for this maintenance specification.
   c. All information is required.
   d. Click **Next** to proceed to the next panel in the process, click **Previous** to return to the previous panel, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.
5. The **Summary** panel is the final panel in the process.
   a. All selections and inputs from the previous panels are displayed on this final panel.
   b. Review the information presented on the panel.
   c. Click **Finish** to create the required entities based on the information provided and to finalize this phase of the process, click **Previous** to return to the previous panel, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.
   d. If needed, click the **Add a Maintenance Trigger** button under the **Additional Process** section to initiate the Maintenance Trigger Process Flow.

Initiating the Maintenance Trigger Process Flow

There are three ways to initiate the Maintenance Trigger Process Flow:

- – From a Closed Maintenance Schedule Process Flow
  – From a Closed Maintenance Trigger Process Flow
  – From the Application's Main Menu

Use the following procedure to initiate the maintenance trigger process flow:

1. To initiate the process flow:
   a. From a **Closed Maintenance Specification Process Flow,** click the **Add a Maintenance Trigger** button in the **Additional Process** section of the Summary panel.
   b. From a **Closed Maintenance Trigger Process Flow,** click the **Add Another Trigger** button in the **Additional Process** section of the Summary panel.
   c. From the **Main Menu,** select **Menu**, select **Main Menu**, select **Preventive Maintenance**, and then select **Maintenance Trigger Process Flow**. The **Process Flow** page opens on the **Maintenance Trigger** panel.
2. The **Maintenance Trigger** panel is the first panel in the process.
   a. Select a Maintenance Trigger Business Object.
   Upon selection, only the fields pertinent to that business object are displayed. All required fields are marked with an asterisk.
   b. Enter a value in the **Maintenance Schedule** field.
      i. If the Maintenance Trigger Process Flow is initiated from a Preventive Maintenance Process Flow, the **Maintenance Schedule** is a drop-down list that contains the Maintenance Schedules used in the Preventive Maintenance Process Flow.

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ii. If the Maintenance Trigger Process Flow is initiated from the **Main Menu**, the Maintenance Schedule is a search.

c. Select the appropriate crew from the **Crew** drop-down list.
This field is required if **Auto Schedule** is set to *Yes*.

d. Enter data as appropriated in the **Calendar Information** section.
If the selected Maintenance Trigger Business Object is Calendar Based, at least one of the **Years**, **Months** or **Days** fields must be populated.

e. Complete the **Runtime Information** section as appropriate.
If the selected Maintenance Trigger Business Object is Runtime Based, then the **Runtime Values** and **Measurement Identifiers** fields must be populated.

f. Click **Next** to proceed to the next panel in the process, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.

3. The **Template**panel is the second panel in the process.

a. Select either the *Create a New Template Work Order and Activity* or *Use an Existing Template Work Order and Activity* **Template Action**.
Upon selection, only the fields pertinent to that selection are displayed. All required fields are marked with an asterisk.

i. If you are selecting the *Use an Existing Template Work Order and Activity* **Template Action**:

i. The **Template Work Order** search automatically filters the Template Work Orders with the selected **Service History Type** in the **Template Activity**.

ii. **Asset Location Template** is not currently available for selection.

ii. If you are selecting the *Create New Template Work Order and Activity* **Template Action**:

i. Asset Location Specific Template Work Order Business Object is not currently available for selection.

ii. The selected **Service History Type** in the **Maintenance Trigger** panel is automatically added to the **Planned Service History** list. You can add additional service history types to the list but cannot delete the existing ones.

b. Click **Next** to proceed to the next panel in the process, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.

4. The **Materials**, **Labor**, **Equipment**, and **Miscellaneous Resources** panels define the resources for the work being planned.

5. The **Materials** panel is the third panel in the process.

a. If the *Use an Existing Template Work Order and Activity* action is selected in the **Template** panel, all existing resources associated with the selected **Template Activity** are for information only. You will not be able to add new resources or delete any existing ones.

b. If the *Create New Template Work Order and Activity* action is selected in the **Template** panel, you can add resources to the panel.

i. Select appropriate Materials resources if applicable. All required fields are marked with an asterisk.

c. Click **Next** to proceed to the next panel in the process, click **Previous** to return to the previous panel, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.

6. The **Labor** panel is the fourth panel in the process.

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a. If the *Existing Template Work Order and Activity* action is selected in the **Template** panel, all existing resources associated with the selected **Template Activity** are for information only. You will not be able to add new resources or delete any existing ones.

b. If the *Create New Template Work Order and Activity* action is selected in the **Template** panel, you may add resources to the panel.

   i. Select appropriate Labor resources if applicable. All required fields are marked with an asterisk.

c. Click **Next** to proceed to the next panel in the process, click **Previous** to return to the previous panel, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.

7. The **Equipment** panel is the fifth panel in the process.

   a. If the *Existing Template Work Order and Activity* action is selected in the **Template** panel, all existing resources associated with the selected **Template Activity** are for information only. You will not be able to add new resources or delete any existing ones.

   b. If the *Create New Template Work Order and Activity* action is selected in the **Template** panel, you may add resources to the panel.

      i. Select appropriate Equipment resources if applicable. All required fields are marked with an asterisk.

   c. Click **Next** to proceed to the next panel in the process, click **Previous** to return to the previous panel, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.

8. The **Miscellaneous Resources** panel is the sixth panel in the process.

   a. If the *Existing Template Work Order and Activity* action is selected in the **Template** panel, all existing resources associated with the selected **Template Activity** are for information only. You will not be able to add new resources or delete any existing ones.

   b. If the *Create New Template Work Order and Activity* action is selected in the **Template** panel, you may add resources to the panel.

      i. Select appropriate Miscellaneous Resources if applicable. All required fields are marked with an asterisk.

   c. Click **Next** to proceed to the next panel in the process, click **Previous** to return to the previous panel, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.

9. The **Summary** panel is the final panel in the process.

   a. All selections and inputs from the previous panels are displayed on this final panel.

   b. Review the information presented on the panel.

   c. Click **Finish** to create the required entities based on the information provided and to finalize this phase of the process, click **Previous** to return to the previous panel, click **Save** to save your inputs, or click **Cancel Process** to cancel out of the process flow.

   d. If needed, click the **Add Another Trigger** button under the **Additional Processes** section to initiate a new Maintenance Trigger Process Flow.

Maintaining Maintenance Events

The **Maintenance Event** portal is used to display and maintain a maintenance event record.

Refer to About Preventive Maintenance for more information.

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You can access the portal from **Menu**, select **Preventive Maintenance**, then select **Maintenance Event**. You are brought to a query portal with options for searching for a specific record. Once a maintenance event has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Maintenance Event**: This zone displays information about the maintenance event record, including maintenance plans and work activity schedule defaults.
- **Maintenance Event Information**: This zone displays summary information about the work activities associated with the maintenance event.

The following zones may appear as part of the portal's **Work Detail** tab page:

- **Plan Trigger**: This zone displays plan trigger information about the maintenance event.
- **Activity**: This zone displays the work activities associated with the maintenance event.

The following zones may appear as part of the portal's **Inventory** tab page:

- **Stock Item Availability**: This zone displays stock item availability information for the maintenance event.

Maintaining Maintenance Plans

The **Maintenance Plan** portal is used to display and maintain a maintenance plan record.

Refer to About Preventive Maintenance for more information.

You can access the portal from **Menu**, select **Preventive Maintenance**, then select **Maintenance Plan**. You are brought to a query portal with options for searching for a specific record. Once a maintenance plan has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Maintenance Plan**: This zone displays information about the maintenance plan.
- **Plan Trigger**: This zone lists all the triggers associated with the maintenance plan.
- **Maintenance Event**: This zone lists the maintenance events associated with the maintenance plan.

Maintaining Maintenance Plan Triggers

The **Maintenance Plan Trigger** portal is used to display and maintain a maintenance plan trigger record.

Refer to About Preventive Maintenance for more information.

You can access the portal from **Menu**, select **Preventive Maintenance**, then select **Plan Trigger**. You are brought to a query portal with options for searching for a specific record. Once a plan trigger has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Plan Trigger**: This zone displays information about the plan trigger record, such as processing information and work order defaults.

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- **Activity**: This zone lists the work activities associated with the plan trigger record.

Maintaining Maintenance Specifications

The **Maintenance Specification** portal is used to display and maintain a maintenance specification record.

Refer to About Preventive Maintenance for more information.

You can access the portal from **Menu**, select **Preventive Maintenance**, then select **Maintenance Specification**. You are brought to a query portal with options for searching for a specific record. Once a maintenance specification has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Specification**: This zone displays information about the maintenance specification and identifies the maintenance schedule.
- **Specification Assets**: This zone lists all the assets associated with the specification record.
- **Attachments**: This zone lists attachments associated with the specification.

Maintaining Preventive Maintenance Schedules

The **Maintenance Schedule** portal is used to display and maintain a maintenance schedule record.

Refer to About Preventive Maintenance for more information.

You can access the portal from **Menu**, select **Preventive Maintenance**, then select **Maintenance Schedule**. You are brought to a query portal with options for searching for a specific record. Once a maintenance schedule has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Maintenance Schedule**: This zone displays information about the maintenance schedule record.
- **Maintenance Trigger**: This zone lists the triggers associated with the maintenance schedule record.
- **Asset List Maintenance Trigger**: This zone lists the asset list maintenance triggers associated with the maintenance schedule record.
- **Maintenance Specification**: This zone lists the specifications associated with the maintenance schedule record.
- **Activity**: This zone lists all the non-finaled activities associated with the maintenance schedule record.

The following zones may appear as part of the portal's **Analytics** tab page:

- **Failure Type Analytics**: This zone displays a graphical view of analytics for the maintenance schedule where corrective maintenance has occurred for the assets associated to the maintenance schedule with a failure type detailed.

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- **Failure Mode Analytics**: This zone displays a graphical view of analytics for the maintenance schedule where corrective maintenance has occurred for the assets associated to the maintenance schedule with a failure mode detailed.
- **Failure Type and Failure Mode Analytics**: This zone displays a graphical view of analytics for the maintenance schedule where corrective maintenance has occurred for the assets associated to the maintenance schedule with a failure type and mode detailed.
- **Failure Type, Mode and Repair Analytics**: This zone displays a graphical view of analytics for the maintenance schedule where corrective maintenance has occurred for the assets associated to the maintenance schedule with a failure type, mode, and repair detailed.

Maintaining Preventive Maintenance Triggers

The **Maintenance Trigger** portal is used to display and maintain a maintenance trigger record.

Refer to About Preventive Maintenance for more information.

You can access the portal from **Menu**, select **Preventive Maintenance**, then select **Maintenance Trigger**. You are brought to a query portal with options for searching for a specific record. Once a maintenance trigger has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Maintenance Trigger**: This zone displays information about the maintenance trigger record, such as processing information, asset qualification conditions, and failure statistics.
- **Activity**: This zone lists the work activities associated with the maintenance trigger record.
- **Failure Information Quick Add**: This zone enables the addition of failure information to the maintenance trigger record.
- **Planned Failure Information**: This zone displays planned failure information associated with the maintenance trigger record.

Construction Work

- About Construction Work
- Maintaining Work Designs
- Maintaining Design Elements
- Maintaining Construction Work Orders
- Maintaining Construction Work Activities
- Maintaining Work Activity Resource Requirements
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About Construction Work

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Construction work involves such types of work as pole extensions, excavations, subdivisions, and so on and require planning and coordination between many different internal and external departments.

This section describes concepts related to construction work.

Refer to the Understanding Construction Work section in the **Admin User Guide** for more information.

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Planning Construction Work

In a standard workflow, an organization begins by determining what materials, labor, and equipment are needed to install (construct) or remove (demolish or retire) an asset at a given location.

Compatible Units (CUs) are then configured based on the resources (materials, labor, and equipment) needed to complete all phases of the work.

Next, work designs are created to estimate the construction work using all of the materials, labor, equipment, and any other costs associated to the work. The compatible units are usually utilized on the design to define these requirements. Multiple design versions can be created so as to compare cost estimates and resource requirements.

Also, the term “asset”, in the context of construction work, is used to refer to fixed assets, also called capital assets. Not all fixed assets are Oracle Utilities Work and Asset Management assets; a record in the asset table with an asset ID. For example, you may not track wires as individual assets within Oracle Utilities Work and Asset Management. Whether an Oracle Utilities Work and Asset Management asset should also be created as a result of construction work is determined by the presence or lack of presence of an asset type on the CU definition.

Work Designs

Work designs are used for construction projects to produce one or many construction estimates with resource requirements. Designs can ensure that all necessary requirements are accounted for before the actual work begins. A single project can have multiple versions so that you can compare different approaches to the project and how they might affect costs.

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Resources included on the original work design are carried over to each new version where users can make the needed adjustments.

Design Elements

Design elements “build” a work design by indicating the compatible units and other resources that are needed for one construction location where one or many assets are planned. **Design Element CU List** on the **Compatible Units** tab of the Design Element enables users to maintain information such as quantity, price type, responsible party, contractor bid, usage, and cost centers, to better reflect changes and to provide more accurate cost estimates. Once the **Usage** value is selected, the system returns a list of valid **Cost Centers** associated with that usage.

Construction Work Costs

Costs are managed just as they are for regular work but with some additional details:

Work Design Estimates

The **Estimates** tab on the work design tabulates totals for all of the resource types, overtime, overhead, and any additional line items. Calculated totals include the following:

- **Customer Built Contributions**: Total derived value of customer supplied compatible units (display as credit)
- **Fixed Price Adjustment**: (Fixed Price – Derived Price)
- **Estimate Grand Total**: (Resource Cost + Additional Cost + Fixed Price Adjustment) – Customer Built Contributions
- **Overhead**: Work Design % per resource class first then apply the additional overhead % to the total

Approving Construction Work

Once ready, work designs can be submitted for standard approval processing. Authorized approver can **Approve** the work design or **Withdrawal the Approval Request** and make changes or add new versions to the work design. Also, approved work designs can be reopened to add new design elements and then resubmit the design for approval.

Once approved, the work design can transition to a “work generated” status and construction work orders and construction work activities can be created from the work design to plan and manage the work. Additional construction work activities can be created on that construction work order or an existing construction work order that has not been associated to any work design as long as the construction work order is in a non-final state. Existing construction work activities that have been associated to the work design can also be updated from the work design.

Construction Work Orders

Construction work orders are a collection of work activities which manage the actual construction work and may or may not be related to compatible units. Construction work orders and construction work activities can be created directly or from an approved work design. Construction work activities, as well as activities from template construction work orders, can

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be added to a construction work order as long as the construction work order is in a non-final state. (The *Add Activity* or *Add Activity(s) From Template Construction Work Order* hyperlinks are provided on the construction work order for this purpose).

Construction Work Activities

Construction work activities (CWAs) manage construction work, typically involving compatible units (such as installing, removing, or maintaining a compatible unit). CWAs manage the creation of new assets resulting from construction, construction related repairs, or maintenance and can be created from a work design, work order, construction work order (CWO), template construction work order, or can be created directly.

As part of the construction work process, it may be determined that a compatible unit is not needed at a construction location. If this is the case, the compatible unit can be removed from a construction work activity as long as the activity is in either a *Planned*, *Approved*, *Active*, *Sent*, or *Sent In Progress* status and includes either assets in a *Planning* status or no assets altogether for that construction location and compatible unit. Removal of the compatible unit deletes any assets that were at a *Planning* status and cancels or reduces the amount of activity resource requirements accordingly.

CWAs and CWAs from a template construction work order can be added to construction work orders in a non-final state directly from the **Construction Work Order Activity Info** zone (Note that the construction work order will transition back to a *Planning* status when new activities are added). To add an activity, select the *Add Activity* or *Add Activity(s) From Template Construction Work Order* hyperlinks to open a dialogue and make an activity type selection and populate activity details.

CWAs can also be moved between construction work orders (CWOs) as long as the CWA is in a *Planning* status and the new CWO is in either a *Planning*, *Approved,* or *Active* status. As a result of the move, the status of the new CWO will revert to a "Planned" status and current workflow processing occurs.

Access to the **Activity Resource Requirement** portal is attained by selecting an activity resource requirement from the **Resource** tab of the **Construction Work Activity** portal. Refer to **Maintaining Activity Resource Requirements** for more activity resource requirement information.

A construction work activity is derived from an activity type that is shared between the activity classes (Field Activity, Work Activity, and Construction Work Activity) and used to control the purpose and configuration of the activity. A setting unique to both work activities and construction work activities is the “Construction Related” flag on the activity type BO which determines whether the activity is to be a construction work activity. Every construction work activity must reference a service class to identify whether or not the activity is an “overhead” activity or an activity used for construction. Overhead activities are created to collect direct overhead costs for planner time, easements, permits, and so on that are associated with the work design and construction work order. Costs are allocated between the offsetting cost centers as determined by the **Work Management Master Configuration**, either cost adjustments, ODCs, as well as on the Overhead record. Construction work in progress (WIP) cost center on the service class is defaulted to the activity.

Overhead Construction Work Activity

“Overhead” activities are another type of construction work activity that can also be created from a work design, work order, template construction work order, or directly form the application. Overhead activities are create to collect direct overhead costs associated with the work design and construction work order, such as planner time, easements, and permits. At closeout, the financial transactions are created to allocate those costs across the actual

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construction activities based on actual construction costs as well as any estimated costs associated with other non-overhead CWAs. Cost adjustments created from the reconciliation process are immediately posted to the system.

- Settings within the **Work Management Master Configuration** determine how direct overhead costs for the construction work activities create as a result of the closeout process; either as a cost adjustment or as an Other Direct Charge (ODC). Define one field or the other, but not both.
- **Cost Adjustment Type For Direct Overhead** setting in the **Work Management Master Configuration** must be populated with a cost adjustment type to enable the cost adjustments to create once the work order activity is closed.
- **Miscellaneous Resource Type for Direct Overhead** setting must be populated with a resource type to enable other direct charges (ODC) to create once the work order activity is closed. The referenced resource type should include a **Resource Source** value of *Internal*, a **Default Values to Activity** value of *Yes*, and a **Fixed Unit Price** value of *No*.

Construction work Activity Dependencies

Construction work activities can be dependent on other activities on the work order. For example, Activity 2 cannot start until Activity 1 is completed and Activity 3 needs to start when Activity 2 is started. The **Activity Dependency** zone on the current activity record displays the dependent activities, their **Timing** and **Resource Options,** and their **Minimum** and **Maximum Offsets**.

Construction Locations

Each construction work activity references one or many construction locations which have one or more compatible units defining the work and resources needed at the location. A user can select one or more CUs and add them all at one time for each selected location or remove a compatible unit that is not required at a construction location (The construction work activity must be in either a *Planned*, *Approved*, *Active*, *Sent*, or *Sent In Progress* status to remove the compatible unit from the construction location).

Construction Work Activity Workflow

Work order activities are associated with a work order and are the tasks and resources required for completing the work. The following is the typical workflow states of a work activity:

Planning

This is the initial status of the work activity which includes all the resource and cost information needed to complete the type of work being planned for and to appropriately charge cost centers for resources and materials. Activities in this status can move between work orders.

Pending Approval

This status indicates that the planning of the work activity is finished and ready to be submitted to an approver.

Approved

This status indicates that the approver has reviewed work activity details and has approved the tasks to be done.

Active

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This status sets the work activity to active so the work can be performed and the activity can accept charges.

In Progress

This status indicates the work activity has been started by the crew but the work is not yet finished

Finished

This status indicates the crew has finished the work

Completed

The activity is set to the *Completed* state once the work is performed and completion information is recorded

Closed

This status indicates that the work activity is complete and no more work is to be done.

Canceled

This status is used to indicate that the task should not be performed

Rejected

This status indicates that the work activity was not approved but rejected by the approver.

The following statuses are only applicable to “outbound” activities:

Sent

This status indicates that the activity has been sent to an external system for scheduling and processing, for example, **Oracle Field Service** (OFS).

Resend

This status indicates an error was corrected and resent to the server.

In Progress (External)

This status indicates the activity has been started by the crew but the work is not yet finished.

Execute Completion Events

This status indicates the work is finished and the completion events are being executed.

Completion Error

This status indicates there was an error in processing the completion events.

Template Construction Work Orders

Template construction work orders are construction work orders that can be re-used to help your organization avoid repeat planning of the same construction work for similar jobs.

A short **Description** and the **Work Priority** is required to create the template and, once created, template construction work activities can then be added to the template construction work order. Template construction work activities can also be added to non-final construction work orders using the *Add Activity* or *Add Activity(s) From Template Construction Work Order* hyperlinks from the **Construction Work Order Activity Info** zone on the construction work order.

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Also, construction work orders can be created directly from the template construction work order record by selecting the **Create Construction Work Order** button from the Title bar. User can then select either an **Asset Location** or **Work Location** and the **Storerooms** in order for the construction work order to be created and for the template construction work activities to populate.

Template Construction Work Activities

Template construction work activities are the activities associated with a template construction work order. Template construction work activities are added to the template construction work order and are generated when the construction work order is created. Fields defined on the template work order activity would default to the construction work activity when created. For example, a Project number defined on the template construction work activity would be defaulted on the construction work activity created from that template. In this way template construction work activities can be reused to help your organization avoid repeat planning of the same work for similar jobs. Template construction work activities can also be added to non-final construction work orders using the *Add Activity* or *Add Activity(s) From Template Construction Work Order* hyperlinks from the **Construction Work Order Activity Info** zone on the construction work order.

User is required to define a short **Description**, select an active construction-related **Activity Type**, and add the number of **Activation Lead Days** to the record. Users must also select a **Service Class** which is used to derive the cost center and cost summary information.

At least one template construction work activity that contains CUs must be included on the template construction work order record.

Construction Work Locations

Construction locations define either a work location or an asset location (not both). Work locations identify where compatible units are used to build new assets. Typically, a work location will become an asset location once the asset is constructed. When work is done on an existing asset, the identified construction location should be identified as an asset location. If construction work occurs at a construction location that is known to cost more in labor, an **Overtime Type** can be specified to apply to all crafts on the construction location. For example, construction work on a major commute bridge can only occur at night (versus regular hours) to minimize traffic disruptions. Construction Locations are added and accessed from the **Construction Location Details** zone on the **Construction Work Activity** portal **Resource** tab.

Scheduling Construction Work

Construction work activities are scheduled from within the **Work and Asset Management** application using the **Scheduling** portal to schedule the labor requirements associated with the construction work activity.

Construction Work Activity Reconciliation

An activity reconciliation is created when a construction work activity is closed. It is created to summarize costs and identify assets that were created, contributed to, or removed on the activity. It immediately gets routed for approval and placed in a *Pending Approval* status.

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Typically, the first person on the approval route will review and update the activity reconciliation.

The Approver can make updates to the reconciliation record, as needed, such as updating cost center and percentages from the **Cost Distribution** zone, or by adding property units, assets, in service, transaction, and retirement dates, quantities, and values from the **Fixed Asset Updates** or **Contributed Assets** zones. Once the record is finalized and approved, the reconciliation record moves to *Closed*, and financial transactions are created. Any fixed assets or customer contributed assets are recorded for export to integrated fixed asset systems, as applicable.

Communication Logs

Communication Logs show all the communications made against a work document and its related work documents. Refer to About Communication Logs for more information.

Maintaining Work Designs

The **Work Design** portal is used to display and maintain a work design record.

Refer to About Construction Work for more information.

You can access the portal from **Menu**, select **Construction Work Management**, then select **Work Design**. You are brought to a query portal with options for searching for a specific record. Once a work design has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Work Design**: This zone displays information about the work design, such as required by date, originating designer, and handling details for the design elements.
- **Design Elements**: This zone lists the design elements associated with the work design record.
- **Design Versions**: This zone lists the estimated totals for each design version created as part of the work design record.
- **Contractor Bids**: This zone lists contractor bids associated with the work design record.
- **Construction Work Order**: This zone displays a hierarchical view of the construction work orders and activities created from the work design.
- **Work Request**: This zone displays the work request created as a result of the work design.
- **Attachments**: This zone enables users to manage all types of attachments for the work design record.
- **Work Design Notes**: This zone displays any note information associated with the work design record.
- **Contact Relationship**: This zone displays any contact information associated with the work design record.
- **Communication Log**: This zone displays any communications associated with the work design record.

The following zones may appear as part of the portal's **Estimate** tab page:

- **Work Design Estimate**: This zone displays all cost associated with the work design.

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The following zones may appear as part of the portal's **Compatible Units** tab page:

- **Work Design — CU Assignment**: This zone enables users to search for and then add compatible units to multiple design elements.

The following zones may appear as part of the portal's **Log** tab page:

- **Work Design Log**: This zone displays log details for the work design.
- **Approval Request History**: This zone lists the approval history for the current work design.

Maintaining Design Elements

The **Design Element** portal is used to display and maintain a design element record.

Refer to About Construction Work for more information.

You can access the portal from the **Work Design** portal when reviewing or adding a design element.

The following zones may appear as part of the portal's **Main** tab page:

- **Design Element**: This zone displays general information as well as Location and Run details associated with the design element record.
- **Design Element — Work Design**: This zone lists associated design elements and asset locations associated with the selected record.
- **Attachments**: This zone enables users to manage all types of attachments for the design element record.
- **Notes**: This zone displays any note information associated with the design element record.

The following zones may appear as part of the portal's **Compatible Units** tab page:

- **Design Element CU List**: This zone lists the compatible units added to the design element.
- **Design Element— CU Assignment**: This zone enables users to search for and then add compatible units to the design element.
- **Design Element— Contractor Bid**: This zone lists contractor bids lined to the design element record.

The following zones may appear as part of the portal's **Resources** tab page:

- **Materials**: This zone displays any resource materials associated with the design element record.
- **Labor and Equipment**: This zone displays all labor, equipment, and overtime associated with the design element.

Maintaining Construction Work Orders

The **Construction Work Order** portal is used to display and maintain a construction work order record.

Refer to About Construction Work for more information.

You can access the portal from **Menu**, select **Construction Work Management**, then select **Construction Work Order**. You are brought to a query portal with options for searching for a

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specific construction work order. Once a construction work order has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Work Order**: This zone displays information about the work order, such as required by date, work details, and access controls.
- **Construction Work Order Activity Info**: This zone displays construction work order activity information for the construction work order record.
- **Follow Up Work Order and Work Request**: This zone displays follow up work orders and work requests for the construction work order record.
- **Activity Dependency**: This zone displays the activity dependencies associated with the construction work order record.
- **Notes**: This zone displays any note information associated with the construction work order record.
- **Attachments**: This zone enables users to manage all types of attachments for the record.
- **Scheduled Activities**: This zone displays the scheduled activities associated with the construction work order record.
- **Contact Relationship**: This zone displays any contact information associated with the construction work order record.
- **Communication Log**: This zone displays all communications associated with the construction work order record.

The following zones may appear as part of the portal's **Cost** tab page:

- **Work Order Cost Summary**: This zone displays a summary of cost information for the construction work order.
- **Work Order Cost Detail**: This zone displays the cost details associated with the construction work order record when a row from the **Work Order Cost Summary** zone is broadcast.

The following zones may appear as part of the portal's **Log** tab page:

- **Work Order Log**: This zone displays log information for the construction work order.
- **Approval Request History**: This zone lists the approval requests for the current construction work order.
- **Related Stock Transactions**: This zone displays the related stock transactions for the construction work order.

Maintaining Construction Work Activities

The **Construction Work Activity** portal is used to display and maintain a construction work activity record.

Refer to About Construction Work for more information.

You can access the portal from **Menu**, select **Construction Work Management**, then select **Construction Work Activity**. You are brought to a query portal with options for searching for a specific construction work activity. Once a construction work activity has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

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- **Work Activity**: This zone displays information about the work activity, such as work site details, reconciliation information, special handling, and schedule details.
- **Work Activity Service History Types**: This zone lists the planned service history types for the construction work activity record.
- **Activity Service Histories**: This zone displays all the service history records associated with the construction work activity. Asset information is also displayed if the service history is associated with an asset. This zone is always displayed, regardless if the activity has an asset on it or not.
- **Scheduled Labor Requirements**: This zone displays the labor requirements for the construction work activity record.
- **Checklists**: This zone lists the checklists associated to the construction work activity record.
- **Completion Events**: This zone lists completion event records that may have been initiated by processing completion information sent from an external system.
- **Work Order Activities**: This zone lists the activities associated with the construction work activity record.
- **Notes**: This zone displays note information associated with the construction work activity record.
- **Attachments**: This zone enables users to manage all types of attachments for the construction work activity record.
- **Active Warranty**: This zone displays the active warranties associated with the construction work activity record.
- **Activity Dependency**: This zone lists the active construction work activities that are dependent on the current construction work activity record.

The following zones may appear as part of the portal's **Construction Locations** tab page:

- **Construction Location Details**: This zone displays a hierarchical view of construction locations, compatible units and related information associated with the construction location. Selecting *Broadcast* for any of the assets within the hierarchy opens additional zones displaying details for **Service History Types**, **Measurement Types**, **Asset Service History**, and **Measurements** associated with the selected asset.
- **Stock Issues To Reconcile**: This zone displays a list of stock items and their associated property unit and quantity, that are not associated with a compatible unit.

The following zones may appear as part of the portal's **Compatible Units** tab page:

- **CU Assignment:** This zone enables users to search for compatible units which can then be added to construction locations.

The following zones may appear as part of the portal's **Resources** tab page:

- **Quick Add**: This zone enables additional resources to be added to the construction work activity record.
- **Activity Resource Action**: This zone displays the construction work activity’s resources. Users can select the resource hyperlink and go to the activity’s resource requirement to make changes.
- **Activity Resource Detail**: This zone displays the resource request and issue lines included on the activity.
- **Unplanned Activity Resource**: This zone displays resource details generated from actual charges, like timesheets that were not planned or estimated.

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The following zones may appear as part of the portal's **Cost** tab page:

- **Activity Cost Summary**: This zone displays a summary of costs associated with the construction work activity record.
- **Activity Cost Detail**: This zone displays the cost details associated with the construction work activity record when a row from the **Activity Cost Summary** zone is broadcast.

The following zones may appear as part of the portal's **Permit** tab page:

- **Activity Permit Checklists**: This zone displays any permit checklists associated with the construction work activity.
- **Permit Attachments**: This zone displays permit attachments associated with the construction work activity.
- **Service History Types**: This zone lists planned service history types for the construction work activity, indicating for each service history type whether it is required to be filled out or not. When an asset is in context the list shows all valid service history types for the asset.
- **Service History**: This zone lists service history records associated with the construction activity and the asset in context.

Maintaining Work Activity Resource Requirements

The **Activity Resource Requirement** portal is used to display and maintain activity resource requirements for work activities and for construction work activities.

Refer to Resource Requirements for more information.

You can access this portal by clicking on any activity resource requirement in the **Resources** tab of the **Work Activity** or **Construction Work Activity** portals.

The zones on the portal's **Main** tab page will change based on the selected resource requirement:

- **Material** Resource Requirements
  - **Resource Requirement**: Displays general information for the material, such as Direct Purchase, material, accounting, and reservation information,
  - **Notes**: This zone enables users to add notes for the resource requirement.
  - **Attachments**: This zone enables users to manage all types of attachments for the resource requirement.
  - **Activity Resource Material Request Lines**: Displays a list of material request lines when material request lines are present on the record.
  - **Direct Purchase Request Line**: Displays a list of direct purchase request lines when a direct purchase request line is present on the record.
- **Craft** Resource Requirements
  - **Resource Requirement**: Displays labor and accounting information for the resource requirement.
  - Notes: This zone enables users to add notes for the resource requirement.
  - **Attachments**: This zone enables users to manage all types of attachments for the resource requirement.
  - **Timesheet Information Detail**: Displays timesheet details for the resource requirement.

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  - **Direct Purchase Request Line**: Displays a list of direct purchase request lines when a direct purchase request line is present on the record.
- **Equipment** Resource Requirements
  - **Resource Requirement**: Displays equipment and accounting information for the resource requirement.
  - **Notes**: This zone enables users to add notes for the resource requirement.
  - **Attachments**: This zone enables users to manage all types of attachments for the resource requirement.
  - **Activity Resource Material Request Lines**: Displays a list of material request lines when material request lines are present on the record.
  - **Direct Purchase Request Line**: Displays a list of direct purchase request lines when a direct purchase request line is present on the record.
- **Miscellaneous** Resource Requirements
  - **Resource Requirement**: Displays miscellaneous resource and accounting information for the resource requirement.
  - **Notes**: This zone enables users to add notes for the resource requirement.
  - **Attachments**: This zone enables users to manage all types of attachments for the resource requirement.
  - **Activity Resource Material Request Lines**: Displays a list of material request lines when material request lines are present on the record.
  - **Direct Purchase Request Line**: Displays a list of direct purchase request lines when a direct purchase request line is present on the record.

Maintaining Template Construction Work Orders

This portal is used to view and maintain template construction work orders.

Refer to About Construction Work for more information.

You can access this portal from **Menu**, select **Construction Work Management**, then select **Template Construction Work Order**. You are brought to a query portal with options for searching for specific construction work order templates. Once the template has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Template Construction Work Order**: This zone provides information about the selected template construction work order and enables user functions to define projects, work priorities, lead days, and more.
- **Template Construction Work Activities**: This zone lists the template construction work activities associated with the template construction work order.
- **Notes**: This zone lists all the notes that have been added for the template construction work order.
- **Attachments**: This zone enables users to manage all types of attachments for the record.

The following zones may appear as part of the portals **Cost** tab page:

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- **Template Construction Work Order Cost**: This zone displays cost summary information, including overhead cost, associated with the selected template construction work order. An appropriate *Overhead* can be applied by selecting **Edit** from within the **Resource Overhead** section. The selected *Overhead* is then displayed in the **Resource Overhead** section on both the template construction work order and template construction work activity **Cost** tab.

Maintaining Template Construction Work Activities

The **Template Construction Work Activity** portal is used to display and maintain a template construction work activity record.

Refer to About Construction Work for more information.

You can access the portal from the **Template Construction Work Order** portal when reviewing or adding a template construction work activity.

The following zones may appear as part of the portal's **Main** tab page:

- **Template Construction Work Activity**: This zone displays information about the template construction work activity, such as Grand Total, Service Class, Work Class, Planner, Crew, Work Priority, Lead Days information, Checklist Types, and Template Activity Dependency.
- **Template Construction Activity**: This zone lists the template construction activities associated with the template construction work activity record.
- **Attachments**: This zone enables users to manage all types of attachments for the template construction work activity record.
- **Notes**: This zone displays note information associated with the template construction work activity record.

The following zones may appear as part of the portal's **Compatible Units** tab page:

- **Template Construction Work Activity CU List**: This zone lists the compatible units that have been added to the template construction work activity record.
- **Template Construction Work Activity CU Assignment**: This zone enables users to search for and then add compatible units to the template construction work activity record.

The following zones may appear as part of the portal's **Resources** tab page:

- **Materials**: This zone displays the stock item, quantity, and unit price derived from the CUs which can then be modified or added to.
- **Labor and Equipment**: This zone displays craft and equipment, rates, and hours derived from the CUs which can then be modified or added to.

The following zones may appear as part of the portal's **Cost** tab page:

- **Template Construction Work Activity Cost**: This zone displays a summary of overhead and resource costs based on the *Overhead* that was configured on the template construction work order.

Maintaining Activity Reconciliations

The **Activity Reconciliation** portal is used to display and maintain an activity reconciliation record.

Refer to About Construction Work for more information.

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You can access the portal from **Menu**, select **Construction Work Management**, then select **Activity Reconciliation**. You are brought to a query portal with options for searching for a specific activity reconciliation record. Once an activity reconciliation record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Activity Reconciliation Display**: This zone displays information about the activity reconciliation, such as approval profiles, fixed assets, removal of tracked assets, and contributed assets.

The following zones may appear as part of the portal's **Financial Transactions** tab page:

- **Activity Reconciliation Financial Transaction**: This zone lists the financial transactions associated with the activity reconciliation.

The following zones may appear as part of the portal's **Log** tab page:

- **Activity Reconciliation Log**: This zone lists log information for the activity reconciliation.
- **Approval Request History**: This zone lists the approval requests associated with the activity reconciliation.

Scheduling

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- Scheduling Portal

About Scheduling

The goal of the scheduling process is to produce the most effective schedule based on the requirements of the work. Scheduling accomplishes this goal by assigning tasks to crew shifts, matching work requirements to crew capabilities.

Planners can use the **Scheduling** portal to search for and to review new activity labor requirements and unfinished back log work in order to make allocations to available crew shifts. Users can also use this portal to view the capacity of shifts based on crafts. First search for the appropriate crew shift, then use the zones to search for activities, review the crew members, or access a graphical representation of craft capacities.

> **Note**
>
> Planners have the ability to add work activities to active crew shifts. Refer to Break In for more information.

Planners can also use the **Scheduling** portal to search for an activity scheduled to a shift. From the activity they can then add a single employee into the schedule or schedule more than one employee at a time.

Daily and Weekly Shifts

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Weekly and Daily shift schedules are planned periods of time used to manage crews as they perform their work. Refer to Daily Versus Weekly Schedules for more information.

Shift Plan Templates

Shift plan templates are used to automatically generate crew shifts based on a set of pre-defined shift criteria such as the shift type, the shift rotation, the defined calendar, and so on. Refer to A Shift Plan Template is Made of Shift Templates for more information.

Scheduling Work

The system schedules an activity to a crew shift, taking into consideration the activity's labor requirements and estimated duration. Refer to The Scheduling Process for more information.

Finding Backlog Work and Assigning

Use the **Scheduling** portal or **Crew Shift** portal's **Scheduling** tab to search for all unfinished and active labor requirements for the selected crew. Unfinished labor requirements are those which are still active but linked to completed or canceled crew shifts. When there are active labor requirements pending for the crew shift, the system provides a prompt where you can allocate the labor to the next available shift. Follow the prompts to complete the process of allocating the labor requirements either to the next available shift, or to a different crew shift.

- The Scheduling Process
- Daily Versus Weekly Schedules
- Break In

The Scheduling Process

The goal of the scheduling process is to produce the most effective schedule based on the activity's labor requirements.

The system considers the following during the scheduling process:

- Weekly and daily shift templates which are used to generate shifts into the future. Shift scheduling also takes into consideration work calendars and holidays.
- Capacities of a shift which is the sum of all the available principle and secondary crafts and their respective number of hours.
- Schedule Priority which determines when the principal craft time should be used for making assignments to a secondary craft.

How is the work scheduled?

- Once an activity is created with labor requirements, Planners or other authorized users can schedule work by navigating to either the **Schedule** tab on the crew shift or to the **Scheduling** portal. In either case, once the crew shift is identified, search for the activity to be scheduled, check the appropriate shifts and click **Apply**. A dialogue prompts for the scheduled hours for each labor requirement on the activity.
- Planners can review the shift assignment in the **Scheduling Details** section on the activity. There are also multiple other ways to search for labor active work such as by activity, by work order, by location, by crew, and so on.
- Using the **Schedule** portal, planners can pull already scheduled work from another shift. For example, the search can be used to transfer assigned work from a weekly shift to a daily shift. Furthermore, the **Previously Scheduled Unfinished Work** zone displays work already assigned to the crew shift being scheduled.

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- Each of these various details and views can be used according to your business practice to create the most efficient scheduling process for your organization.
- In addition, when a shift is completed, all unfinished activities assigned to the shift are copied to the next open shift for the crew. A dialog prompts the user for details on expected duration left to complete the work.

Daily Versus Weekly Schedules

A weekly shift is a weekly schedule plan containing a collection of daily shifts. A daily shift is the plan for a single shift on a specific day.

Please note the following with respect to shifts:

- Weekly shifts are referred to as “schedule plans” in the system since the plan can come in any multiple of weeks.
- A weekly shift’s capacities, service areas, and service classes are derived from its set of daily shifts.
- A weekly shift specifies a type, as does a daily shift
- A weekly shift specifies a crew name, as does a daily shift
- Both a weekly shift and daily shift can be scheduled
- A weekly shift does not specify employees, as daily shift does (instead, it has a collection of daily shifts)
- A weekly shift does not specify a template, as a daily shift does
- A weekly shift can have many daily shifts attached to it - just like a week has many weekdays
- A daily shift can only specify one weekly shift - just like a specific day belongs to just one week

Break In

There are times when users will need to modify the work on a crew shift that is already activated. The activities that are added to an active shift schedule are known as Break In activities and they essentially override the original schedule.

The **Activity Labor Requirements** zone on the crew shift record is stamped with the date and time of the break in activity.

Planners can also use the **Activity** portal to manually assign an active shift directly to a work order activity when the following conditions are true:

- Activity is in either an *Approved* or *Active* status
- None of the activity’s labor requirements has been scheduled to any shift.

Planner would click **Add to Schedule** and search for and select a shift once the dialog box appears.

About Crew Shifts

A crew shift is a planned period of time in which a crew (one or more workers) is scheduled to perform work. For example, a crew shift might be defined as Crew A, consisting of Jack and a van, working on a specific date from 9am — 5 pm.

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Refer to Understanding Scheduling for more information.

This section describes concepts related to managing crew shifts.

- Creating Shifts
- Service Area
- Crew Shift Workflow
- Controlling the Schedule
- Employee Unavailability

Creating Shifts

Typically, crew shifts are generated by shift plan templates that define the basic characteristics of the shifts. A crew's shifts may be generated by a single shift weekly template or daily shift templates at any given point in time.

Refer to Understanding Shift Plan Templates for more information.

Shifts can also be manually created to address special situations on particular days.

Service Area

Service areas define a logical boundary of your organization’s territory. Every crew shift is populated with a list of service areas that the crew shift is allowed to work. This is matched up with the service area indicated on the activity to help determine which crew shift can work the activity.

Crew Shift Workflow

The following describes key stages in the overall lifecycle of a crew shift.

Planning

A shift in this state means that the schedule is still being planned and activity resource requirements being added.

Active

A shift in an active status means that the shift’s schedule is approved for work. Any schedule changes made at this state is considered “break in”.

Incomplete

A shift having an incomplete status means that the shift has reached its planned start date and time and some work scheduled to it is not yet completed nor covered by a future schedule.

Completed

A shift in a completed state means that it has reached its planned end date and time and all the work scheduled to it is either completed or already scheduled to a future shift.

Cancelled

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This state indicates the shift is canceled and should no longer be used for scheduling. If any activities are currently scheduled to the shift, they need to be rescheduled.

A user or any process can cancel a shift that has not started yet. Once started, it can only be replanned or completed.

Planned shifts that were not started before their planned end date and time are automatically canceled.

Controlling the Schedule

This section describes the various aspects of a shift used by the scheduler to control the crew's schedule of work on that shift.

Fixed Shifts

By default, the duration of a shift is fixed and defined as the time between its planned start and end date and times. The crew is assumed to start their shift at the planned start time and end it at the planned end time. While typically shifts are shorter than a day, there is no such limitation in the system; they can be set up to any length as the business requires. For example, night shifts could be shorter than day shifts or special day shifts could be longer than regular day shifts.

Employee Unavailability

Employee unavailability records establish periods of time where an employee has been given leave from their regular job duties. This might be due to circumstances such as vacation, sick leave, jury duty, and so on. Logging employee unavailability allows the system to know when an employee is not available to perform work on the crews that they are associated with and to create their timesheet, if desired, during the time when they are unavailable. Users can enable automatic timesheet creation for employee unavailability, by selecting the **Auto Timesheet Creation** box on the **Employee Unavailability** record and entering the **Date**, **Hours**, and **Timesheet Detail** information in the **Timesheet List** section. Timesheets are only created for an "Approved" unavailability period if the **Timesheet Date** is less than or equal to the **Current Date**. Then the daily scheduled *Employee Unavailability (W1-EU)* batch would create the records going forward.

Employee unavailability types define the kinds of leave that might be used when creating an **Employee Unavailability** record.

Standard approval processing facilitates approval or rejection of employee leave. After the leave is approved, employees indicated on the attendees list are not available as work resources. This means that during scheduling, the crafts available to the shift are reduced so that the employee on leave cannot be included. Timesheet generation is completed for the leave according to your settings and business practices.

Employees who need to cancel their unavailability are able to do so by selecting **Cancel** on the unavailability record. The unavailability is then ignored during the scheduling process and the Craft Capacity and Available hours are increased so that the employee is once again considered for the shift.

Maintaining Crew Shifts

This portal is used to view and maintain crew shifts.

Refer to About Crew Shifts for more information.

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You can access this portal from **Menu**, select **Resource Management**, and then select **Crew Shift**. You are brought to a query portal with options for searching for specific crew shifts. Once the crew shift has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Crew Shift**: This zone provides information about the selected crew shift, including crew status, crew shift type, subscriptions, crew members, service classes, service areas, and more.
- **Daily Schedules**: This zone displays the actual crew shift hours (For example, 8am - 4pm).
- **Activity Labor Requirements**: This zone displays the work activity and labor requirements associated with the crew shift.
- **Mobile Subscriptions**: This zone displays a list of employees currently subscribed to the crew's daily shift from their mobile device.

The following zones may appear as part of the portals **Schedule** tab page:

- **Crew Shift Craft Capacity**: This zone displays a graphical representation of the various crafts, craft capacities, and remaining hours for the particular crew shift.
- **Crew Members**: This zone lists the crew members and their relationship to the crew. For example, crew member or supervisor .
- **Activity Search**: This zone displays a query portal with options for searching for activities.

Maintaining Employee Unavailability

This portal is used to view and maintain employee unavailability.

You can access this portal from **Menu**, select **Resource Management**, and then select **Employee Unavailability**. You are brought to a query portal with options for searching for a specific employee unavailability record. Once the employee unavailability has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Employee Unavailability**: This zone provides information about an employee's leave including definitions for creating a timesheet during the unavailability period.

Scheduling Portal

This portal helps planners manage craft capacities and activity labor requirements for crew shifts.

You can access this portal from **Menu**, select **Work Management**, and then select **Scheduling**. You are brought to a query portal with options for searching for a specific crew shift. Once the crew shift has been selected, you are brought to the **Scheduler** portal where you can view and manage the craft capacities and labor requirements for the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Craft Capacity.** This zone displays a graphical representation of the various crafts, craft capacities, and remaining hours for the particular crew shift.

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- **Activity Search.** This zone displays a query portal with options for searching for activities.
- **Scheduled Labor Requirements.** This zone displays the work activity, labor requirements, and crew allocation associated with the crew shift.

Refer to About Scheduling for more information.

Approvals

- About Approvals
- Maintaining Approval Requests
- About Change Requests
- Maintaining Change Requests

About Approvals

Approvals simplify the routing of work orders, purchase requests, timesheets, and other documents that require approval.

Approval requests use approval profiles to define the requirements for the approval:

- Who receives the approval
- Method for notifying the approver
- Which work calendar to use

When the approval request is submitted, the system sends a notification to all approvers defined on the approval profile according to the **To Do Roles** and the **Sequence** defined on the profile. Notifications can be sent using email, To Do List, or both, depending on the system notification settings.

Approvers can use the **Approval Dashboard** to manage the approvals that require their attention.

This section describes how various processes work together to manage approvals throughout the system.

Refer to Maintaining Approval Requests in the **Business User Guide** for information on maintaining approval requests.

Refer to Understanding Approval Processing in the **Administrative User Guide** for more information.

- Approval Profiles
- Approval Routing
- Outstanding Approvals at a Glance
- Approval Dashboard

Approval Profiles

Approval profiles are used to define the approval hierarchy within your organization and controls which approvers are required to approve the record.

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Approval Profiles based on **To Do Roles** define:

- the approvers level of authority to approve a document
- the types of documents the role can approve
- the working calendar to use when determining approval time lines and when to send To Dos
- dollar amount maximums that the role is authorized to approve

An approval profile can have one or many **To Do Roles** and it is possible for an approver to be assigned to more than one To Do Role in the same approval profile.

Depending on the notification setting designated on the approval profile, the approver can receive an email, an alert, or both in their **To Do List**.

> **Note**
>
> Individual approvers can choose to modify their notification settings for approvals. Navigate to the **User** portal and access the **Characteristic** tab to set the **Approval Profile E-Mail Override** setting to disable email notifications for approval requests. When this is set, the approver does not receive any emails and must rely on the approval dashboard or To Dos.

Approval Routing

The approval request, once submitted, is routed for approval based on the roles of the approvers and their approval decisions. For example:

- **One Standard Role**: If the approval profile consists of one To Do Role with mandatory or standard approval type, the users with that role receive the approval notification and any one of them can approve the request as long as the To Do Role has authority for the needed dollar amount.
- **Multiple Roles/All Standard**: If the approval profile consists of multiple To Do Roles and all are standard, any To Do Role can approve the request as long as they have the authority for the needed dollar limit.
- **Mix of Mandatory and Standard Roles**: If the approval profile consists of multiple To Do Roles with a mix of mandatory and standard, the users with mandatory must approve the request even if the standard approvers have authority based on the dollar limit or other factors. In other words, the mandatory approval role must take an action by agreeing or rejecting the request.
- **Request Time-out**: If approvers do not respond to the request within the time allotted by the time-out threshold, the system sends another notification to the approvers. If action is still not taken, the request moves to the next approval role, as applicable and the next role receives notification.
- **One Approver with Multiple Roles**: If one approver has multiple To Do Role s on one approval profile for the request, the system prompts that person to indicate which role they are approving. For example, approver Jon is in both the supervisor and manager To Do Roles. When an approval request comes in and Jon approves the request, a selection box opens to allow Jon to choose in which **To Do Role** the request is being approved . If Jon selects multiple approval requests to approve at once in the **Approval Dashboard** Jon may receive a warning to specify an **Acting To Do Role** before selecting an action. This means you must pick a role from the **Acting To Do Role** drop down and click **Search** to let the system know which role you are using to approve the requests.

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- **Insufficient Approval Amount**: If an approval request comes in for a record with a higher dollar amount than anyone on the approval path is authorized to approve, the requestor is notified that no one on the approval profile has sufficient authority. The requestor must choose a different approval profile and resubmit.
- **One Standard Role**: If an approver rejects the approval request, the request terminates and additional approvers on the approval path are not notified. The requestor is notified that the request has been rejected. Any approver in the route can reject and terminate the approval process regardless of their approval authority or limit amount. However, this does not apply for “notification only” approvers.
- **Not Authorized to Approve**: Some roles might be set as “not authorized to approve” but they still appear on the approval path. These approvers receive notification of the request and can approve or reject, but their decision is simply recorded for the next approver on the approval path to be aware of their decision. This setting is only applicable for an approval profile that is for no amount.
  If this type of approver rejects the request, the same processing applies as described for “one standard role”.

Outstanding Approvals at a Glance

The **Approval Dashboard** provides approvers with a quick glance, by document type, of the status of approvals that are currently due or are now past due. Approvers can then take appropriate action to reject or approve the requesting document.

Also, the system includes an **Approval Request Action** dashboard zone in the side dashboard which highlights any new approval requests that require the logged in user’s attention. The user can approve or reject the request directly from this dashboard, if desired.

Approval Dashboard

The approval dashboard provides a summary of approval requests that have been sent to the broad list of approvers with a breakdown of the approval profiles. This overview provides approvers with a simple summary of the records requiring their attention.

The summary list includes the counts of approval requests that have been sent out to any approvers that are not **Notification Only** and shows the current approvers and the mandatory future approvers. The list is broken down by document type and approval profile.

It is possible to filter the list by current or future approvers using the **Queue** field. The filter is used to distinguish current and future approval requests which may require the attention of the approver. For example, if an approver is about to go on vacation, they may want to take action on an approval request early. In this case the list can be filtered by “future” approval requests where this approver is not necessarily next in the approval route. This is a way for the approver to obtain a “preview” of requests that are coming from the route.

Broadcasting an individual line opens a zone where the approver can check off records and choose a button to make their approval decision (approve or reject). The approver can also click the link to open the approval request itself, and to open the individual record.

Note that the dashboard contents are specific to the logged in user, so one person may see a different list than another depending upon their approval authority.

Refer to About Approvals for more information.

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Work Order Approval Summarization and Work Request Approval Summarization

Work Order Approval Summarization and Work Request Approval Summarization use generative Artificial Intelligence (GenAI) models to compile and provide a summary of the approval. The specific information provided for each is as follows:

- **Work Request Approval Summarization**: A summary of the approval request and work request to help users understand the work to be performed. In addition, related possible-duplicate information and, when available, approval history information is displayed with the summary.
- **Work Order Approval Summarization** A summary of the approval request, work order, and activity information to help users understand the work to be performed. In addition, access to individual activity records requiring approval and, when available, approval history information is displayed with the summary.

Click the icon in **Summarize** column of the **Approval Detail List** zone to view the **Approval Summary**, which provides a summary of the requesting document and approval request, as well as some key observations.

See Enabling the Work Order and Work Request Approval Summarization Features for more information about enabling this feature for work orders and work requests.

> **Note**
>
> - Work Order Approval Summarization and Work Request Approval Summarization are available under Limited and Controlled Availability in approved regions.
> - Work Order Approval Summarization and Work Request Approval Summarization rely on generative AI models that must be deployed as part of your cloud service implementation. Please contact your Oracle Customer Success Manager if you wish to use Work Order Approval Summarization or Work Request Approval Summarization.
> - Work Order Approval Summarization and Work Request Approval summaries are prepared by generative AI. Carefully review and verify them against trusted sources, as they may include out-of-date, inaccurate, or incomplete information.

Maintaining Approval Requests

This portal is used to view and maintain approval requests.

Refer to About Approvals for more information.

You can access the portal from **Menu**, select **Home Page**, then select the **Approvals** tab. Broadcast the **Document Type** and then select the **Approval Request ID** hyperlink from within the **Approval Detail List** zone.

The **Approval Request** zone on the portal's **Main** tab page provides information about the approval request, including approvers, approval amounts, approval profile, etc.

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About Change Requests

Change requests simplify the process associated with managing changes respective to assets, asset locations, vendors, vendor locations, stock items, stock item details, and any other records as appropriate.

The **Change Request** portal controls the full cycle of the change request, from request creation, review, approval, application, and closure. The portal includes an **Original** zone, which holds all the original data elements, and a **Proposed** zone, which holds all the changed data. The updated data elements are saved as temporary until the change is approved.

When the change request is submitted for approval, the system sends a notification to all approvers defined on the approval profile according to the **To Do Roles** and the **Sequence** defined on the profile. Notifications can be sent using email, To Do List, or both, depending on the system notification settings.

Approvers can use the **Approval Dashboard** to manage the change request approvals that require their attention.

Refer to Maintaining Change Requests in the **Business User Guide** for information on maintaining change requests.

Refer to Understanding Change Request Types in the **Administrative User Guide** for more information.

- Change Request Approval Profiles
- Change Request Approval Routing

Change Request Approval Profiles

Change request approval profiles are used to define the approvers who are required to approve a change request record.

Approval Profiles based on **To Do Roles** define:

- the approvers level of authority to approve a record
- the types of documents the role can approve
- the working calendar to use when determining approval time lines and when to send To Dos

An approval profile can have one or many **To Do Roles** and it is possible for an approver to be assigned to more than one **To Do Role** in the same approval profile. Valid types of approval profiles include the following:

- Non-Amount Based
- No Approval Required

Depending on the notification setting designated on the approval profile, the approver can receive an email, an alert, or both in their **To Do List**.

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> **Note**
>
> Individual approvers can choose to modify their notification settings for approvals. Navigate to the **User** portal and access the **Characteristic** tab to set the **Approval Profile E-Mail Override** setting to disable email notifications for approval requests. When this is set, the approver does not receive any emails and must rely on the **Approval Dashboard** or **To Dos**.

Change Request Approval Routing

The change request approval request, once submitted, is routed for approval based on the roles of the approvers and their approval decisions. For example:

- If the approval profile consists of one **To Do Role** with mandatory or standard approval type, the users with that role receive the approval notification and any one of them can approve or reject the request.
- If the approval profile consists of multiple **To Do Roles** and all are standard, any valid **To Do Role** can approve or reject the request.

The approver is able to review the proposed changes and approve or reject the change request. Rejected requests can be resubmitted for approval once the issue is resolved. Once approved, a user can click the **Apply Changes** button to apply the change. This action completes the change request and updates the appropriate record.

Maintaining Change Requests

The **Change Request** portal is used to display and maintain a change request record.

Refer to About Change Requests for more information.

You can access the portal from **Menu**, select **Resource Management**, then select **Change Request**.

- If **Add** is selected:
  - Only a “Generic” change request can be created.

> **Note**
>
> Creation of any other type of change request must be on the change request associated record. Once on the associated record, user permissions drive who is able to create the change request. Users having full permissions can select **Edit** to make their changes or select the **Create Change Request** button directly from the **Dashboard**. Users having limited permissions can only create a change request by selecting the **Create Change Request** button directly from the **Dashboard**. Once the change request is created, users having full permissions can view the change request by going directly to the associated record and clicking the change request hyperlink from the zone on the **Dashboard**.

- If **Search** is selected:

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- User is brought to a query portal with options for searching for a specific change request. Once a change request has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Change Request**: This zone displays information about the change request, including the description of the change and any warning information.
- **Original**: This zone displays the original details of the request.
- **Proposed**: This zone initially displays original data. Selection of an **Edit** hyperlink enables the user to update the data to proposed values. This zone highlights the updated **Field** names and also the **List Headers** on the associated record if the content of the list has changed.
- **Attachments**: This zone enables users to manage all types of attachments for the change request record.

The following zones may appear as part of the portal's **Log** tab page:

- **Change Request Log**: This zone displays log details for the change request.
- **Approval Request History**: This zone displays the approval histories for the request.

Resource Usage

- About Timesheets
- About Resource Charges
- Maintaining Timesheets
- Maintaining Timesheet Quick Entry
- Maintaining Other Direct Charges

About Timesheets

Timesheets are used to record the amount of time that workers (labor resources) spend on activities or work orders. Once charges are entered, processing allows these workers to receive proper compensation for their work and labor charges are applied to the appropriate cost buckets.

Generally, each of these individual workers and the persons designated as their supervisor are the only ones who can access or enter timesheet information for that individual, however, authorized “timekeepers” who are not supervisors of these individuals can be configured to manage timesheet information for these workers. Refer to Timekeepers for more information.

Timesheet Access

Access to an employee’s timesheet is controlled in the following manner:

- Employees can always access their own timesheet
- An employee having a supervisor role can access any of their employee’s timesheets. This access is hierarchical such that a supervisor’s designated supervisor is also able to access timesheets for lower-level employees.
- Users can be assigned to the role of Timekeeper and will have access to all employee’s timesheets listed on the *Active* Timekeeper record.

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- Users can be designated as a special group, usually payroll employees, on their User record that gives them access to all employee timesheets.

Unrestricted Timesheet Search (W1UTMSTS) application service can be associated with a User Group which allows any employee to search for any employee and create or access their timesheet. The employee is not restricted to a list of valid employees they are responsible for but can simply click the **Search** icon next to the **Employee** field and search for and create or access timesheets for that employee.

Shift Types

When workers book time, they also specify the shift type they worked. Different shift types have different multipliers and adders which impact the labor costs. Timesheets can only specify daily shift types (as opposed to weekly shifts).

To restrict access to only those employees that are valid for the Employee, remove the Unrestricted Timesheet Search (W1UTMSTS) application service from the User Group to provide a drop-down list of valid employees the employee can create and edit timesheets for.

- Timesheet Quick Entry

Timesheet Quick Entry

The **Timesheet Quick Entry** portal allows a user to enter any number of timesheet detail entries for any number of employees and for any charge types, for example activity, cost center, project, leave, and process function. The employees available to be chosen by the logged on user is defined as below:

- The employee record of the logged on user
- If the logged on employee is a supervisor, all of their employees
- If the logged on user is a timekeeper, employees on the timekeeper record
- If the logged on user has payroll security authorization, any employee

New timesheet details can be entered manually, or user can create a .csv file in which to upload the new entries. See Creating CSV Files for more information.

Once the entries are complete, the system checks whether there is an existing timesheet for the same time period for each employee:

- If yes, the system creates a new timesheet detail under that same timesheet header.
  - If in a **Created** status, new line items are added in **Created** status.
  - If in an **Approved** status, timesheet is returned to **Created** status, existing line items are left alone, and new line items are added in a **Created** status.
  - If in **Posted** status, timesheet is returned to **Created** status, existing line items are left alone, and new line items are added in a **Created** status.
- If no, new timesheet header is created and timesheet details for the same employee and time period are added to that timesheet header.

Timekeepers can use the **Timesheet Quick Entry Search** option to search for timesheet entries they have created.

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> **Note**
>
> This search option restricts timekeepers to only those timesheet entries they have created.

About Resource Charges

Each activity on a work order is defined with one or more resource requirements which is needed to perform the activity. Resources are referenced on the activity so the system can track what is charged for each resource against the total cost of completing the activity.

- Equipment Charges
- Other Direct Charges

Equipment Charges

Equipment is referenced on activities as a material resource requirement. The system tracks usage and reports the costing associated with that usage against the total cost of completing the activity.

Other Direct Charges

Other direct charges are defined by your organization to be referenced as a charge type to charge work against. This might include miscellaneous charges for activities such as meals, miles, a hotel stay, car or truck rentals, and so on.

Other direct charges are incurred on activities as a material resource requirement from “miscellaneous resources”. The system tracks usage and reports the costing associated with that usage against the total cost of completing the activity.

Maintaining Timesheets

The **Timesheet** portal is used to display and maintain a timesheet record.

Refer to About Timesheets for more information.

You can access the portal from **Menu**, select **Work Management**, then select **Timesheet**. You are brought to a query portal with options for searching for a specific timesheet. Once a timesheet has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Timesheet Display**: This zone displays information about the timesheet. This zone displays the status, employee, and time period of the timesheet. Timesheet summary section displays a chart that includes the craft and regular, overtime, and total hours summarized for the timesheet.
- **Timesheet Detail Quick Add**: This zone enables a user to quickly enter timesheet details.
- **Timesheet Details**: This zone displays information from the timesheet details.

The following zones may appear as part of the portal's **Log** tab page:

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- **Timesheet Log**: This zone displays log details for the timesheet.
- **Approval Request History**: This zone displays approval service histories for the timesheet.

Maintaining Timesheet Quick Entry

The **Timesheet Quick Entry** portal is used to create timesheet detail records.

Refer to About Timesheets for more information.

You can access the portal from **Menu**, select **Work Management**, then select **Timesheet Quick Entry**. You are brought to a query portal with options for searching for your timesheet quick entry records. Once a record has been selected, you are brought to the maintenance portal where you can create, view, and update the associated timesheet detail records and then process and complete the entry using the completion event to create the appropriate timesheet header and timesheet detail records.

The following zones may appear as part of the portal's **Main** tab page:

- **Timesheet Quick Entry**: This zone displays the status and new timesheet detail records created by the user.
- **Timesheet Quick Entry Completion Event**: This zone displays timesheet quick entry completion events associated with the record.

Maintaining Other Direct Charges

The **Other Direct Charges** portal is used to display and maintain an other direct charge record.

Refer to About Timesheets for more information.

You can access the portal from **Menu**, select **Work Management**, then select **Other Direct Charge**. You are brought to a query portal with options for searching for a specific other direct charge. Once a record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Other Direct Charges**: This zone displays information about other direct charges including an other direct charges details summary.
- **Other Direct Charges Detail Quick Add**: This zone enables a user to quickly enter other direct charge details.
- **Other Direct Charges Details**: This zone displays other direct charge detail information.

The following zones may appear as part of the portal's **Log** tab page:

- **Other Direct Charges Log**: This zone displays log details for the other direct charges record.
- **Approval Request History**: This zone displays approval service histories for the other direct charge record.

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Financials

- About Financial Transactions
- About Cost Adjustments
- Maintaining Financial Transactions
- Maintaining Cost Adjustments

About Financial Transactions

Financial transactions are created in the system whenever an object generates a cost transaction. For example, the posting of a timesheet or other direct charges can create a financial transaction. Authorized users can access this accounting log at any time to review transactions.

Users can navigate to the **Financial Transaction** portal and search for financial transactions according to the corresponding work order, activity, creation date, status, and so on.

Financial transactions are automatically frozen upon creation and the transactions that created them, sibling transactions, are finalized. For example, a material issue or a timesheet detail are considered the siblings to the financial transactions that they created. Once frozen, a financial transaction and its details are ready to be interfaced to the general issues. The system does not depend on batch processing to transition financial transactions between states. Instead, a batch GL interface program extracts frozen financial transactions and creates a flat file.

If there happens to be any accounting setup issues or other issues, a financial transaction will enter an error state until an authorized user adjusts the configuration or other source of the issue. Refer to the **Administrative User Guide** for more information. The error state allows any sibling transactions to continue and complete without being affected by the related transaction which is in error.

Refer to the Understanding Financials section in the **Administrative User Guide** for configuration guidelines.

About Cost Adjustments

Cost adjustments enable the correction of erroneous applied charges. Costs can be transferred from one activity to another, project to project, cost center to cost center, activity to cost center, and so on.

Each cost adjustment line item represents one entity, for example, activity, project, or cost center involved in the transfer of charges and for each line item both a cost center and an expense code must be specified.

Maintaining Financial Transactions

The **Financial Transaction** portal is used to display and maintain financial transaction records.

Refer to About Financial Transactions for more information.

You can access the portal from **Menu**, select **Financial**, then select **Financial Transaction**. You are brought to a query portal with options for searching for a specific transaction. Once a

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record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Financial Transaction**: This zone display information about the financial transaction such as, currency code, accounting date, GL details, and more.

Maintaining Cost Adjustments

The **Cost Adjustment** portal is used to display and maintain cost adjustment records.

Refer to About Cost Adjustments for more information.

You can access the portal from **Menu**, select **Financial**, then select **Cost Adjustment**. You are brought to a query portal with options for searching for a specific cost adjustment. Once a cost adjustment has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Cost Adjustment**: This zone lists information about the cost adjustments and details such as cost center, expense code, amount, and so forth.
- **Attachments**: This zone displays the attachments associated with this specific record.

The following zones may appear as part of the portal's **Financial Transaction** tab page:

- **Cost Adjustment Financial Transaction**: This zone lists the financial transactions for the cost adjustment.

Oracle Utilities Customer Program Management Cloud Service / Customer Program Management

- Overview
- About Customer Program Management
- Maintaining Controllable Assets and Devices
- Maintaining Device Locations
- Maintaining Facilities
- Maintaining Metered Service
- Maintaining Metered Service Points
- Maintaining Network Locations
- Maintaining Programs and Related Records
- Maintaining Devices and Measurements
- Maintaining Event Impact Measurement & Verification Data
- Maintaining Customer Program Service Tasks

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- Enrolling and Unenrolling Customers Using Process Flow
- Creating Program Service Calls Using Process Flow
- Manually Completing Work Activities Using Process Flow
- Using the Customer Program Summary Portal
- Using the Program Dashboard
- Using Unified Search with Customer Program Management Cloud Service / Customer Program Management
- Other Related Functionality

Overview

Customer Program Management refers to the core functionality for utilities to create, run, and maintain demand response and distributed energy resource programs as part of a larger distributed energy resource management system (DERMS).

Customer Program Management functionality is offered via the following products:

- Oracle Utilities Custom Program Management Cloud Service
- Oracle Utilities Customer Program Management (when implemented on-premises)
- Oracle Utilities Customer Cloud Service

> **Note**
>
> Customer Program Management functionality in Oracle Utilities Customer Cloud Service must be licensed separately.

Demand response programs are programs in which customers agree to let their utility service provider temporarily alter the settings of specific devices in their homes (referred to as controllable devices or controllable assets) in response to periods of high demand. For instance, customers might enroll in a program that allows their utility to temporarily adjust their thermostat during a heat wave, or disable an electric vehicle charger during a period a of peak energy usage in the area. Instances such as these are known as "program events".

Oracle Utilities Customer Program Management Cloud Service also supports behavior-driven demand management programs, such as Critical Peak Pricing Programs or Peak Time Rebate programs that do not involve controllable devices.

Customer information, including service agreements, service locations, and contact information, can be received from a customer information system, such as Oracle Utilities Customer Cloud Service or Oracle Utilities Customer to Meter, and be used when enrolling customers in demand response programs.

Customer program eligibility criteria can include specific types of controllable devices, current utility rates, past and present program participation, customer opt-out history, heating/cooling technology, and specific customer questions (such as "Does your house have an internet connection?").

Customer enrollment involves identifying a specific customer that is eligible for a particular program. Some programs also involve and one or more controllable devices installed at a specific device location that are applicable to a specific program, but not all programs involve devices. Devices can include those that the customer purchases and installs themselves, those that the utility provides to the customer to install, and those that the utility provides and

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installs at the customer's location, and can include "smart" thermostats, electric vehicle chargers, storage batteries, and other types of devices. Programs that don't involve devices include home energy assessment programs, critical peak pricing, programs, among others.

As devices are installed and registered during the enrollment process, device information is provided to an advanced distribution management system (ADMS) such as Oracle Utilities Network Management System, a distributed energy resource management system, or a supervisory control and data acquisition (SCADA) system. These systems are sometimes referred to as "control systems" and are used to manage communication with and control of individual controllable devices during program events.

Device control scores - numerical ratings that help utilities determine if a device should participate in a program event - are calculated on a daily basis and sent to the distributed energy resource management system. When a utility determines that it should run a program event, control system operators use control score information (in addition to other data) to identify a set of devices that should participate in the program event, and the control system sends details of the event to Oracle Utilities Customer Program Management Cloud Service. Program event details include the date and time of the event, as well as a list of devices that will participate in the event, and if appropriate, specific dates and times during which each device will participate in the program event. This information is used to create "event participation" records for each device.

After the event has completed, the control system sends a list of devices that participated in the event, and the outcome of each device's participation. Outcomes can include successful participation in the event, cancelation of the event for the device, an "in-flight" override in which the customer overrides the control of the device at its location, or an error. The results of the program event are used to update the event participation records for each device, which are subsequently used in future control score calculations.

Calculation of device control scores is performed through configuration of program rules and score calculation rules that use pre-configured values and customer-defined formulas. Program rule parameters can include the number of times within a specific period (such as a week or month) that an individual device can participate in an event, the frequency of these cyclical periods, the minimum number of days that must transpire between events, and more. Control scores are intended to capture the contract rules the device operates under, both from an operational perspective as well as a financial perspective.

Customer measurement data can be imported from a customer information system such as Oracle Utilities Customer Cloud Service or Customer to Meter, which can be used to calculate a customer's "baseline" usage used when calculating reductions in customer usage related to demand response programs.

As device-related events are completed, program event settlement transactions are created that represent credits that will be applied to a customer's bill based on participation in an individual event. Program event settlement transactions can be created either from data received from an external analytics application or via a batch process. When created via batch processing, data regarding reductions in consumption or demand for the event is calculated via Program Settlement Calculation Rules which perform a comparison of actual consumption or demand to a "baseline" that represents an estimate of the customer's consumption or demand for the event period had they not participated in the event. When created from an external analytics application, the application sends files containing details regarding consumption or demand reduction achieved for the duration of an event for each customer. These reductions are multiplied by a price to determine the total credit to be applied to the customer's bill for the event.

Program event settlement transactions aren't applied directly to a customer's bill. Instead, they are collected in customer settlement transactions that summarize all of the events in which the customer participated during a given time period. In other words, customer settlement

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transactions represent the total of all of the customer's program event settlement transactions for a given time period. Customer settlement transactions are created upon requests from a customer information system. These requests are typically sent on an annual basis (such as at the beginning or end of the year), but customer settlement transactions are also created in the other specific situations such as when a customer moves out or stops their service (in which case the customer settlement is applied to the customer's final bill), when a customer is re-billed (in which case the customer settlement is applied to the customer's new bill), or when a customer unenrolls for a program (in which case the customer settlement is applied to the customer's next bill). Once calculated. customer settlement transactions can be downloaded and sent to the customer information system for use in billing.

Oracle Utilities Customer Program Management Cloud Service also includes other asset management functionality, including inventory, purchasing, financials, work orders and more.

About Customer Program Management

This section describes customer program management objects and data used with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

- About Controllable Assets and Devices
- About Device Locations
- About Facilities
- About Metered Service
- About Metered Service Points
- About Network Locations
- Programs
- Devices and Measurements
- Event Impact Measurement and Verification
- About Customer Program Service Tasks
- About Enrollment and Unenrollment
- About Service Calls

About Controllable Assets and Devices

Controllable assets and devices are the individual devices installed at a device location that can participate in demand response programs and program events. Devices can include those that the customer purchases and installs themselves, those that the utility provides to the customer to install, and those that the utility provides and installs at the customer's location, and include devices and assets such as thermostats, batteries, photo-voltaic solar panels, and other devices.

Controllable assets are represented by two records in the system: a controllable asset, and a controllable device. When a new controllable asset is created, a corresponding controllable device record is created automatically.

Controllable assets are defined by the following:

- **Asset Type**: The asset type record on which the asset is based. Asset types define certain parameters and attributes of a class of assets.

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- **Status**: The current status of the asset. Only assets in the "Active" state can participate in program events.
- **Identifiers**: The Badge Number, Serial Number, Network Identifier, and Network Address used to identify the asset in the system and in external systems.
- **Specification**: The specification for the asset. See Controllable Asset Specifications below for more information.
- **Asset Disposition Detail**: The current disposition of the asset (such as "In Receipt", "In Store", "Installed", "Retired", and so on), including the asset's location and the date and time the asset was moved to that location.
- **Access Control**: Details about the organizations which have access to data related to the asset.
- **Control Score**: Details about the asset's control score, calculated via program calculation rules, including:
  - **Score**: The most recent control score calculated for the controllable asset or device.
  - **Score Date/Time**: The date and time at which the control score was calculated.
  - **Asset Availability**: A flag that specifies ("Yes" or "No") whether or not the asset is available for events based on the last score calculation.

Controllable devices are defined by the following:

- **Device Type**: The device type record on which the device is based. Device types define certain parameters and attributes of a class of devices.
- **Status**: The current status of the device. Only devices in the "Active" state can participate in program events. A device's status always matches the status of its corresponding asset.
- **Identifiers**: The Badge Number, Serial Number, Network Identifier, and Network Address used to identify the device in the system and in external systems.
- **Manufacturer** and **Model**: The manufacturer and model of the device.
- **Head-End System**: The head end system associated with the controllable device
- **Head-End Registration Status**: The registration status of the controllable device on the head end system. This is updated via data synchronization as appropriate based on data in a related Distributed Energy Resources Management System
- **DER Aggregator Service Provider**: The aggregator with which the device is registered

System Data

Controllable assets are based on the following system data:

Data Type	Description
Maintenance Object	Asset (W1-ASSET)
Business Object(s)	Controllable Asset (X1-ControllableAsset)

Controllable devices are based on the following system data:

Data Type	Description
Maintenance Object	Device (D1-DEVICE)
Business Object(s)	Item (D1-Item)

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Controllable Asset Specifications

Controllable asset specifications describe design details and functional performance criteria for a set of controllable assets. This can include manufacturer, model, and other information specified for the assets. Specifications may also contain written procedures, careful handling instructions for hazardous or delicate materials, or any other set of attributes needed to provide information about a set of assets. Controllable asset specifications should be created using the Controllable Asset Specification (X1-ControllableAssetSpec) business object.

See About Specifications for more information about specifications.

System Data

Controllable asset specifications are based on the following system data:

Data Type	Description
Maintenance Object	Specification (W1-SPEC)
Business Object(s)	Controllable Asset Specification (X1-ControllableAssetSpec)

Distributed Energy Resource (DER) Device Attributes

Registration of DER devices includes populating various attributes of the device and related specifications. These DER attributes are captured as characteristics whose Characteristic Types are defined for the "Asset Attribute" and "Specification Attribute" characteristics entities.

See Distributed Energy Resource (DER) Device Attributes in for more information about configuring these attributes and attribute types.

About Device Locations

Device locations represent locations where controllable devices are installed and used. A device location can have multiple controllable devices installed at a time.

Device locations are often created as a result of the customer enrollment process, but can be created on an ad-hoc basis as needed.

Device locations are defined by the following:

- **Device Location Type**: The device location type record on which the device location is based. Device location types define certain parameters and attributes of a class of device locations.
- **Distribution Network Facility**: The network node closest to the device location. In terms of electric networks, facilities typically represent transformers.
- **Division**: The operating company or operating division within a large conglomerate of utilities associated with the device location.
- **Status**: The current status of the device location.
- **Address and Location Information**: The address (including city, state, postal code, and country) and geographic location of the device location.
- **Controllable Devices**: A list of one ore more controllable devices installed at the device location, including the date and time the device was installed or removed (as applicable), and whether or not the device is active. When a controllable device has been removed, this list also indicates a crew (used to identity the Out of Service Location where the the asset is moved to upon removal).

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- **Life Support / Sensitive Load Information**: Information regarding life support equipment installed at the device location, or if the load supplied to the device location is considered sensitive.
- **Field Information**: Information related to field work performed at the device location, including any applicable warnings or instructions.

System Data

Device locations are based on the following system data:

Data Type	Description
Maintenance Object	Service Point - MDM (D1-SP)
Business Object(s)	Device Location (X1-DeviceLocation)

About Facilities

Facilities represent the network node level closest to the device location. In terms of electric networks, facilities typically represent transformers, but can also be feeders and substations.

Facilities are defined by the following:

- **Facility Type**: The type of facility (derived from the business object). Facilities used with Customer Program Management are typically transformers, but can also be feeders and substations.
- **Service Type**: The type of service provided by the facility. This is most often "Electric".
- **Status**: The current status of the facility.
- **External ID**: An ID used to identify the facility in external systems.
- **Time Zone**: The time zone in which the facility resides.

System Data

Facilities are based on the following system data:

Data Type	Description
Maintenance Object	Facility (D1-FACILITY)
Business Object(s)	Feeder (D1-Feeder) Substation (D1-Substation) Transformer (D1-Transformer)

Defining Facility Types

Different types of facilities can be defined using the Facility Type (D1-FacilityTypeLookup) extendable lookup. This lookup can be used to define the Network Node Type for each type of facility (such as transformer, feeder, or substation), as well as whether or not facilities of a given type are eligible to be connected to metered service points (via the **SP Connection Eligibility** flag).

About Metered Service

Metered service records represent a customer's service agreements and usage subscriptions in Oracle Utilities Customer Cloud Service (or Oracle Utilities Customer to Meter),

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Metered service records are created via a data synchronization process between Customer Program Management Cloud Service and Customer Cloud Service.

Metered Service records are used as Master Subscriptions when creating Program Subscriptions.

Metered service records are defined by the following:

- **Metered Service Type**: The metered service type record on which the metered service is based. Metered service types define certain parameters and attributes of a class of metered services.
- **Status**: The current status of the metered service record.
- **Start and End Date/Time**: The date and time on which the metered service record started, and ended (if applicable).
- **External ID**: An ID used to identify the metered service record in an external system.
- **External Account ID**: An ID used to identify the account associated with the metered service record in an external system.
- **Main Customer**: The program contact associated with the metered service record.
- **Time Zone**: The time zone associated with the metered service record.
- **Bill Cycle**: The bill cycle associated with the metered service record, used when calculating program incentives and fees via batch processing. If defined here, the Bill Cycle is defined by default on all program subscriptions for the metered service.
- **Rate History**: A list of one or more effective-dated Oracle Utilities Customer Care and Billing or Oracle Utilities Customer to Meter (or Customer Cloud Service) rates for the metered service record. These are used to determine a customer's eligibility to participate in a program. Rates can be defined using the Customer Rate Schedule extendable lookup.
- **Metered Service Points**: A list of one or more metered service points associated with the metered service record, including the start and stop dates and times for each.
- **Program Subscriptions**: One or more program subscriptions that have the metered service defined as their Settlement Group.
- **Attribute Values**: Attribute values whose characteristic type are defined as valid characteristic types on the metered service type.
- **Settlement Group Program Subscriptions**: Program subscriptions that have the metered service defined as their Settlement Group.

System Data

Metered service records are based on the following system data:

Data Type	Description
Maintenance Object	Usage Subscription (D1-US)
Business Object(s)	Metered Service (X1-MeteredService)

About Metered Service Points

Metered service points represent service points in Oracle Utilities Customer Cloud Service (or Oracle Utilities Customer to Meter).

Metered service points are created via a data synchronization process between Customer Program Management Cloud Service and Customer Cloud Service.

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Metered service points are defined by the following:

- **Metered Service Point Type**: The metered service point type record on which the metered service point is based. Service points types define certain parameters and attributes of a class of metered service points.
- **Division**: The operating company or operating division within a large conglomerate of utilities associated with the metered service point.
- **Weather Station**: The weather station associated with the metered service point. Weather stations are mapped to metered service points based on geographical location. When a metered service point is added or updated, an algorithm maps the metered service point to the nearest weather station using the **Location Information** (specifically the geographic latitude and longitude). If longitude and latitude are not available, mapping is done based on the metered service point's postal code and assigns the weather station defined for the Postal Code Default that includes the service point's postal code.
- **Status**: The current status of the metered service point.
- **External Service Point ID**: An ID used to identify the metered service point in an external system.
- **External Premise ID**: An ID used to identify the premise associated with the metered service point in an external system.
- **Main Contact**: The program contact associated with the metered service point.
- **Address and Location Information**: The address (including city, state, postal code, and country) and geographic location of the metered service point.
- **Field Information**: Information related to field work performed at the metered service point, including any applicable warnings or instructions
- **Distribution Network Facility**: The network node closest to the metered service point. In terms of electric networks, facilities typically represent transformers.
- **Access Group**: The access group used to control which groups of users have access to the metered service point (if applicable). See Defining Access Groups in the *Administrative User Guide* for more information.

System Data

Metered service points are based on the following system data:

Data Type	Description
Maintenance Object	Service Point - MDM (D1-SP)
Business Object(s)	Metered Service Point (X1-MeteredServicePoint)

About Network Locations

Network locations define the location of a facility within a larger network.

Network locations hold the network nodes that provide service to a facility. In the case of electric networks, network locations define the feeder and substation associated with a transformer (facility). Because these network nodes can change over time, a facility can have many network locations (this is an effective-dated relationship). For example, for electric service, whenever the substation or feeder that provides power to a given transformer is changed, a new record that references the latest substation and feeder is typically created.

Network Locations are defined by the following:

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- **Facility ID**: The facility associated with the network location.
- **Start** and **End Date/Time**: The date and time range during which the facility was connected to the feeder and/or substation.
- **Feeder**: An ID for the feeder related to the facility.
- **Substation**: An ID for the substation related to the facility.
- **External ID**: An ID used to identify the network location in external systems.

System Data

Network locations are based on the following system data:

Data Type	Description
Maintenance Object	Network Location (D1-NWLOC)
Business Object(s)	Electricity Network Location (D1-ElectricityNetworkLocation) Nominal Electricity Network Location (D1-NominalElecNetworkLocation)

Programs

This section describes components and data related to demand response programs in Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

Information about programs is maintained in Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management, but other systems are responsible for initiating and creating program events.

- About Programs
- About Program Contacts
- About Contact Communications
- About Program Subscriptions
- About Program Control Scores
- About Program Events
- About Event Participation
- About Program Event Settlement Transactions
- About Program Incentives and Fees
- About Customer Settlement Transactions
- About Interval Prices and Price Sets

About Programs

Programs represent specific demand response programs in which customers agree to let their utility service provider temporarily take control of specific devices in their homes (referred to as controllable devices or controllable assets) in response to periods of high demand. For instance, customers might enroll in a program that allows their utility to temporarily adjust their thermostat during a heat wave, or disable an electric vehicle charger during a period a of peak energy usage in the area. Instances such as these are known as "program events".

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Programs are defined by the following:

- **Program Type**: The program type associated with the program. Program types define certain parameters and attributes of a class of programs.
- **Status**: The current status of the program. Only programs in the "Active" state are eligible for customer enrollment and events.
- **Eligibility**: A program initiative associated with the program, used to determine eligibility for customers to enroll in the program.
- **Approval Profile**: The process used for approval of the program (see Approvals and Approval Profiles below for more information).
- **Suspend**: A flag that indicates if the program is currently suspended (the default is No).
- **Start Date**: The date on which the program is active and available.
- **End Date**: The date after which the program is no longer active.
- **Division**: The operating company or operating division within a large conglomerate of utilities associated with the program.
- **Program External ID**: The ID for the program used by external systems.
- **Allow Customer Unavailability**:: A flag that indicates (Yes or No) if customers are allowed to make themselves unavailable for a period of time for program events for the program. Customer unavailability for a period of time is captured using Customer Unavailability device events.
- **Program Quantities**: One or more quantities associated with the program such as the default reduction capacity for demand response programs.
  - **Start Date/Time**: The start date and time for the time period during which the quantity applies
  - **End Date/Time**: The end date and time for the time period during which the quantity applies
  - **Program Quantity Type**: The type of quantity (based on the **Program Quantity Types** defined on the program type)
  - **Program Quantity**: The quantity, based on the UOM, TOU, and SQI defined for the program quantity type

In addition, programs can also have the following related objects and data:

- **Specifications**: One or more specifications for devices eligible for the program, used to determine eligibility for customers to enroll in the program (the customer must have devices based on the listed specifications to join the program).
  - Programs based on a program type whose **Program Category** is "DER Registration" must have a specification and attributes defined (see Maintaining Specifications for more information). When registering and enrolling a DER device, the device's specification attributes must match the specification's attributes in order for the DER device to be registered and enrolled.
- **Rates**: One or more rates used to determine eligibility for customers to enroll in the program (the customer must be on one of the listed rates to join the program)
- **Rules**: One or more program rules associated with the program. If a program has more than one program rule, the rule with the latest effective date/time is used. See Understanding Program Rules in the *Administrative User Guide* for more information about program rules.

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> **Note**
>
> : If a Device Score rule is added to program, or an existing Device Score Program Rule associated with a program is edited, a synchronization request and outbound message are created to update external DERMS systems such an Oracle Utilities Grid Edge DERMS.

- **Qualifications**: One or more qualification questions used to determine eligibility for customers to enroll in the program. The **Response Required** flag can be used to indiciate that an answer must be provided for the question. See Understanding Customer Questions in the *Administrative User Guide* for more information about questions.
- **Informational**: One or more informational questions used to capture additional information about customers when enrolling in the program. The **Response Required** flag can be used to indiciate that an answer must be provided for the question. See Understanding Customer Questions in the *Administrative User Guide* for more information about questions.
- **Events**: A list of program events associated with the program. See About Program Events for more information about program events.
- **Program Settlement Calculation Groups** (on the **Calculation Groups** tab): One or more program settlement calculation groups that contain settlement calculation rules used to calculate program settlements for devices associated with the program. When more than one group is defined on the program, the appropriate calculation group is executed based on the **Event Settlement Method**. If more than one group is defined for the same Event Settlement Method, a program settlement transaction is created for each group. If a **Calculation Group Determination** is defined on the program's type, that algorithm may override which calculation group is used. Program Settlement Calculation Groups are defined by the following:
  - **Eent Settlement Method**: A flag that indicates when program settlement events are calculated after participating in an event. Options include:
    - **After Event Participation**: Calculations are performed as each program settlement event is created. This option is used with settlement calculations based on non-peak or consumption measurements (referred to as "kWh Avoided").
    - **End of Season**: Calculations are performed at the end of a specified time period (a year, a season, and so on). This option is used with settlement calculations based on peak or demand measurements ("kW Drop").
  - **Transaction Type**: The type of transaction . Options for this are defined as Characteristic Values for the Settlement Transaction Type (X1-STTRT) Characteristic Type.
  - **Calculation Group**: The program settlement calculation group that contains settlement calculation rules used to calculate program settlements for the selected **Event Settlement Method** and **Transaction Type**.
  - **Effective Date/Time**: The date and time at which the calculation group is in effect.
  - **Expiration Date/Time**: The date and time at which the calculation group expires and is no longer in effect.

System Data

Programs are based on the following system data:

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Data Type	Description
Maintenance Object	Dynamic Option (D1-DOP)
Business Object(s)	Program (X1-Program) Program Characteristics (X1-ProgramCharacteristics)

Calculate Control Score via Program Transaction Algorithm

The Calculate Control Score via Program Transaction (X1-CLCNTPRTR) algorithm, defined on the "Program (BO) - Control Score Calculation" System Event creates program transactions that are used to calculate control scores for controllable devices associated with a program. This algorithm also defines the following variables that can be used in Program Calculation Rules:

- **Control Score Variable Name**: Defines the variable used to represent control scores. When Program Calculation Rules return a value for this variable (defined as the Result Variable on the rule), the score is saved to the controllable asset (along with the date and time at which the score was calculated). The default value for this variable is "SC".
- **Availability Mark**: Defines the variable used to represent the availability of the device's participation in program events. If Program Calculation Rules return a value of 0 for this variable, the Asset Availability flag in the controllable asset is set to "No". If Program Calculation Rules return a non-zero value for this variable or the rule doesn't return a value for this variable, the Asset Availability flag in the controllable asset is set to "Yes". The default value for this variable is "AV".

Approvals and Approval Profiles

Programs and program types can specify an Approval Profile used to define a process for approval of programs. Programs with an Approval Profile enter the "Approval in Progress" state after being created, and must be approved before moving into the "Active" state. An Enter algorithm on the "Approval in Progress" state creates an approval request based on the specified approval profile.

See About Approvals for more information about creating and maintaining approvals and approval profiles.

Program Incentives and Fees

Beyond incentives based on reductions in consumption (kWh Avoided) demand (kW Drop) via program settlements, programs can be configured to include other customer incentives, such as sign-up incentives for enrollments, referral rebates, and incentives for remaining enrolled during the peak season. Customers may also receive penalties or fees in some circumstance, for instance if they terminate their enrollments before the contracted period, or when the utility incurs charges related to device repairs, device upgrades, premium device fees. The incentive and fees are sent to the customer information system to be passed on to the customer.

Program incentives and fees are configured as Program Rules that define how and when calculations are performed, with corresponding Program Settlement Calculation Rules that define the specific calculations performed for each type of incentive or fee.

Customer Unavailability Events

Customer unavailability events define periods of time during which customers make themselves (and controllable devices at the customer's device location) as unavailable for program events for a particular program. For example, if a customer will be out of town for a period of time, they may choose to make themselves unavailable to participate in program

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events during that time. Customer unavailability periods for the same device cannot overlap. Customer unavailability events are based on device events.

Customer unavailability events are defined by the following:

- **Customer Unavailability Type**: The customer unavailability device event type. See Understanding Device Event Types for more information about creating device event types.
- **Status**: The current status of the event. Possible statuses include "Active", "Inactive", and "Cancel".
- **Device**: The controllable device marked as unavailable.
- **Device Location**: The device location for the controllable device marked as unavailable.
- **Unavailability Start Date/Time**: The start date and time of the unavailability period for the customer and controllable device
- **Unavailability End Date/Time**: The end date and time of the unavailability period for the customer and controllable device
- **Reason**: The reason the customer is unavailable, from the Device Event Reason (D1-DeviceEventReasonLookup) extendable lookup

System Data

Customer Unavailability events are based on the following system data:

Data Type	Description
Maintenance Object	Device Event (D1-DVCEVENT)
Business Object(s)	Customer Unavailability (X1-CustomerUnavailability)

About Program Contacts

Program contacts represent customers enrolled in programs, and are associated with programs via program subscriptions.

Program contacts are defined by the following:

- **Contact Type**: The program contact type associated with the contact . Contact types define certain parameters and attributes of a class of contacts.
- **Name**: The contact's name.
- **Contact Information**: Contact information for the contact, including phone number and/or email address (used with customer contacts),
- **Contact External ID**: An ID used to identify the contact in external systems (used with customer contacts).
- **Life Support / Sensitive Load Information**: Indicates if the contact is considered to be on life support (used with customer contacts).
- **Asset System Contact ID**: An ID used to identify the contact in external asset systems (used with customer contacts).
- **Address**: The address for a point of contact.
- **Phones**: One or more phone numbers for a point of contact.
- **Emails**: One or more email addresses for a point of contact.

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System Data

Program contacts are based on the following system data:

Data Type	Description
Maintenance Object	Contact (D1-CONTACT)
Business Object(s)	Business (D1-Business) Person (D1-Person) Point of Contact (D1-PointOfContact)

About Contact Communications

Contact communications are interactions with the customer, most often notes captured during an enrollment or unenrollment process.

Contact communications are defined by the following:

- **Create Date/Time**: The date and time the communication was created
- **Contact ID**: The contact associated with the communication
- **Communication Channel**: The channel used for the communication, such as email or phone. Values for this are defined in the Customer Communication Channel (X1-CustCommChnLookup) extendable lookup.
- **Contact Communication Class**: The class of the communication, such as enrollment, unenrollment, trouble report, and so on. Each class can have one more associated communication categories. Values for this are defined in the Customer Communication Class (X1-CustCommClassLookup) extendable lookup.
- **Contact Communication Category**: The category of the communication, such as written or verbal. Values for this are defined in the Customer Communication Category (X1-CustCommCatLookup) extendable lookup.
- **Metered Service**: The metered service associated with the communication (from the enrollment or unenrollment service task)
- **Metered Service Point ID**: The metered service point associated with the communication (from the enrollment or unenrollment service task)
- **Program ID**: The program associated with the communication (from the enrollment or unenrollment service task)
- **Service Task ID**: The service task associated with the communication (from the enrollment or unenrollment service task)
- **WO Activity**: The work order activity associated with the communication (from the enrollment or unenrollment service task)
- **Field Activity ID**: The field activity associated with the communication (from the enrollment or unenrollment service task)
- **Notes**: Notes associated with the communication (from the enrollment or unenrollment service task)

System Data

Contact communications are based on the following system data:

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Data Type	Description
Maintenance Object	Contact Communication (D1-CONTCOMM)
Business Object(s)	Customer Program Communications (X1-CustomerComm)

About Program Subscriptions

Program subscriptions represent a customer's enrollment in a program, and link a customer with a program and (in most cases) a device location. Customers can have separate program subscriptions for different device locations and programs.

Metered service records serve as a parent to individual program subscriptions for each of a customer's programs and/or device location. If multiple program subscriptions are associated to the same device location, one can be defined as a "parent" program subscription. Program subscriptions are most often created as a result of the customer enrollment process, but can be created on an ad-hoc basis if needed.

Program subscriptions are defined by the following:

- **Program Subscription Type**: The program subscription type associated with the program. Program subscription types define certain parameters and attributes of a class of program subscriptions.
- **Metered Service**: The metered service record that serves as a "parent" for the program subscription.
- **Parent Program Subscription**: (Optional) A program subscription that serves as a "parent" for the program subscription.
- **Settlement Group**: A metered service for the Main Customer associated with the program subscription, used to group program subscriptions for customer settlement transactions.
- **External Account ID**: An ID used to identify the program subscription in external systems.
- **Main Customer**: The program contact for the customer associated with the program subscription.
- **Status**: The current status of the program subscription.
- **Start** and **End Date/Time**: The date and time on which the program subscription record started, and ended (if applicable).
- **Time Zone**: The time zone associated with the program subscription.
- **Device Location**: The device location associated with the program subscription. This defines the devices for which the customer is enrolled in the program.
- **Program**: The program in which the customer is enrolled.
- **Program Enrollment Source**: The source of the customer's enrollment in the program. Options incude:
  - **Bring Your Own**: The enrollment was created as a result of the customer installing their own controllable device.
  - **Contact Center**: The enrollment was created by the customer contacting the utility's contact center. This includes enrollments created via the Customer Enrollment Process Flow.
  - **Self Service**: The enrollment was created via an online customer self service portal.

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- **Bill Cycle**: The bill cycle associated with the program subscription, used when calculating program incentives and fees via batch processing. If defined for the parent metered service, the Bill Cycle is defined by default on all program subscriptions for the metered service.
- **Transaction Calculation Groups**: One or more effective dated program calculation groups that contain program calculation rules used to calculate scores for devices associated with the program subscription. If more than one group is defined on the program subscription, the group with the latest effective date/time is used.
- **Fallback Transaction Calculation Groups**: A list of one or more effective dated program calculation groups used if a program calculation group is not defined on the program subscription (from the program subscription type).

System Data

Program subscriptions are based on the following system data:

Data Type	Description
Maintenance Object	Usage Subscription (D1-US)
Business Object(s)	Program Subscription (X1-ProgramSubscription)

Creating Program Event Settlement Transactions

Program event settlement transactions can be created via the "Initiate program event settlement for completed program events" (X1-INIPES) monitor algorithm defined on the program subscription business object. This algorithm is triggered by the Program Subscription BO Periodic Monitor Process (X1-PSPMB) batch process (see below).

This algorithm scans program events and event participation records related to the program subscription looking for program events that have been in the "Complete" status for a number days (defined as a parameter on the algorithm) with related event participation records that are in either the "Successful participation" or "In-flight override" states. The algorithm creates program event settlement transactions for each program event/event participation found.

Program event settlement transactions are created in the "Pending" state, and are processed by the Process Program Settlement (X1-PREVS) batch process which transitions the transaction to a specific state depending on the type of program event settlement transaction. See About Program Event Settlement Transactions for more information.

Batch Processing

Program subscription processing is supported by the following monitor batch processes:

- Program Subscription BO Periodic Monitor Process (X1-PSPMB): Used to trigger monitor algorithms on the program subscription.

Use the **Batch Control** portal to learn more about the parameters used by these batch processes.

About Program Control Scores

Program control scores are created via a regularly scheduled process that performs control score calculations for each device associated with a program subscription, based on the transaction calculation groups defined for the program subscription. A separate program control scores is created for each device associated with the program subscription.

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Program control scores are created by the Calculate Asset Score (X1-CALAS) batch process , which should be run on a daily basis to monitor controllable assets that are currently installed on a device location and enrolled in a device control program. This batch process invokes the Calculate Control Score (X1-CLCNTSCR) algorithm (a Monitor algorithm on the "Installed" state of the Controllable Asset (X1-ControllableAsset) business object). This in turn invokes the Calculate Control Score via Program Transaction (X1-CLCNTPRTR) algorithm defined on the "Program (BO) - Control Score Calculation" System Event on the Program, which creates the program control score. When the program control score enters the "Calculate" state, the Identify Program Calculation Group and Apply its Rules (X1-CALCPT) algorithm executes the Program Calculation Group defined on the Program Subscription (if the Program Subscription has multiple calculation groups, the group with the latest effective date/time is used).

Program transactions contain the following data:

- **Program Subscription**: The program subscription for which the program control score was run.
- **Calculation Group**: The transaction calculation group containing the transaction calculation rules executed as part of the program control score.
- **Transaction Date/Time**: The date and time when the program transaction was run.
- **Device**: The device for which the program control score was run.
- **Status**: The status of the program control score. Statuses include Pending, Error, Discarded, and Complete.
- **Calculation Results**: The results of the calculations performed by the transaction calculation rules. This includes the program control score's start and end dates and times, the Program Calculation Rules and variables used to calculate the results, and the individual quantities and formulas for each variable used in the calculation.
- **Issues**: One or more messages related to the program control score.

System Data

Program control scores are based on the following system data:

Data Type	Description
Maintenance Object	Usage Transaction (D1-USAGETRAN)
Business Object(s)	Program Control Score (X1-ProgramTransaction)

About Program Events

Program events represent instances when a utility takes control of a set of controllable assets in response to demand. For example, during a heat wave, a utility may wish to adjust the thermostats (controllable assets) during peak usage times to help alleviate demand.

Program events are performed by an advanced distribution management system (ADMS) or a supervisory control and data acquisition (SCADA) system. When an event is to occur, the ADMS or SCADA system information about the program (including date/time information), and a "Scheduled" event record is created. The same system then creates event participation records for each device to be included in the event. Once the event has been processed, the external system updates the event to the "Complete" status, and then sends list of impacted devices and the status of each. These details are captured in program event participation records.

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> **Note**
>
> **Program Events and Program Event Stages**
> Program Events in Oracle Utilities Customer Program Management Cloud Service/ Customer Program Management are *program event stages* of program events defined and managed in external systems such as ADMS or SCADA. A program event in ADMS or SCADA can comprise multiple program event stages. For example, a program event in an ADMA or SCADA might be 8 hours in total duration, comprising 4 program event stages of 2 hours each. Each of these 2-hour program event stages would be represented in CPMS/CPM as a program event. Program events in external systems are designated by the **External Event ID** field on each program event.

Program events are defined by the following:

- **Program**: The program associated with the event.
- **Status**: The current status of the event (Pending, Complete, or Canceled).
- **Program Category**: The category of the event, such as Device Test, Economic, Reliability, and so on.
- **Start** and **End Date/Time**: The date and time when the event started and ended.
- **External ID**: An ID used to identify the program event stage in an external DERM system.
- **External Event ID**: An ID used to identify the program event in an external DERM system.

System Data

Program events are based on the following system data:

Data Type	Description
Maintenance Object	Dynamic Option Event (D1-DOPEVT)
Business Object(s)	Program Event (X1-ProgramEvent)

About Event Participation

Event participation records capture the participation of a controllable device in a program event. When a program event is to occur, the ADMS or SCADA system sends a list of devices and date/time information to "reserve" the devices for the event, and event participation records are created. Once the event is complete, the external system sends a list of impacted devices and the status of each. These details are captured in event participation records.

Event participations are defined by the following:

- **Status**: The current status of the event participation record.
- **Participation Start** and **End Date/Time**: The start and end date and time of the event.
- **Reservation Start** and **End Date/Time**: The start and end date and time of the device's participation in the event, Some devices may participate in only a portion of an event. If not applicable, this field is blank.
- **Device ID**: The information string for the controllable device which participated in the event.
- **Program Subscription**: The program subscription associated with the device and program associated with the event.

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- **Program**: The program for which the event took place.
- **Program Event**: The event associated with the event participation record.
- **Reservation**: A flag that indicates if the event participation record represents a device reservation. This flag is typically set to "Yes" when the system receives a list of devices for a planned event.
- **Outcome**: The outcome of the device's participation in the event. Possibly outcomes include "Successful participation", "Non-responsive device", "In-flight override", "Error", and "Canceled".
- **Preemptive Opt-Out** : A flag which indicates if the device preemptively opted out of the event. This flag is most often set to "Yes" when a device is removed from an event after an event participation record has been created.
- **External ID**: An ID used to identify the event participation record in external systems.

System Data

Event participation records are based on the following system data:

Data Type	Description
Maintenance Object	Event Participation (D1-EVENTPART)
Business Object(s)	Event Participation (X1-EventParticipation)

Successful Event Participations

The number of successful event participations for a device is used when calculating control scores for the device (via Program Transactions). A device's event participation is considered successful in the following circumstances:

- The Event Participation has an **Outcome** of "Successful Participation".
- The Event Participation has an **Outcome** of "Canceled". This happens when a device has been reserved but the event stopped halfway through due to reasons such as, target load control reached. It is considered as a success in customer perspective, since it is the utility that stopped the event which resulted to a cancelled outcome.
- The Event Participation has a blank **Outcome** and the device was not preemptively opted out of the event (**Preemptive Opt-Out** is "No" or blank). Posting of an event's outcome may be delayed, and until then the event participation of a reserved device is considered as a success as long as the customer did not opt out before the event transpires.

About Program Event Settlement Transactions

Program event settlement transactions represent credits that will be applied to a customer's bill based on participation in an individual event. Note that program event settlement transactions aren't applied directly to a customer's bill. A customer's program event settlement transactions are totalized into Customer Settlement Transactions (see About Customer Settlements Transactions) which are applied to the customer's bill.

Program event settlement transactions are calculated in different ways depending on the type of event and the program on which they're based. Typically programs are based on either consumption saved or demand reduction events.

- Program event settlement transactions for consumption-based program events can be calculated as they created. The consumption saved per hour (represented as hourly interval values, typically in kWh) are multiplied by hourly prices for the same date and time

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and the results are totaled to create an settlement amount that will be applied to the customer's bill. Program settlement transactions for consumption-based programs are referred to "kWh Avoided" program settlement transactions.

- Program event settlement transactions for demand-based program events can be calculated as they created or are calculated based on a calculated demand value for a specified period of time, such as a year, a season, and so on (these are referred to as "end of season"). For these demand-based events, program event settlement transactions capture individual demand reduction interval value as well as a the "Maximum Drop" for an event (the largest demand reduction value for the event) and are saved in a "Calculation Deferred" state until a Customer Settlement Transaction is created for the period. Program event settlement transactions for demand-based programs are referred to "kW Drop" program settlement transactions.
- When a Customer Settlement transaction is created for "end of season" demand-based programs, a new program event settlement transaction is created for the entire time period which calculates the average of a set of the "Maximum Drop" values from the "Calculation Deferred" transactions created previously. These program settlement transactions are referred to as "Combined kW Drop" program settlement transactions.

The **Program Settlement Method** attribute on the Program indicates when settlement is calculated for participating in an event. Options include:

- **After Event Participation**: Calculations are performed as each program event settlement is created. This option is most often used with settlement calculations based on non-peak or consumption measurements ("kWh Avoided"), but can be used with settlement calculations based on peak or demand measurements ("kW Drop").
- **End of Season**: Calculations are performed at the end of a specified time period (a year, a season, and so on). This option is used with settlement calculations based on peak or demand measurements ("kW Drop").

Program event settlement transactions can be created either from data received from an external analytics application or via a monitor batch process run for program subscriptions (see Creating Program Event Settlement Transactions in About Program Subscriptions).

- When created from data received from an external analytics application, the external analtyics applicationsends files containing details regarding consumption or demand reduction achieved for the duration of an event for each customer. A batch process imports these files and creates business flags that capture the data for each metered service point. These business flags in turn create program event settlement transactions containing data regarding reductions in consumption or demand for the event.
- When created via batch processing, data regarding reductions in consumption or demand for the event is calculated via Program Settlement Calculation Rules which perform a comparison of actual consumption or demand to a "baseline" that represents an estimate of the customer's consumption or demand for the event period had they not participated in the event. See **Baseline Calculations** for more information about this calculation.

There are three types of program settlement transactions:

- "kWh avoided" program event settlement transactions are created based on reductions in consumptions achieved for the duration of an event for each customer. See Processing KWH Avoided Files for more information about how "kWh Avoided" program event settlement transactions are created from business flags received from an external analytics application.
- "kW Drop" program event settlement transactions are created based on reductions in demand achieved for the duration of an event for each customer. See Processing KW Drop Files for more information about how "kW Drop" program event settlement transactions are created from business flags received from an external analytics application.

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- "Combined kW Drop" program event settlement transactions are created by customer settlement transactions and contain demand reduction values derived from individual "kW Drop" program event settlement transactions in the "Calculation Deferred" state that fall within the date range of the customer settlement transaction.

Program event settlement transactions are created in the "Pending" state, and are processed by the Process Program Settlement (X1-PREVS) batch process which transitions the transaction to a specific state depending on the type of program settlement transaction:

- Pending "kWh Avoided" program event settlement transactions (for programs with a **Program Settlement Method** of "After Event Participation") are transitioned to the "Calculate" state where Consumption-based Program Settlement Calculation Rules defined for the program related to the program settlement transactions (See Understanding Program Settlement Calculation Rules for more information) are executed. The amount of a "kWh Avoided" program settlement transaction is calculated by applying the Program Settlement Calculation Rules defined on the metered service's program to the "kWh avoided" values from the program settlement transaction. These rules apply interval prices to the "kWh avoided" interval values and total the results for the event. Once the program settlement transaction calculations are complete, it is transitioned to the "Calculated" state.
- Pending "kW Drop" program event settlement transactions (for programs with a **Program Settlement Method** of "End of Season") are transitioned to the "Calculation Deferred" state. These are later used by customer settlement transactions and "Combined kW Drop" program settlement transactions.
- Pending "Combined kW Drop" program event settlement transactions are transitioned to the "Calculate" state where demand-based Program Settlement Calculation Rules defined for the program related to the program event settlement transactions (See Understanding Program Settlement Calculation Rules for more information) are executed. The amount of a "Combined kW Drop" program event settlement transaction is calculated by applying the Program Settlement Calculation Rules defined on the metered service's program to the "kW Drop" values derived from the program event settlement transactions in the "Calculation Deferred" state to calculate the overall reduction in demand and apply a price to calculate the settlement amount for the event. Once the program event settlement transaction calculations are complete, it is transitioned to the "Calculated" state.

Program event settlement transactions contain the following data:

- **Program Subscription**: The program subscription associated with the event for which the program settlement transaction was created
- **Start Date/Time**: The start date and time of the event
- **End Date/Time**: The end date and time of the event
- **Parent Customer Settlement Transaction**: The customer settlement transaction that is considered the "parent" of the program event settlement transaction. (Note: Only populated after after customer settlement transaction request is received).
- **Used on Bill**: A flag that indicates (Yes or No) if the program event settlement transaction has been included in a customer settlement transaction.
- **Status**: The current status of the program event settlement transaction.
- **Calculation Details**:
  - **Program Event**: The program event for which the program event settlement transaction was created.
  - **Price**: The price used with "kW Drop" program event settlement transactions

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- **Program Settlement Calculation Group**: The program settlement calculation group containing the program settlement calculation rules executed as part of the program event settlement transaction.
- **Line Description**: A single line description of the program event settlement transaction, which can be used when displaying the transaction on bills or reports.
- **UOM/TOU/SQI**: The unit of measure, time of use period, and service quantity identifier combination used to define the interval usage values used in the program event settlement calculation. These are derived from the UOM/TOU/SQI defined on the business flag type of the business flag that created the program event settlement transaction.
- **Interval Size**: The size of the interval usage values, represented as hours:minutes:seconds (HH:MI:SS). This is derived from the Interval Size defined on the business flag type of the business flag that created the program event settlement transaction. This should match the interval size used for interval price sets.
- **Maximum Drop**: The largest demand reduction interval value for the event
- **Minimum Drop**: The smallest demand reduction interval value for the event
- **Average Drop**: The average demand reduction interval value for the event
- **Settlement Quantity**: The total quantity used for the program event settlement.
  * For "kWh Avoided" program settlements, this is the "kwh avoided" consumption saved for the event period, calculated by adding together the individual "kWh avoided" values for the event period
  * For "Combined kW Drop" program settlements, this is the average of the "Maximum Drop" values selected by the Program Settlement Rule - Demand Based program settlement calculation rule.
- **Actual Consumption**: The actual consumption for the customer for the event period (applicable only for "kWh Avoided" program event settlement transactions)
- **Program Settlement Amount**: The program event settlement transaction's monetary amount, calculated by multiplying interval values by prices that apply to the event.
  * In the case of "kWh Avoided" program settlements, the interval values are individual "kWh avoided" interval values (from the "kWh avoided" business flags received from an external analytics application)
  * In the case of "kW Drop" program settlements, the interval values are those derived from individual "kW Drop" program settlements (based on the Program Settlement Calculation Rule configuration).
- **Intervals**: Details of the interval values and prices used in the program settlement transaction calculation, including:
  * **Service Quantity Data Date/Time**: The date and time of the interval value (per the UOM/TOU/SQI and price (if applicable)
  * **Quantity**: The interval value (per the UOM/TOU/SQI) for the interval date and time
  * **Service Quantity Interval Condition**: The condition code of the interval value (per the UOM/TOU/SQI) for the interval date and time
  * **Price**: The interval price for the interval date and time (applicable only for "kWh Avoided" program settlement transactions)
  * **Program Settlement Amount**: The monetary amount for the date and time, calculated by multiplying the "kWh avoided" interval value times the interval price at the interval date and time (applicable only for "kWh Avoided" program event settlement transactions)

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- **Issues**: One or more messages related to the program event settlement transaction.

Example - KW Avoided

An event scheduled for 12:00 PM to 6:00 PM on February 11, 2023 results in the following "kWh avoided" values for a particular customer:

Date/Time	kWh Avoided
02-11-2023 12:00:00PM PST	5.00
02-11-2023 01:00:00PM PST	3.00
02-11-2023 02:00:00PM PST	2.00
02-11-2023 03:00:00PM PST	2.00
02-11-2023 04:00:00PM PST	3.00
02-11-2023 05:00:00PM PST	8.00
02-11-2023 06:00:00PM PST	6.00

This represents a total "Consumption Saved" of 29.00.

Later, the system receives the following price data for this event period:

Date/Time	Price
02-11-2023 12:00:00PM PST	0.45
02-11-2023 01:00:00PM PST	0.45
02-11-2023 02:00:00PM PST	0.35
02-11-2023 03:00:00PM PST	0.25
02-11-2023 04:00:00PM PST	0.35
02-11-2023 05:00:00PM PST	0.45
02-11-2023 06:00:00PM PST	0.45

When a program event settlement transaction is calculated for this event, the details of the program event settlement transaction would be as follows:

- UOM/TOU/SQI: kWh
- Interval Size: 01:00:00
- Consumption Saved: 29.00
- Actual Consumption: 430
- Program Settlement Amount: 12.15
- Intervals:

Service Quantity Data Date/Time	Quantity	Service Quantity Interval Condition	Price	Program Settlement Amount
02-11-2023 12:00:00PM PST	5.00	999999	0.45	2.25
02-11-2023 01:00:00PM PST	3.00	999999	0.45	1.35
02-11-2023 02:00:00PM PST	2.00	999999	0.35	0.70

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Service Quantity Data Date/Time	Quantity	Service Quantity Interval Condition	Price	Program Settlement Amount
02-11-2023 03:00:00PM PST	2.00	999999	0.25	0.50
02-11-2023 04:00:00PM PST	3.00	999999	0.35	1.05
02-11-2023 05:00:00PM PST	8.00	999999	0.45	3.60
02-11-2023 06:00:00PM PST	6.00	999999	0.45	2.70

System Data

Program event settlement transactions are based on the following system data:

Data Type	Description
Maintenance Object	Usage Transaction (D1-USAGETRAN)
Business Object(s)	Program Event Settlement Transaction (X1-EventSettlementTransaction) Program Event Settlement Transaction (X1-ProgramEventSettlementTr)

Batch Processing

Program event settlement transaction processing is supported by the following monitor batch processes:

- Process Program Settlement (X1-PREVS): Used to transition program event settlement transactions in the "Pending" state to the "Calculate" state.
- Retry Program Settlement (X1-RTEVS): Used to retry program event settlement transactions in the "Issue Detected" state.
- Recalculate Program Settlement (X1-RCEVS): Used to recalculate program event settlement transactions in the "Calculated" state. This is used in the case of a rebill, when updated measurement data is received from the customer information system, or when updated "kWh avoided" data is received from an external analytics application.

Use the **Batch Control** portal to learn more about the parameters used by these batch processes.

Correcting Calculated Program Event Settlement Transactions When Measurement Data Changes

In the event that updated measurement data is received after a program event settlement transaction has been calculated, but before it has been included in a customer settlement transaction, the program event settlement transactions must be recalculated and corrected. For example:

- A customer participates in a program event in May, and a program event settlement transaction is created for the event in "Pending" status.
- Measurement data for the customer for the month of May is received in June, and the program event settlement transaction is calculated and updated to the "Calculated" state.

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- Before the program event settlement transaction been included in a Customer Settlement. updated measurement data for the customer is received.
- The program event settlement transaction must be recalculated to account for the change in measurement data (which could impact the baseline calculation results used in the transaction).

When updated measurement data is received and processed (via Direct Measurement Processing) the Create UT Correction for Baseline Derived SQs (X1-CRUTCORRB) Post-VEE algorithm on the IMD Type creates a Usage Transaction Correction activity (details regarding parameters for this algorithm can be found in the **Detailed Description** of the X1-CRUTCORRB Algorithm Type). When this activity is processed, the Recalculate Program Event Transaction Due to Measurement Change (X1-RECLPETMC) algorithm recalculates the program event settlement transaction and marks the transaction with a reason code of "Measurement Change".

Additionally, program event settlement transactions can be recalculated and corrected using the following options:

- Using the Recalculate Program Settlement (X1-RCEVS) batch process (see Batch Processing). When using this option, the Recalculation Reason parameter must be set to "X1MC" (Measurement Change).
- Using the "Re-Calculate" button in the **Record Actions** section of the program event settlement transaction. When using this option, you must select the "Measurement Change" reason for the recalculation.

About Program Incentives and Fees

Program incentives and fees are program settlement transactions used to calculate incentives and fees for program subscriptions, based on rules configured on the program subscription's program. Incentives include sign-up incentives for enrollments, referral rebates, and incentives for remaining enrolled during the peak season. Penalties or fees are applied in certain circumstance, for instance if they terminate their enrollments before the contracted period, or when the utility incurs charges related to device repairs, device upgrades, premium device fees.

Incentives and fees transactions are created either ad-hoc from the **Program Subscription** portal, or via a regularly scheduled batch process. In both cases, the process performs calculations for program subscriptions based on the program rule(s) configured on the program subscription's program. The Calculate Incentives and Fees (X1-CALIF) batch process should be run on a regular basis to monitor program subscriptions enrolled on in a device control program with an Incentive and Fees program rule in effect as of the batch run date. The Calculate Incentives and Fees (X1-CALIF) batch process creates transactions for all eligible rule types configured on the program rule.

When run either manually or via batch, the process creates the incentives and fees transaction, and when the program transaction enters the "Calculate" state, the Calculate Incentives and Fees (X1-CALCIFT) algorithm executes the Program Settlement Calculation Group defined on the Program Rule.

Program incentive and fee transactions contain the following data:

- **Program Subscription**: The program subscription for which the transaction was run.
- **Start Date/Time and End Date/Time**: The date and time range when the subscription was run.
- **Status**: The status of the program transaction. Statuses include Pending, Error, Discarded, and Complete.

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- **Program Rule**: The program rule on which the transaction is based.
- **Rule Type Category**: The category for the incentive and fee, from the Incentive and Fee Type Category (X1-IncentiveFeeTypeCatLookup) extendable lookup
- **Calculation Group**: The program settlement calculation group containing the program settlement calculation rules executed as part of the transaction.
- **Interim Calculations**: The interim results of the calculations performed by the program settlement calculation rules, including the variables used in the calculations and the value of each. These are results are based on variables marked as "FPCO" (For Calculation Purposes Only) on the program settlement calculation rules.
- **Calculated Amounts**: The interim results of the calculations performed by the program settlement calculation rules, including the variables used in the calculations and the line description and calculated amount for each.

System Data

Incentives and Fees transactions are based on the following system data:

Data Type	Description
Maintenance Object	Usage Transaction (D1-USAGETRAN)
Business Object(s)	Incentives and Fees Transaction (X1-IncentivesFeesTransaction)

About Customer Settlement Transactions

Customer settlement transactions represent credits that will be applied to customer's bill based on all of the events in which the customer participated during a given time period. In other words, customer settlement transactions represent the total of all of the customer's program settlement calculations for a given time period.

Customer settlement transactions are created upon requests from a customer information system (CIS). Customer settlement transaction requests are sent in a file which is processed by a batch process which creates the individual customer settlement transactions.Customer settlement transaction requests include the customer contact or account or metered service, the program, the start and end date for the requested time period, and the type of request. These requests are typically sent on an annual basis (such as at the beginning or end of the year), but customer settlement transactions are also created in the following specific situations:

- Final Bill: When a customer moves out or stops their service, a customer settlement transaction is created and applied to their final bill.
- Re-Bill: When a customer is re-billed, the customer settlement transaction is recalculated for inclusion on the new bill.
- Customer Unenrollment: When a customer unenrolls from a program, a customer settlement transaction is created and applied to their next bill.

Customer settlement transactions are created in the "Pending" state. Pending customer settlement transactions are processed by the Process Customer Settlement (X1-PRCS) batch process which transitions them the "Calculate" state, in which all of the customer's program settlements for the requested time period are collated and totalized. These are then sent back to the customer information system for application on the customer's bill.

For customer settlement transactions for programs with an **Program Settlement Method** of "End of Season" (typically associated with demand-based programs), the Calculate Customer Settlement (X1-CALCCST) algorithm creates a "Combined kW Drop" program settlement

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transaction for the customer settlement transaction time period which calculates the average of a set of the "Maximum Drop" values from "Calculation Deferred" program settlement transactions that fall within the customer settlement transaction time period. The customer settlement transaction uses the results of the "Combined kW Drop" program settlement transaction. See About Program Settlement Transactions for more information about "Combined kW Drop" program settlements.

Once customer settlement transaction calculations are complete, they can be sent back to the customer information system for application on the customer's bill. See Downloading Customer Settlement Transactions for more information about how customer settlement transaction information is sent to the customer information system.

By default, the credits from customer settlement transactions are applied to the metered service for which they were calculated. However, in the case of a group of related metered services (such as a set of stores belonging to a common franchise), customer settlement transactions can be applied to a single "parent subscription" via the **Settlement Aggregation Method** (see below). "Parent" subscriptions are defined using the **Settlement Group** attribute on the Program Subscription. A program subscription's **Settlement Group** is a metered service associated with the program subscription's Main Customer, and is used to group program subscriptions for customer settlement transactions (see About Program Subscriptions for more information). "Parent" subscriptions are often used with demand-based programs for commercial customers where credits for overall demand reduction (based on "kW Drop" program settlement transactions) for a group of related accounts (metered services) are applied to the "parent" account.

Customer settlement transactions contain the following data:

- **Metered Service ID**: The metered service (customer) for which the customer settlement transaction was run.
- **Start and End Date**: The start and end date for the customer settlement transaction period.
- **Status**: The current status of the customer settlement transaction.
- **Used on Bill**: A flag that indicates (Yes or No) if the customer settlement transaction has been calculated.
- **Extract**: A flag that indicates (Yes or No) if the customer settlement transaction has been extracted.
- **Customer Settlement Request Type**: The type of customer settlement request. Valid options include Valid options include, End of Season, Final, Rebill, Regular, and Unenrollment.
- **Included Transaction**: The types of transactions included in the customer settlement. This is supplied in the customer settlement request received from the customer information system. Valid options include:
  - **Both**: Include both program event settlement transactions and incentive and fee transactions in the customer settlement transaction.
  - **Event Settlement**: Include only program event settlement transactions in the customer settlement transaction.
  - **Incentive and Fee**: Include only incentive and fee transactions in the customer settlement transaction.
- **Program**: The program associated with the customer settlement.
- **Method**: A flag that indicates the method by which customer settlements are applied to customer accounts. Options include:

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  - **Individual**: Indicates that customer settlements should be applied to the individual customer accounts (represented by metered services).
  - **Grouped**: Indicates that customer settlements should be applied to "Settlement Group" customer accounts (metered services specified as a **Settlement Group** on a program subscription).
- **Calculation Details**:
  - **UOM/TOU/SQI**: The unit of measure, time of use period, and service quantity identifier combination used to define the interval usage values used in the program settlement transactions that comprise the customer settlement calculation
  - **Customer Settlement Quantity**: The total quantity on which the customer settlement is base
    * For customer settlements based on "kwh Avoided" program settlements, this is the consumption saved for the customer settlement, calculated by adding together the individual program settlement transaction "Consumption Saved" values
    * For customer settlements based on "kW Drop" program settlements, this is the average of the "Maximum Drop" values from the individual program settlement transactions
  - **Total Actual Consumption**: The total actual consumption for the customer for the customer settlement, calculated by adding together the individual program settlement transaction "Actual Consumption" values (applies only to customer settlements for consumption-based programs)
  - **Customer Settlement Amount**: The monetary amount for the customer settlement.
    * For customer settlements based on "kwh Avoided" program settlements, this is calculated by adding together the individual program settlement transaction "Program Settlement Amount" values.
    * For customer settlements based on "kW Drop" program settlements, this is the amount from the "Combined kW Drop" program settlement transaction.
  - **Issues**: One or more messages related to the customer settlement transaction.
- **Program Settlements**: The program settlement transactions used for the the customer settlement transaction calculations

System Data

Customer settlement transactions are based on the following system data:

Data Type	Description
Maintenance Object	Usage Transaction (D1-USAGETRAN)
Business Object(s)	Customer Settlement Transaction (X1-CustomerSettlementTransaction)

Batch Processing

Customer settlement transaction processing is supported by the following monitor batch processes:

- Process Customer Settlement (X1-PRCS): Used to transition customer settlement transactions in the "Pending" state to the "Calculate" state.
- Retry Customer Settlement (X1-RTCS): Used to retry customer settlement transactions in the "Error" state.

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Use the **Batch Control** portal to learn more about the parameters used by these batch processes.

About Interval Prices and Price Sets

Interval price sets represent set of interval pricing values used in various types of calculations, including program settlement transactions used with Customer Program Management, settlement calculations used with Market Settlements Management, or pricing calculations used in billing or rating. Interval price values can include market prices or real-time prices. When using multiple sources of interval prices, each source might be represented by a different interval price set.

Interval prices are individual prices based on a defined interval size (for example, hourly prices).

Interval price are defined by the following data:

- **Interval Price Set Type**: The interval price set type on which the interval price set is based. The interval price set type defines a number of attributes of the price set, including the interval size for the price intervals (such as 1 hour, 15 minutes, and so on), and the unit of measure, time of use period, and service quantity identifier used to define the price values.
- **External Identifier**: An identifier for the interval price set used in external systems
- **Time Zone**: The time zone associated with the interval price set
- **Interval Prices**: A set of interval price values belonging to the interval price set, including the following:
  - **Price Date/Time**: The date and time of the interval price
  - **Price**: The price value (based on the unit of measure defined for the interval price set's type)

System Data

Interval Price Sets are based on the following system data:

Data Type	Description
Maintenance Object	Measuring Component (D1-MEASRCOMP)
Business Object(s)	Interval Price Set (D1-IntervalPriceSet)

Interval Prices are based on the following system data:

Data Type	Description
Maintenance Object	Measurement (D1-MSRMT)
Business Object(s)	Interval Prices (D1-IntervalPrices)

Devices and Measurements

Oracle Utilities Customer Program Management Cloud Service and Customer Program Management can store customer measurement data which can be used to calculate a customer's baseline usage used when calculating reductions in customer usage related to demand response programs. Refer to **Baseline Calculations** for more details about calculating a customer's baseline usage from measurement data.

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Storing measurement data also involves maintaining records about customer meters and meter installation. including the following specific types of data:

- Devices
- Device Configurations
- Measuring Components
- Install Events

Metered-related records are created via a data synchronization process between Customer Program Management Cloud Service and a customer information system such as Oracle Utilities Customer Cloud Service or Customer to Meter.

Measurement data is imported into Oracle Utilities Customer Program Management Cloud Service and Customer Program Management from a customer information system such as Oracle Utilities Customer Cloud Service or Customer to Meter using a process called Direct Measurement Processing. See Configuring Payload Processing for more details regarding the process of importing measurement data.

This section provides information about device and measurement data and how they are used in Customer Program Management Cloud Service and Customer Program Management.

- About Meters
- About Device Configurations
- About Measuring Components
- About Install Events
- About Device Events
- About Measurements and Measurement Processing

About Meters

Meters are a type of device, which can be physical or virtual objects, that can produce data to be handled by the system.

A meter can have one or more device configurations over time. A meter's measuring components (if applicable) are associated with the device via device configurations.

A meter's device category (defined as an option on the device's business object) defines the broad category to which a particular device belongs. This option is used by smart meter commands and other processes when determining how the system should behave when executing processes based on the category of device. For example, when viewing items via the Device portal, certain item-specific zones appear that are not displayed when viewing meters or communication components. The base package supports the following device categories for meters:

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- **Smart Meter**: these meters are associated to a head end system and support smart meter commands. The measuring components associated to these devices are expected to be read very frequently. These meters support periodic estimation.
- **AMR Meter**: these meters may also be associated to a head end system but they do not support smart meter commands. The measuring components are read frequently.
- **Manual Meter**: these meters are seldom read and do not support smart meter commands.

Attributes used to define devices include the following:

- Basic information about the Device including type of device (Smart Meter, Manual Meter, and so on), Manufacturer, and Model
- One or more device identifiers such as serial number, badge number, meter number, etc.
- For smart meters the device can also specify a head end system and an incoming data shift. Note: these fields are only necessary when there is no fallback defined on the device type.

System Data

Meters are based on the following system data:

Data Type	Description
Maintenance Object	Device (D1-DEVICE)
Business Object(s)	Manual Meter (D1-ManualMeter)
	Smart Meter (D1-SmartMeter)
	ADK - Smart Meter (DG-SmartMeter)
	Sensus Smart Meter (D6-SmartMeter)
	SSN - Smart Meter (D7-SmartMeter)

About Communication Modules

Communication modules enable automatic meter reading for manual meters, and handle electronic transmission of measurement data and events for meters that are not capable or not enabled to handle this data. Devices of this sort are attached to manual meters as equipment, and in the case of modules that measure consumption or other data, are associated to the physical meter’s scalar measuring components.

Communication modules associated with a manual meter are defined in the **Device Equipment** list on the Manual Meter business object (D1-ManualMeter). See the embedded help for more information.

Creating Measuring Components for Communication Modules

Measuring components used with communication modules must be scalar register measuring components (based on the D1-Register business object) and must be defined on the manual meter's device configuration.

If the communication modules will also record interval consumption, create an interval channel measuring component (based on the D1-IntervalChannel business object) add it to the manual meter's device configuration, and add it as the register measuring component’s **Consumption Reference Measuring Component**.

Measurement and Device Event Processing for Communication Modules

The IMD Seeder and Device Event Seeder support payloads that reference the communication module identifiers currently attached to a physical meter, instead of the physical meter's identifier.

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Based on the physical meter and the communication module currently attached to it, the seeders can identify the physical meter's register (or related interval) measuring component and use it for instantiating the initial measurement or device event.

Devices and Characteristics

Characteristics can be defined for devices using the **Device Characteristics** zone on the **Device** portal. Only characteristics of types defined for the device's type in the **Valid Device Characteristic Types** zone on the Device Type portal can be defined for the device.

About Device Configurations

Device configurations represent specific configurations of a device as of a certain time.

Over time, a device can have many configurations. Device configurations are effective-dated allowing a device to retain its identifiers (such as serial number, badge number, etc.) even while the quantities it measures change over time.

Each device configuration can have one or more measuring components associated with it.

Attributes used to define device configurations include the following:

- The device configuration type
- The parent device
- The effective date and time of the device configuration
- The time zone in which the device operates

System Data

Device Configurations are based on the following system data:

Data Type	Description
Maintenance Object	Device Configuration (D1-DVCCONFIG)
Business Object(s)	Device Configuration (D1-DeviceConfiguration)

About Measuring Components

Measuring components are single points for which data will be received and stored in the system.

A measuring component can be associated to a device, which can have one or more measuring components, or it can be "virtual" or "stand-alone," meaning that it is not associated to a device.

The base package supports the following types of measuring components:

- **Physical**: Physical measuring components are those that physically exist, and that are linked to a device that can be configured differently over time. Interval channels and scalar registers are examples of physical measuring components.
  Note: The terms register and channel are synonyms for measuring component.
- **Standalone**: A standalone measuring component is used to record measurements for something that does not have a physical presence or is not associated to a particular device or service point. For example, you might create a standalone measuring component to record the average daily temperature supplied by a weather station. Standalone measuring components can be identified through **Standalone Identifier**.

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Attributes used to define measuring components can include the following:

- The measuring component type
- The device configuration to which the measuring component is associated
- Details concerning how the measuring component is read, such as the number of digits, the type of read out (dials or digital), the meter multiplier, etc.
- The VEE groups used for validation and estimation of measurement data.

System Data

Measuring Components are based on the following system data:

Data Type	Description
Maintenance Object	Measuring Component (D1-MEASRCOMP))
Business Object(s)	Interval Channel (D1-IntervalChannel)
	Interval Channel Subtractive (D1-IntervalChannelSubtractive)
	Register (D1-Register)
	Register - Auto-Read (D1-RegisterAutoRead)

Scalar vs. Interval

Beyond the four types described above, measuring components generally fall into one of two primary classes of: scalar measuring components, and interval measuring components.

- **Scalar measuring components** are measured at unpredictable intervals. For example, "once a month" is not a predictable interval as the amount of time between reads in unpredictable and inconsistent.
- **Interval measuring components** are measured at predictable intervals, such as every 15 minutes, every 30 minutes, every hour, etc.
- The terms "interval size" and "seconds-per-interval" (SPI) are used to define the size of an interval measuring component's intervals.
- Note: A device may have any combination of interval and/or scalar measuring components

Measuring Component Measurements

Measuring components are configured to measure specific types of quantities. These include:

- **Unit of Measure:** The unit of measure for the quantity being recorded. Examples include kilo-watt hours (kWh), kilo-watts (kW), therms, cubic feet (CCF), temperature (Fahrenheit or Celsius), etc.
- **Time of Use:** Modifiers for a given unit of measure that indicate a period of time during which a quantity has been used, such as On-Peak (meaning during a time when the greatest quantity of some consumable is being used), Off-Peak (meaning during a time when the least amount of some consumable is being used), etc.
- **Service Quantity Identifiers:** Used to further distinguish between measured quantities that have identical UOM/TOU combinations, including situations in which the distinguishing identifier of a UOM is not accurately described as a TOU. Generally, SQI is only used when multiple measuring components measure the same thing, but in different ways. A meter that measures both generation KWH and consumption KWH could use SQIs to differentiate between the two.

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The combination of UOM, TOU and SQI define what a measuring component measures. TOU and SQI are optional, but UOM must be defined for all measuring components. For example, consider a meter (as illustrated in the image below) with two measuring components, both measuring the same unit of measure (kWh), but each measuring component measures consumption in different time of use (TOU) periods (peak and off-peak).

Subtractive vs. Consumptive Measurements

Another attribute that defines how measuring components measure quantities is the distinction between subtractive and consumptive measuring components.

A subtractive measuring component's usage is equal to the current reading (also known as the Stop or End Measurement or Reading) minus the previous reading (also known as the Start Measurement or Reading). To put this more simply:

Usage = End Reading - Start Reading

Most residential scalar meters are subtractive and in some cases interval meters can be subtractive as well . The table below lists a series of measurements for a subtractive measuring component.

Date	kWh (Reading)	Usage
01/01/2010	0	
01/31/2010	1000	1000 kWh
03/02/2010	1780	780 kWh
04/01/2010	2700	920 kWh

A consumptive measuring component's usage is equal to its current measurement. Most residential interval meters are subtractive. For scalar, consumptive measuring components are often used to measure demand, such as KW. The table below lists a series of measurements for a consumptive scalar measuring component.

Date	KW (Reading)	Usage
01/01/2010	0	0 KW
01/31/2010	10	10 KW
03/02/2010	10	10 KW
04/01/2010	13	13 KW

- Physical Measuring Components

Physical Measuring Components

Physical measuring components are associated to the meters installed at service points. Through a device configuration there can be one-to-many measuring components in place at a given point in time. Much like other measuring components these are either scalar or interval and either consumptive or subtractive.

> **Note**
>
> Refer to About Measuring Components for additional information about scalar versus interval and consumptive versus subtractive measuring components.

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The base product supports a core set of physical measuring components, as described in the following sections.

Interval Channel

These measuring components represent consumptive data that is recorded on a regular and consistent frequency as defined by the interval size. By definition interval data must fall on a specific interval boundary. For example, a meter that receives data once per hour cannot have a measurement at 1:30. Rather, the data must fall on either 1:00 or 2:00 not in between.

Data for interval channels is expected to be contiguous. However, in situations where it is not, there is no impact to the calculation of those intervals subsequent to the missing intervals. This is because the calculation of each interval is independent to all other intervals.

If there is a gap in the intervals it can be estimated through the periodic estimation process.

Interval Channel - Subtractive

These measuring components have behavior characteristics of both interval channels and registers. Like the interval channel they receive data on a regular and consistent frequency that is expected to be contiguous. Like a register they use a subtractive consumption calculation and provide rollover validation.

Unlike the interval channel when there are missing intervals there is an impact on the calculation of those intervals subsequent to the missing intervals. This is because the calculation of a given interval is always computed by subtracting its reading from the last known prior reading. The following table describes an example of that scenario:

Date/Time	Reading Condition	Reading	Measurement Condition	Usage
01/01/2010 12:00AM	Regular	0	Regular	0 kWh
01/01/2010 01:00AM	Regular	10	Regular	10 kWh
01/01/2010 02:00AM	Regular	20	Regular	10 kWh
01/01/2010 03:00AM	Regular	30	Regular	10 kWh
Missing measurements				
1/01/2010 12:00PM	Regular	120	Combined Quantity	90 kWh

Notice that the consumption for the 01/01/2010 12:00PM interval has become overloaded and covers the entire period for which no intervals have had been received. Also take note that the measurement condition is assigned a unique condition of Combined Quantity to signify that the consumption covers more than one interval.

A similar situation can arise when there has been an underestimation of consumption for a particular meter:

Date/Time	Reading Condition	Reading	Measurement Condition	Usage
01/01/2010 12:00AM	Regular	0	Regular	0 kWh

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01/01/2010 01:00AM	System Estimate	10	System Estimate	10 kWh
01/01/2010 02:00AM	System Estimate	13	System Estimate	3 kWh
01/01/2010 03:00AM	System Estimate	16	System Estimate	3 kWh
1/01/2010 04:00AM	Regular	40	Estimated	24 kWh

To help avoid these situations where an interval becomes overloaded with usage due to missing or estimated intervals the subtractive interval channel has the ability to initiate the calculation of missing intervals or re-calculation of estimated intervals when processing newly received intervals.

> **Note**
>
> Refer to Understanding Measuring Component Types link for additional information about how to configure subtractive interval measuring component types to perform prior and subsequent estimation.

Register

A register, often referred to as scalar, measuring component is used to represent infrequently received data from a meter. Typically these types of measuring components will only be read once per month aligning to the billing period for the customer.

The physical meter these measuring components represent often have dial readings where there are a finite number of digits that can register the consumption. When the maximum amount has been measured the meter will rollover and start counting once more from zero. To appropriately handle these scenarios this type of measuring component can be defined with a rollover tolerance that allows the system to accurately identify an invalid reading from a standard rollover. For example when a meter has 6 dials (a maximum of 999,999):

- Going from a reading of 999,990 to 20 would likely be valid and represent consumption of 30.
- Whereas going from a reading of 999,990 to 800,000 would be an invalid reading since it would represent consumption of 810,000.

Given the infrequent nature of these measuring components they are not eligible for the periodic estimation process.

Register - Auto-Read

An automatically read register processes nearly identical to a register. The key difference between these two types of measuring components is that the automatically read variant is expected to be read on a frequency of at least once per day.

These measuring components are eligible for periodic estimation since the information about their reading schedule allows for missing readings to be detected and estimated.

Given the frequency these meters are read and the nature of subtractive consumption calculation they can be configured to re-estimate any past or future estimates when actual data has been received. The actual readings allow these estimates to be refined since the total

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consumption for the estimated period can be calculated (current reading - last reading prior to estimation).

About Install Events

Whenever a device is installed at a Metered Service Point, an installation event is created. Installation events capture the history of the devices that have been installed at a Metered Service Point. This allows consumption for a Service Point to be calculated over time. In technical terms, installation events (or Install Events) link a specific Device Configuration to a Metered Service Point.

There are specific Install Event business objects for different types of devices, including smart meters, manual meters, and communication components.

While a device is installed at a Metered Service Point, it may be turned off (and back on again). The installation event that records the original installation date and time also records the dates and times when the device has been turned on and off. When a device is removed, the original installation event is updated with the removal date and time.

System Data

Install Events are based on the following system data:

Data Type	Description
Maintenance Object	Install Event (D1-INSTLEVT)
Business Object(s)	Manual Meter Installation Event (D1-ManualMeterInstallEvent) Smart Meter Installation Event (D1-SmartMeterInstallEvent)

About Device Events

Device events are developments that have taken place relative to a device, and can include power outages, power restorations, tampering alerts, command completions, among others.

> **Note**
>
> In Oracle Utilities Customer Program Management Cloud Service and Customer Program Management, device events are used to capture periods of time during which customers make themselves unavailable to participate in program events. See Customer Unavailability Events in About Programs for more information.

System Data

Device Events are based on the following system data:

Data Type	Description
Maintenance Object	Device Event (D1-DVCEVENT)
Business Object(s)	Customer Unavailability (X1-CustomerUnavailability)

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About Measurements and Measurement Processing

This section describes components and data related to measurements and measurement processing in Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

- About Initial Measurement Data
- Direct Measurement Processing
- About Final Measurements

About Initial Measurement Data

Initial measurement data (IMD) is the term for measurement data in its initial (or raw) form.

Measurements read from a measuring component are referred to as "initial measurement data" (or initial measurements) and are used to record how much of the quantity (defined by UOM, TOU, and SQI) measured by the measuring component was consumed.

Initial measurement data for scalar measuring components contain a single "reading" or value, while initial measurement data for interval measuring components can contain multiple readings, one for each interval that falls between the start time and stop time of the measurement.

At a simple level, initial measurement data goes through the following process:

1. Initial measurements are loaded into the system.
2. Initial measurement data is validated, edited, and estimated (VEE). Please refer to About VEE for more details on the VEE process.
3. Initial measurements are converted into final measurements and stored in the Measurement (D1_MSRMT) table.

There are two ways in which initial measurement data is processed:

- **Legacy Measurement Processing** involves creating records in the database for each initial measurement upon receipt. These records are updated through each stage of processing until the initial measurement is finalized, and are retained in the system until archived and/or deleted. Processing is defined based on the initial measurement data business object. Legacy Measurement Processing can be used with Initial Load, Manual, and Estimation initial measurement data. See for more information.

  > **Note**
  >
  > Legacy Measurement Processing is NOT used with Oracle Utilities Customer Program Management Cloud Service and Digital Asset Management.

- **Direct Measurement Processing** involves processing incoming measurement data in memory, based on algorithms defined on an IMD type. If using Measuring Component Ordering, this also creates staging records for each initial measurement upon receipt (staging records are deleted once the measurement has been processed). Direct Measurement Processing is only supported for Initial Load measurement data. It does not support Manual or Estimation initial measurements. See Direct Measurement Processing for more information.

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> **Note**
>
> Oracle Utilities Customer Program Management Cloud Service and Customer Program Management use Direct Measurement Processing when processing measurement data received from a Customer Information System.

Only initial measurements can be edited directly by end users, and only when using Legacy Measurement Processing..

Quantities in an initial measurement can change during processing.

- "Pre VEE" quantities are consumption values derived from the measurements recorded by the head end system or meter reader with the appropriate installation and measuring component multipliers applied.
- "Post VEE" quantities are the "final" values, after VEE processing.

Changes in quantities can be based on a number of conditions, including:

- VEE rules have changed the quantities because they are missing or obviously wrong. In this, the Pre VEE values are adjusted based on the specifics of the VEE rules applied to the initial measurement to create the Post VEE values
- Manual changes by a user.

When using Legacy Measurement Processing, initial measurement data records contain both the original (Pre VEE) and final (Post VEE) versions of the quantities recorded by the measuring component.

When using Direct Measurement Processing, if any quantities are changed during VEE processing, original (Pre VEE) quantities are captured along with the final (Post VEE) quantities in the Measurement (D1_MSRMT) table.

In addition to recorded consumption values, measurements also have condition codes, used to indicate the source and quality of a measurement. For example:

- Regularly recorded measurements might have a condition code of "Regular"
- Missing measurements might have a condition code of "Missing"
- Estimated measurements might have a condition code of "External Estimated" or "System Estimated" based on where the estimation was performed.

Both Pre VEE and Post VEE values have their own condition code, which can also change during VEE processing. For example, a measurement that was missing in the Pre VEE document will likely become "System Estimated" in the Post VEE document once VEE has been executed.

Direct Measurement Processing

Direct Measurement Processing is a method of processing incoming initial measurement data designed to reduce the volume of initial measurement records in the database. Rather than create and update initial measurement data records, Direct Measurement Processing processes initial measurement data in memory and creates final measurements in the Measurement (D1_MSRMT) table. With Direct Measurement Processing, records in the Initial Measurement Data (D1_INIT_MSRMT_DATA) table are created only if an error is encountered during processing (including VEE processing). If using Measuring Component Ordering (see below), Direct Measurement Processing also creates temporary staging records (in the IMD Control Staging (D1_IMD_CTRL_STAGE) table).

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> **Note**
>
> Direct Measurement Processing is available with Native Implementations only, and only for processing Initial Load measurements. It cannot be used for Manual or Estimation measurements.

IMD Types

IMD Types are configuration records used to define how initial measurements are processed using Direct Measurement Processing. There are two main categories of IMD types - seeder types (based on the Seeder IMD Type (D1-IMDSeederType) business object) and specific types (based on the Specific IMD Type (D1-IMDType) business object).

- **Seeder IMD types** represents an initial measurement data (IMD) seeder, which serves as the universal input into the system for external callers or for initial measurement payload processing. The main purpose of the seeder IMD type is to determine the most appropriate specific IMD type (such as interval or scalar, or a type used with a particular Smart Grid Gateway adapter) to use for further processing and prepare the input data for that IMD type. Additionally, a seeder IMD type is used to perform critical validation (such as an interval count validation), device and channel identification, mapping of external values (such as Unit of Measure and time zone) to internal values, and time zone conversion for date/time fields.

  > **Note**
  >
  > There can only be on seeder IMD type active at any one time.

- **Specific IMD types** define the rules for processing a specific initial measurement data (IMD) record. Different specific IMD types contain rules for processing the different types of initial measurement data that can be received. For example, one IMD type defines the rules for processing a scalar measurement from the Landys+Gyr head end system while another IMD Type instance defines the rules for processing an interval initial measurement from the Sensus head end system. There are four types of algorithms supported for specific IMD types: Pre Processing, Pre-VEE, VEE, and Post-VEE. These algorithms are responsible for validating that the measurement has been correctly mapped to the IMD Type (Pre Processing), calculating consumption (Pre-VEE), performing VEE (VEE), writing to the final measurement table (Post-VEE), among other responsibilities.

IMD Types are defined for specific measuring component types in the "Initial Measurement Creation" processing method (“How to Create MC Related Information”) for each head end system. See Creating Head End Systems in the *Administrative User Guide* for more information about processing methods.

See Understanding IMD Types in the *Administrative User Guide* for more information.

VEE Processing and Exceptions with Direct Measurement Processing

When using Direct Measurement Processing, VEE is performed by the Direct Measurement Processing Service based on algorithms defined for the initial measurement's IMD Type.

- If any quantities are changed during VEE processing, original (Pre VEE) quantities are captured along with the final (Post VEE) quantities in the Measurement (D1_MSRMT) table.
- If an initial measurement fails a VEE rule with only exceptions with a Severity of "Information", a header record is created in the Initial Measurement Data

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(D1_INIT_MSRMT_DATA) table. This header serves as a parent record for the VEE exception(s). In this case, final measurements are created as part of the process.

- If an initial measurement returns an error during Pre-VEE processing or fails a VEE rule with a Severity of "Issues" or "Terminate", a record is created in the Initial Measurement Data (D1_INIT_MSRMT_DATA) table for the initial measurement, and further processing is done using Legacy Measurement Processing. The type of initial measurement data record created is based the configuration of the IMD type.

The table below summarizes how VEE exceptions are created and and whether final measurements are created when using Direct Measurement Processing.

Scenario	Initial Measurement Data (D1_INIT_MSRMT_DATA) Record	VEE Exceptions Created	Final Measurements Created
No exceptions	No	No	Yes
Error in Pre VEE algorithms	Yes, based on the IMD Business Object defined on the IMD Type (such as D1-InitialLoadIMDInterval)	No	No
"Information" and "Issue" or "Terminate" VEE Exceptions	Yes, based on the IMD Business Object defined on the IMD Type (such as D1-InitialLoadIMDInterval)	Yes	No
"Issue" or "Terminate" VEE Exceptions	Yes, based on the IMD Business Object defined on the IMD Type (such as D1-InitialLoadIMDInterval)	Yes	No
Only "Information" VEE exceptions	Yes, Informational Exception Header (D1-InfoExceptionHeader)	Yes	Yes

> **Note**
>
> When using Direct Measurement Processing with Machine Learning Anomaly Scoring, VEE processing is only performed if a measurement is deemed "anomalous" or if a Post-ML VEE Group is defined for the measuring component or measuring component type. Otherwise, VEE processing is skipped. See Machine Learning Anomaly Scoring for more information.

Enabling Direct Measurement Processing

To enable Direct Measurement Processing, do the following:

1. Enable the **Use IMD Type** option on your SGG Payload Processing Configuration extendable lookup values. See Configuring Direct Measurement Processing and Creating SGG Payload Processing Extendable Lookup Values in the *Administrative User Guide* for more information.

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2. Update the "Initial Measurement Creation" processing method (“How to Create MC Related Information”) to specify the IMD Types to use for your measuring component types for each head end system. See Configuring Direct Measurement Processing and Creating Head End Systems in the *Administrative User Guide* for more information.

Enabling Direct Measurement Processing with Machine Learning Anomaly Scoring

To enable Direct Measurement Processing with Machine Learning Anomaly Scoring, do the following:

1. Enable the **Use IMD Type** option on your SGG Payload Processing Configuration extendable lookup values. See Configuring Direct Measurement Processing and Creating SGG Payload Processing Extendable Lookup Values in the *Administrative User Guide* for more information.
2. Update the "Initial Measurement Creation" processing method (“How to Create MC Related Information”) to specify the IMD Types to use for your measuring component types for each head end system. See Configuring Direct Measurement Processing and Creating Head End Systems in the *Administrative User Guide* for more information.
3. Set the **Enable ML Based Validation** or **Enable ML Based Validation (Fallback)** flag to "Yes" on the specific measuring components or measuring component types (respectively) you wish to process using machine learning anomaly scoring.
4. Configure an SGG ML Payload Processing Configuration extendable lookup value, and enable the **Use IMD Type** option. See Configuring Machine Learning Anomaly Scoring in the *Administrative User Guide* for more information.

About Final Measurements

Final measurements are measurements that have been validated, and if necessary, edited & estimated, and is ready for use in downstream processing such as bill determinants calculations.

When an initial measurement is considered "final," that is, it has passed all VEE processing and no additional modifications or changes need to be made, it is transformed into a Final Measurement, or simply a Measurement (the terms measurement, final measurement, and final consumption all reference this same "final" measurement data). Only one final measurement can exist for a given date/time for a given measuring component; one final measurement exists per interval, and likewise one final measurement exists for each scalar reading. In both cases, the final measurement value stored represents the amount consumed between its date/time and the prior final measurement's date/time.

When creating final measurements from initial measurement data:

- Final measurements are created using Post VEE quantities
- Each final measurement's condition is copied from the Post VEE condition
- Initial measurements are normalized into final measurements where each final measurement is for a specific date and time.
- Because a single initial measurement may contain many "readings," a separate final measurement is created for each interval in the initial measurement. For example, if an initial measurement contains 24 hours of 15 minute readings, 96 measurements will be created, each with a specific date and time.
- A Combined Multiplier (created from multipliers defined for the measurement’s measuring component type and install event) is stored for each measurement. In addition, other values are stored for measurements of specific types. The Reading Value (which often differs from the measurement value) is stored for scalar and subtractive interval

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measurements, and the Reading Condition is stored for subtractive interval measurements. These values are used with measurement reprocessing and other recalculation processes in the event that the original initial measurements have been archived or deleted.

The measurement date/time of a measurement represents the end of the period the measurement value covers. How the start of the period is defined varies slightly based on the type of measuring component associated to the measurement:

- **Scalar Measuring Components**: the measurement date/time represents the point at which the reading was taken. The period the measurement covers is defined as the previous measurements date/time through the measurement date/time.
- **Interval Measuring Components**: the measurement date/time represents the end of the interval period. No date/time is stored to represent the beginning of the interval period, rather it is implied by the interval size of the measuring component. For example an interval measuring component with an hourly interval size and a measurement date/time of 01/01/2010 12:00AM represents the measured quantity for the period of 12/31/2009 11:00PM through 01/01/2010 12:00AM.
- For scalar measuring components there exist special circumstances where a final measurement is not eligible for use in processing (e.g. consumption calculation, usage calculation, etc.). To prevent other processes from using these measurements they are marked with a usage flag of "Do Not Use." This is typically the result of the automatic correction of a rollover threshold error when lower quality measurements inaccurate measurements are removed to enable successful calculation of subtractive consumption.

Conditions

Conditions are used to describe the quality of a final measurement and is an important input into many of our processes. During initial measurement data processing these conditions help VEE rules identify the initial measurements that require more advanced validation or estimation. During usage calculations measurement conditions help to inform the billing system whether the billing determinants produced are based on actual data read from a meter or if it has been estimated (or in many cases a combination of the two).

Conditions follow a numeric sequencing that begins at 000000 and goes up to 999999. As the condition code rises numerically so does its perceived quality. Many areas the system take this into account:

- VEE rules use conditions to identify which initial measurement values need to be estimated or adjusted
- Rollover error automatic corrections allow higher quality data to bypass lower quality data in order to achieve a consumption calculation that does not produce an error.
- Usage calculation rules can provide information about the quality of billing determinants based on the underlying measurement data that feeds into those service quantities.

Throughout the system functionality uses condition code ranges to make decisions. In general the ranges are considered to be:

Condition Range Start	Condition Range End	Description of Range
000000	199999	No measurement
200000	299999	Missing Measurement
300000	499999	Estimated measurement
500000	999999	Regular measurement

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The ranges of "No Measurement" and "Missing Measurement" at first glance sound synonymous but there is an important distinction. With conditions that fall within the "No Measurement" range the expectation is that no measurement should exist. Whereas, the "Missing Measurement" range implies that a measurement was expected but never received.

Note: in some circumstances, like rollover threshold errors, the regular range is further divided to include a "Superior" range of 9000000 - 999999 which can be used to select the appropriate reading to be used to resolve the error.

Derived Values

Final measurements can record up to 10 derived values in addition to the "as measured" value. The derivation formula for each value on a final measurement is controlled by the measuring component type.

Derived values are not reliant on consumption values, but can also come from factors, historical data, or another source. For example, a set of measurements can be adjusted or converted into other units of measure. In the below example the first derived value is the result of the application of a loss adjustment factor and the second derived value is the result of applying a pre set formula against the loss adjusted value to compute BTU.

Date/Time	As Measured UOM: CCF SQI: N/A	Loss Adjusted UOM: CCF SQI: N/A	Thermal Units UOM: BTU SQI: N/A
01/01/2010 3:00PM	10	10.1	10.11
01/01/2010 4:00PM	15	15.15	15.165
01/01/2010 5:00PM	10	10.1	10.11

Refer to Understanding Measuring Component Types in the Administration Guide for additional information about configuring derivation algorithms.

Final Measurements and Direct Measurement Processing

When using Direct Measurement Processing, final measurement may display additional information if any quantities were changed during VEE processing. In this case, original (Pre VEE) quantities and data are captured along with the final (Post VEE) quantities in the following values:

- Pre-VEE Measurement: The Pre-VEE value for the measurement
- Pre-VEE Measurement Condition: The Pre-VEE condition code or the measurement
- Pre-VEE Reading: The Pre-VEE value for reading (used with scalar measurements)
- Pre-VEE Reading Condition: The Pre-VEE condition code for reading (used with scalar measurements)

Event Impact Measurement and Verification

Event Impact Measurement and Verification (M&V) for Distributed Energy Resource (DER) and Demand Response (DR) programs refers to the overall process of accurately measuring and verifying the actual energy savings or demand reductions achieved by implementing programs of these types, such as rooftop solar panels or battery storage, OR load control devices, like Smart Thermostats or Smart Water Heaters, where customers eventually end up reducing their electricity usage during peak demand periods.

The determination of energy savings achieved for an individual program event using baseline calculation methodologies allows utilities to perform the corresponding financial settlements.

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Refer to About Program Event Settlement Transactions for more information about how these settlements are calculated.

Event Impact Measurement and Verification (M&V) can be used to determine program-level demand reductions (either achieved or projected to be achieved) and ensure the effectiveness and reliability of these initiatives and can provide transparent data for market participants and regulators. This plays a key role in ongoing assessment and improvement in the program development cycle. At a high-level, this means evaluating the overall effects of a program (load reductions or load increases) related to a particular event or set of events, energy savings (positive or negative) and also cost effectiveness among others. The effects may be determined at the program level or at any level of granularity.

M&V calculations are performed using a type of regression analysis known as "Difference-in-Differences" (or DiD). At a high level the DiD methodology (as defined by Wikipedia), is "a statistical technique used in quantitative research that attempts to mimic an experimental research design using observational study data, by studying the differential effect of a treatment on a 'treatment group' versus a 'control group' in a natural experiment". When applied to demand response events, this analyzes the change in electricity consumption between a group of customers participating in a demand response program (the *treatment group*) compared to a similar group not participating (*control group*), both before and after the demand response event, allowing the outcome to isolate the causal effect of the program on electricity usage by accounting for any pre-existing trends in consumption patterns across the groups. This method using *Treatment* and *Control* groups is effective for impact estimation of relatively similar or uniform groups of customers, such as residential or small commercial customers , where several hundred or several thousand customers might participate in a program. The method is less effective for evaluating smaller numbers of customers or large commercial or industrial customers, because the treatment-control differences will have too much random error to be reliable.

As noted above, M&V calculations are performed for two different types of groups of customers:

- **Treatment Groups:** Groups of customers enrolled in a demand response program, receiving price signals or direct load control during the event. Treatment groups are also referred to as **Device Population Groups**.
- **Control Groups:** Groups of similar customers who are not part of the program and experience normal electricity prices during the event.

Both Device Population (or Treatment) groups and Control groups are defined using Entity Groups. See Understanding Device Population and Control Groups in the *Adminitrative User Guide* for more information.

As part of the DiD regression calculations, average hourly load is calculated for the following two regression periods:

- **Pre-Treatment**: A single period of time, typically 3 hours immediately before and adjacent (without gaps or overlaps) to the **Treatment** period.
- **Treatment**: A period comprising Pre-Event, Event, and Post-Event periods. Pre-Event and Post-Event periods are typically 2-3 hours each, while the Event period itself can up to 8 hours.

More specifically, a load model is constructed for each participant in both the **Device Population** group and the **Control** group using the interval meter reads for the **Pre-Treatment** period and the **Treatment** period. Subsequently a regression analysis is performed across the data to compute a ratio of the estimated **Treatment** period average hourly load of the **Device Population** group assuming no event to the **Control** group **Treatment** period average hourly load, and eventually to the **Device Population** group hourly (kW) Load Impact.

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This ratio and other outputs from the regression analysis are captured in M&V Transactions, and additional calculations can be performed using M&V Calculation Rules.

M&V Processing and Dynamic Aggregation

M&V processing leverages functionality Dynamic Aggregation in a number of specific ways.

First, it uses Dimension Scanning to identify changes to Device Population and Control groups, and creates aggregation measuring components for each device population group. This process is run on a regular basis.

Secondly, it uses Find Constituents processing as part of the M&V calculation and regression process to identify the measuring components for both Device Population and Control groups. However, instead of aggregating measurement data for these measuring components, instead it stores the measuring components in a global temporary table called the Entity Group Constituents Temporary Table (D1_GTT11). The algorithms that execute the regression calculations read the measuring components from this table and aggregates the data for the Device Population group and the Control group.

Both of these processes requires configuration of Data Sources, Dynamic Aggregation Measuring Component Types, Aggregation Groups, and Measuring Component Sets.

- About Regression Aggregation Measuring Components
- About M&V Subscriptions
- About M&V Transactions
- About Service Point Event Outcome Snapshots
- Dynamic Aggregation

About Regression Aggregation Measuring Components

Regression aggregation measuring components are Aggregation Measuring Components used to represent Device Population groups. Unlike standard aggregation measuring components, these do NOT store aggregated measurement data. Instead, they are used to orchestrate M&V processing for their associated Device Population groups and their corresponding Control Groups (see Understanding Device Population and Control Groups in the *Administrative Use Guide* for more information about the relationship between Device Population and Control groups).

Regression aggregation measuring components are created via the Dimension Scanning process based on changes to Devce Populaion groups.

Regression aggregation measuring components are defined by the following:

- **Initiating Measuring Component Set**: The measuring component set that triggered creation of the aggregation measuring component via the Dimension Scanning process (see Dimension Scanning for more information).
- **Status**: The current status of the measuring component. Valid values are "Active", "Aggregate", and "Inactive".
- **Service Type**: The type of service (electric, water, and so on) the measuring component supports
- **Time Zone**: The time zone in which the measuring component operates
- **Processing Information**: Details of aggregation processing for the aggregation measuring component, including the date and time through which aggregation has been performed.

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- **Measuring Component Attributes**: Attributes that describe the dimensions and criteria for the aggregation measuring component (used by the Dimension Scanning process)

System Data

Regression aggregation measuring components are based on the following system data:

Data Type	Description
Maintenance Object	Measuring Component (D1-MEASRCOMP))
Business Object(s)	Regression Aggregator for M&V (X1-RegressionAggregatorMV)

Regression Aggregation Measuring Component Processing

As noted above, regression aggregation measuring components orchestrate M&V processing for their associated Device Population groups and their corresponding Control Groups.

Over time, as program events take place, Event Participation records record which customers participate in which events and the outcome of those events (such as "Successful", "Error", and so on). These are used to create Service Point Event Outcome Staging records.

On a regular basis, the Aggregation by MC Set Monitor (D1-AMCS) batch process triggers processing for aggregation measuring components in the "Active" state. This initiates a series of algorithms which do the following:

- Check for participation in program events
- Build a list of customers from the Device Population group who successfully participated in the event (Find Constituents) in the Entity Group Constituents Temporary Table (D1_GTT11).
- Trim the list of constituents by retrieving related Service Point Event Outcome records and deleting records from the Entity Group Constituents Temporary Table (D1_GTT11) in the event of any of the following:
  - The record indicated an outcome of non-responsive device, or canceled
  - The record has the Multiple Entity Group flag set to "Yes"
  - Any customer where another thermostat for the service point has participated in a different event for the same external event ID.
  - If no Service Point Event Outcome record is found for a customer in the Device Population group
- Perform a "Difference in Differences" regression analysis, aggregating and comparing data from the Device Population group to corresponding data from the Control group, and create a M&V transaction, which uses M&V Calculation Rules to perform calculations based on the regression outcome quantities
- Check for participation in any remaining unprocessed qualifying events
  - If no event occurred, the measuring component remains in the "Active" state
  - If another event is found, the measuring component is set to the "Aggregate" state (and can be transitioned back to the "Active" state via the Transition to Default Next Status (Java) (F1-AT-RQJ) batch process.

About M&V Subscriptions

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M&V subscriptions represent the enrollment of a group of customers (defined by a "Device Population" entity group) in a program. The same group of customers can have separate subscriptions for different programs.

M&V subscriptions are created whenever a new Device Population group is created or changed. A M&V Subscription's Device Population group defines the group of customers whose data is aggregated and processed when Measurement and Verification Transactions are created.

M&V subscriptions are defined by the following:

- **M&V Subscription Type**: The M&V subscription type associated with the Device Population group and program. M& V subscription types define certain parameters and attributes of a class of M&V subscriptions.
- **Division**: The division in which the customers in the Device Population group reside.
- **Start** and **End Date/Time**: The date and time on which the subscription record started, and ended (if applicable).
- **Entity Group**: The Device Population group
- **Program**: The program in which the Device Population group customers are enrolled.
- **Time Zone**: The time zone associated with the subscription.
- **M&V Calculation Groups**: The calculation groups defined for the subscription and used when creating M&V transactions for the Device Population group, including:
  - **M& V Calculation Group**: The M&V Calculation Group
  - **Effective Date/Time**: The date and time at which the calculation group is in effect.
  - **Expiration Date/Time**: The date and time at which the calculation group expires.

System Data

M&V subscriptions are based on the following system data:

Data Type	Description
Maintenance Object	Usage Subscription (D1-US)
Business Object(s)	M&V Subscription (X1-MsrmtVerifSubscription)

About M&V Transactions

M&V transactions capture the results of the regression analysis and calculations preformed on those results based on data for the Device Population (treatment) group and the Control group. This includes the following coefficients and calculated values:

- Intercept
- Coefficient for Time
- Coefficient for Treatment
- Coefficient for Time * Treatment
- Control group average hourly load over the pre-event reference period (scalar value)
- Treatment group average hourly load over the pre-event reference period (scalar value)
- Treatment group hourly average load over the event period (interval values)
- Control group hourly average load over the event period (interval values)

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M&V transactions are created by monitor algorithms on aggregator measuring components associated with Device Population groups.

M&V transactions contain the following data:

- **M&V Subscription**: The M&V subscription associated with the event for which the M&V transaction was created
- **Program Event**: The event for which the M&V transaction was created
- **Start Date/Time**: The start date and time of the event
- **End Date/Time**: The end date and time of the event
- **Regression Statistics**: Statistics from the regression calculation, including:
  - **Coefficient of Determination**
  - **Multiple R**
  - **Standard Error**
  - **Number of Observations**
- **Coefficient Statistics**: Statistics for each of the following coefficients: Intercept (b0), Coefficient for Time (b1), Coefficient for Treatment (b2), and Coefficient for Time * Treatment (b3), including:
  - **Standard Error**
  - **Low Confidence Interval**
  - **High Confidence Interval**
- **Issues**: One or more messages related to the transaction.

System Data

M&V transactions are based on the following system data:

Data Type	Description
Maintenance Object	Usage Transaction (D1-USAGETRAN)
Business Object(s)	M&V Transaction (X1-MsrmtVerifTransaction)

Batch Processing

M&V transaction processing is supported by the following monitor batch processes:

- Retry M&V Transaction (X1-RTMVT): This batch process monitors M&V Transactions and advances them to the next state, and will retry M&V Transactions events in error.
- Recalculate M&V Transaction (X1-RCMVT): This batch process monitors M&V Transactions to recalculate and advances them to the next state.

Use the **Batch Control** portal to learn more about the parameters used by these batch processes.

About Service Point Event Outcome Snapshots

Service Point Event Outcome Snapshots capture a summary of event data at a service point level for program participants that have multiple controllable devices, such as thermostats, including both residential and commercial customers.

Service Point Event Outcome Snapshots are defined by the following:

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- **Metered Service Point**: The metered service point for which the event outcome snapshot was created
- **Treatment Group**: The Device Population group to which the devices that participated in the event belong
- **Program Event**: The program event for which the outcome snapshot was created
- **Program Subscription**: The program subscription associated with the event outcome snapshot
- **Service Point Event Outcome**: The outcome of the service point's participation in the event. Possibly outcomes include "Successful participation", "Non-responsive device", "In-flight override", "Mixed", and "Canceled".
- **Control Group**: The control group to be used for M&V processing for the event
- **Parent**: A flag that indicates (Yes or No) if the program subscription associated with the event outcome snapshot is a parent subscription
- **Device Count**: The number of devices that participated in the event
- **Multiple Entity Group**: A flag that indicates (Yes or No) if the event outcome snapshot is based on multiple entity groups
- **Multiple Program Event**: A flag that indicates (Yes or No) if the event outcome snapshot is based on multiple program events
- **Service Point Event Outcome Quantity**: A list of quantities captured in the event outcome snapshot, including the following for each:
  - **Sequence**: The sequence of the quantity
  - **SQI**: The service quantity identifier for the quantity
  - **Date/Time**: The date and time of the quantity
  - **UOM**: The unit of measure for the quantity
  - **Quantity**: The quantity

System Data

Service Point Event Outcome Snapshots are based on the following system data:

Data Type	Description
Maintenance Object	Service Point Event Outcome (D1-SPEVTOUTC)
Business Object(s)	Service Point Event Outcome (X1-ServicePointEventOutcome)

Batch Processing

Service Point Event Outcome snapshot processing is supported by the following monitor batch processes which create Service Point Event Outcome Snapshots from Event Participation and M&V transaction records:

- Create Service Point Event Outcome Staging (X1-SPEOC): This batch process creates Service Point Event Outcome Staging records from Event Participation records that contain the basic data used for the snapshot
- Create SP Event Outcome Quantity Staging (X1-SPEOQ): This batch process creates Service Point Event Outcome Quantity Staging records from M&V Transaction records that contain Service Point Event Outcome Quantities

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Use the **Batch Control** portal to learn more about the parameters used by these batch processes.

Dynamic Aggregation

- Dynamic Aggregation Overview
- Understanding Dynamic Aggregation Execution
- About Aggregation Measuring Components
- Maintaining Aggregation Measuring Components

Dynamic Aggregation Overview

Standard aggregation processing uses specific algorithms configured to work with a specified set of dimensions. For example, the base package Service Type and Postal aggregation uses specific algorithms for dimension scanning and finding constituent measuring components. In contrast, dynamic aggregation uses dynamic queries for the dimension scanning, find constituents, and aggregation processes.

Dynamic aggregation can be used for analysis (to view aggregated data to understand load demand, for instance) as well as settlement processing performed by Oracle Utilities Market Settlements Management.

Understanding Dynamic Aggregation Execution

This section provides an overview of how dynamic aggregation processing is executed, including descriptions of the different types of dynamic aggregation processing and the different types of data that can be aggregated.

Dynamic Aggregation Execution: Aggregation Groups and Aggregation Group Runs

Aggregation processing is managed via aggregation groups. Aggregation Groups outline the sequence of aggregations that must occur for a given aggregation process. Each aggregation group includes a set of Measuring Component Sets, each of which has one or more related Aggregation Measuring Components.

When processing is initiated for an aggregation group, the system creates an Aggregation Group Run record to track the status and progress of the aggregation processing. This record is used to manage the aggregation process for each group and track which Measuring Component Sets should be executed next and when the aggregation is complete.

The following steps outlines the aggregation process:

1. The Dimension Scan and Aggregation monitor batch control (D1-DSAEM) initiates processing for all Aggregation Groups. This should be scheduled at least once per day. This monitor process runs all monitor algorithms on each aggregation group. The base package aggregation group has two monitor algorithms:
    - Aggregation Group Run Maintenance (D1-AGRM)
2. The Aggregation Group Run Maintenance algorithm verifies if the Aggregation Group is ready to aggregate by looking at the processing timetable defined for the aggregation group and the last scheduled execution. If it is time for the next aggregation then the algorithm creates a pending Aggregation Group Run which will then be used to track the status of the Measuring Component Sets for the aggregation.

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3. At the completion of the Dimension Scanner and Aggregation monitor batch process, the Submit Dimension Scanner Batch (D1-SUBDIMSCN) post-processing algorithm searches for any Aggregation Group Run entries that are in progress where the next Measuring Component Set is not manual. If at least one is found then it will initiate the Aggregation Group Dimension Scanner batch process (D1-AGDS).
4. The Aggregation Group Dimension Scanner batch process identifies the next Measuring Component Set for each Aggregation Group Run that is in progress. If that next Measuring Component Set is not manual then it will retrieve each Aggregation Measuring Component for the Measuring Component Set and execute the monitor algorithms for that Aggregation Measuring Component. These include an aggregation algorithm (specific to the type of data to be aggregated such as interval, billed quantities, etc.) and in some cases a value derivation algorithm.
5. For each Aggregation Measuring Component that is monitored by the Aggregation Group Dimension Scanner batch process, the aggregation process:
    a. Executes the appropriate Find Constituents algorithm to find the list of constituents that are to be aggregated
    b. Extracts the data for those constituents that should be aggregated
    c. Executes the appropriate aggregation algorithm against that data and store the results
    d. Executes validation algorithms if applicable
    e. Executes value derivation algorithms if applicable
6. The Aggregate Next Measuring Component Set (D1-AGGNXMCS) post-processing algorithm on the Aggregation Group Dimension Scanner batch process updates the Aggregation Group Run the batch information for each Measuring Component Set that was aggregated, and requests the Dimension Scan and Aggregation monitor batch process to run again.
7. This again executes the monitor algorithms for all the Aggregation Groups which will do one of several things:
    - If the Aggregation Group Run is in progress and the next Measuring Component Set is Automatic then nothing will happen.
    - If the Aggregation Group Run is in progress and the next Measuring Component Set is Manual it will create a To Do.
    - If the Aggregation Group Run does not have a next Measuring Component Set, it will set the Aggregation Group Run to Complete

    > **Note**
    >
    > The Dimension Scanner algorithm will be executed again but since there will not be a pending Aggregation Group Run it will not do anything.

8. Once all Measuring Component Sets are complete the Aggregation Group Run Maintenance algorithm marks the Aggregation Group Run as complete.

Aggregation Scheduling

Aggregation Scheduling for Aggregation Groups can be based on either a Defined Lag, or a Processing Timetable.

- **Defined Lag** scheduling uses the following parameters:

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  - **Aggregation Cut Off Time**: The end time for aggregation calculations performed for Aggregation Measuring Components for Measuring Component Sets associated with the Aggregation Group. This is used to ensure a consistent end time for aggregation periods. This is especially useful when aggregating other aggregations.
  - **Aggregation Lag**: The number of days between the date on which aggregation calculations are performed and the end date of the aggregation period. This defines the time period between the aggregation calculation date and the aggregation horizon that serves to allow all measurements to arrive. This together with the Aggregation Horizon is used to determine the start and end dates of an aggregation period. For example, with an Aggregation Horizon of 5 and an Aggregation Lag of 2, aggregation calculations performed on January 9 would be for an aggregation period of January 3 through January 7. The next day (January 10), the aggregation period would shift to January 4 through January 8.
  - **Aggregation Horizon**: The number of days in the aggregation period for Aggregation Measuring Components for Measuring Component Sets associated with the Aggregation Group. This reflects the time period during which there's a potential change in measurement data for one or more of the measuring components associated with Aggregation Measuring Components. This together with the Aggregation Lag is used to determine the start and end dates of an aggregation period.

- **Processing Timetable** scheduling uses a Processing Timetable Type to drive aggregation schedule.

With dynamic aggregation, the aggregation period is consistent for all members of an Aggregation Group when an aggregation is performed. This is despite the fact that there may be differences between Measuring Component Sets and even Measuring Components within an Measuring Component Set as to how far the data has been aggregated through. In addition, individual Aggregation Measuring Components all use the same aggregation period when aggregation is performed.

Anchor Time

Dynamic aggregation processing supports calculations based on an "Anchor Time". The Anchor Time is specified on dynamic aggregation measuring component types and defines the start and end time of the business day for purposes of aggregation processing. When processing aggregation for dynamic aggregation measuring components whose type specifies an **Anchor Time**, the Start Time and End Time of the calculation period should match the **Anchor Time** on the dynamic aggregation measuring component type.

> **Note**
>
> When processing calculations for measuring components whose type specifies an **Anchor Time**, if the Start Time and End Time of the calculation period do NOT match the **Anchor Time** on the measuring component type, the Start and Stop Time are shifted to align with the closest time to the **Anchor Time** that aligns with the interval size of the measurement data being processed. The Start Time is shifted backwards (to an earlier time) and the End Time is shifted forwards (to a later time). In the case of hourly intervals with Start Times and End Times on the hour, no shift occurs. In the case of daily intervals, the shift is to the nearest Anchor Time. For example, in the Anchor Time is 07:00AM but the Start Time and End Time are both 12:00, the Start Time would be shifted to the previous 07:00AM, and the End Time would be shifted the next 07:00AM.

- Dynamic Aggregation Processing

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- Types of Aggregations

Dynamic Aggregation Processing

This section provides additional details around the specific types of processing used with dynamic aggregation.

Similar to standard aggregation, dynamic aggregation processing comprises three primary types of processes:

- **Dimension Scanning**: a process that searches for unique combinations of dimensions that are not yet represented by an Aggregation Measuring Component.
- **Find Constituents**: a process that finds all source data to be aggregated for a given Aggregation Measuring Component, based on the Aggregation Measuring Component's dimensions.
- **Aggregation**: a process that aggregates source data that corresponds to the Aggregation Measuring Component's dimensions.

Dynamic aggregation processing is driven by the following types of administrative data:

- **Data Sources** define the source of data to be aggregated, such as measurement data from usage subscriptions linked to a service point, badged or unbadged items, or other sources of data.
- **Aggregation Measuring Component Types** define the most important properties of aggregation measuring components used to store aggregated data.
- **Aggregation Groups** define the ordering of a series of related aggregations and the schedule of aggregation.
- **Measuring Component Sets** define the dimensions and criteria by which aggregation will be performed.

Refer to Dynamic Aggregation Configuration Overview for more information about configuration of this data.

- Dynamic SQL
- Dimension Scanning
- Find Constituents
- Aggregation Calculation
- Foundation and Composite Aggregation

Dynamic SQL

Dynamic aggregation uses dynamic SQL queries to perform dimension scanning, find constituents, and aggregation processing. These dynamic queries are based on configuration of:

- Data Sources
- Aggregation Measuring Component Types
- Measuring Component Sets

The Source of Dynamic SQL

Data sources provide template SQL that is used as the basis for dynamic queries. This template SQL is extended by additional SQL generated from the data source configuration as well as configuration defined for measuring component sets, measuring components, and

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measuring component types that reference the data source. The ways in which the template SQL is extended is based on the type of process:

- **Dimension Scanning**: The data source template SQL is extended by the criteria, dimensions, and individually managed items configured on the measuring component sets being processed.
- **Find Constituents**: The data source template SQL is extended by attributes defined on the aggregation measuring components being processed.
- **Aggregation**: The data source template SQL is extended by the value identifiers defined on the measuring component type of the aggregation measuring components being processed.

Dimension Scanning

The dimension scanning process analyzes master data to identify unique dimension combinations and create an aggregation measuring component for each. Several objects play a role in this process:

- The Aggregation Group holds the monitor algorithm that performs the scanning
- The Data Source defines the template SQL for identifying dimensions
- Measuring Component Sets define the dimensions and criteria for identifying the dimension combinations

See Dynamic SQL for more about the role of data sources and measuring component sets in generating dynamic SQL queries for dimension scanning.

This process is executed when aggregation is initiated for an Aggregation Group. This process should be run on a frequent basis (daily or more frequent) and should be executed prior to aggregation processing being run. Each time it is executed the dimension scanning process takes the following high level steps:

1. Identifies all Measuring Component Sets for the Aggregation Group that are not imported from an external source
2. Identifies all yet to be represented dimension combinations
3. Creates an Aggregation Measuring Component based on the Measuring Component Set's Measuring Component Type for each dimension combination identified in step 2.
4. Adds Attributes for each Aggregation Measuring Component created to describe the dimensions and criteria for that Measuring Component
5. Adds an entry in the Measuring Component Set participants table for each Aggregation Measuring Component created

This processing is performed by a monitor algorithm (Aggregation Group Dimension Scanner: D1-AGDS) on the Finalized status of the Aggregation Group business object.

Find Constituents

The Find Constituents process finds all source data to be aggregated for a given aggregation measuring component, based on the Aggregation Measuring Component’s dimensions. The queries used for this process are based on data source template SQL extended by attributes defined on the Aggregation Measuring Components being processed.

The Find Constituents process is initiated by the aggregation algorithm on the Aggregation Measuring Component (each type of Aggregation Measuring Component — interval, item, billed quantities — has its own aggregation algorithm), and is performed by algorithms defined for the Find Constituents system event on the Aggregation Measuring Component business object.

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This process differs slightly when finding constituents for interval and scalar measurements stored on measuring components, item data, and billed quantities.

Measuring Components

The Find Constituents process for measuring components uses the Find Constituents for Dynamic Aggregation (D1-FINDCONST) algorithm which retrieves data based on the following:

- Attributes on the Aggregation Measuring Component based on the Measuring Component Set configuration
- Measuring Component Types on the Data Source

Measuring component constituents are inserted into a global temporary table (GTT1) with the following information:

- Measuring Component ID
- Horizon Start Date/Time
- Horizon End Date/Time
- Time Zone

> **Note**
>
> The aggregation period for each is adjusted by the source Measuring Component's installation history.

Items

The Find Constituents process for items uses the Find Constituents for Items (D1-FICONITEM) algorithm which retrieves data based on the following:

- Attributes on the Measuring Component based on the Measuring Component Set configuration
- Item Types / Service Point Types on the Data Source (for badged vs. unbadged items, respectively)

Item constituents are inserted into a global temporary table (GTT3) with the following information:

- Maintenance Object (Device or Service Point)
- Device Type: Item Type
- Item Count
- Horizon Start Date/Time
- Horizon End Date/Time
- Time Zone

> **Note**
>
> The aggregation period for each is adjusted by the source Item's installation history.

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Billed Quantities

The Find Constituents process for billed quantities uses the Find Constituents for Billing Data (D1-FINDCONSB) algorithm which retrieves data based on the following:

- Attributes on the Aggregation Measuring Component based on the Measuring Component Set configuration
- Usage Subscription Types on the Data Source

Billed quantity constituents are inserted into a global temporary table (GTT5) with the following information:

- Usage Subscription ID
- Usage ID
- Horizon Start Date/Time
- Horizon End Date/Time
- Time Zone

> **Note**
>
> The aggregation period for each is adjusted by the source Usage Subscription's installation history.

Aggregation Calculation

The aggregation calculations process aggregates source data that correspond to the Aggregation Measuring Component's dimensions. The queries used for this process are based on data source template SQL extended by the value identifiers defined on the measuring component type of the Aggregation Measuring Components being processed.

The aggregation calculation process is initiated by Aggregation by MC Set Monitor batch process (D1-AMCS), and is performed by monitor algorithms defined on the Active state of the Aggregation Measuring Component business object. The algorithms used by each type of Aggregation Measuring Component are as follows:

Aggregation Measuring Component Business Object	Aggregation Algorithm
Dynamic Aggregator - Billed Quantities (D1-AggBilledServiceQuantities)	Aggregate Billed Service Quantities (D1_AGGBSQ)
Dynamic Aggregator - Composite (D1-AggregatorComposite)	Aggregate Interval Measurements (D1_AGGINT)
Dynamic Aggregator - Customer Quantities (D1-AggregatorCustomerQuantity)	Aggregate Customer Specific Quantities (D1_AGGCSQ)
Dynamic Aggregator - Interval (D1-AggregatorInterval)	Aggregate Interval Measurements (D1_AGGINT)
Dynamic Aggregator - Items (D1-AggregatorItems)	Aggregate Item Data (D1_AGGITEM)
Dynamic Aggregator - Scalar (D1-AggregatorScalar)	Aggregate Scalar (D1_AGGSCLR)

See Types of Aggregation for more information about aggregation calculations for each type.

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Other Calculations

In addition to basic aggregation processing, other calculations can be performed on aggregated measurements as needed. For instance, a common step in aggregating date for use in market settlements is applying a loss factor to aggregated data to reflect system losses (line loss, etc.) between generation-level quantities and end consumption quantities.

These types of calculations can be performed by value derivation algorithms. These are algorithms based on the Derive Aggregated Quantity Using a Formula (D1-DERAGGQTY) algorithm type which apply a configured formula to aggregated measurement values. For instance, to apply a loss factor, an algorithm can retrieve effective-dated factor values for a loss factor and multiply each aggregated measurement value by the appropriate factor value.

The Execute Aggregation Value Derivation (D1-EAGGVALD) algorithm on Aggregation Measuring Components executes any value derivation algorithms specified for Value Identifiers on the Aggregation Measuring Component Type.

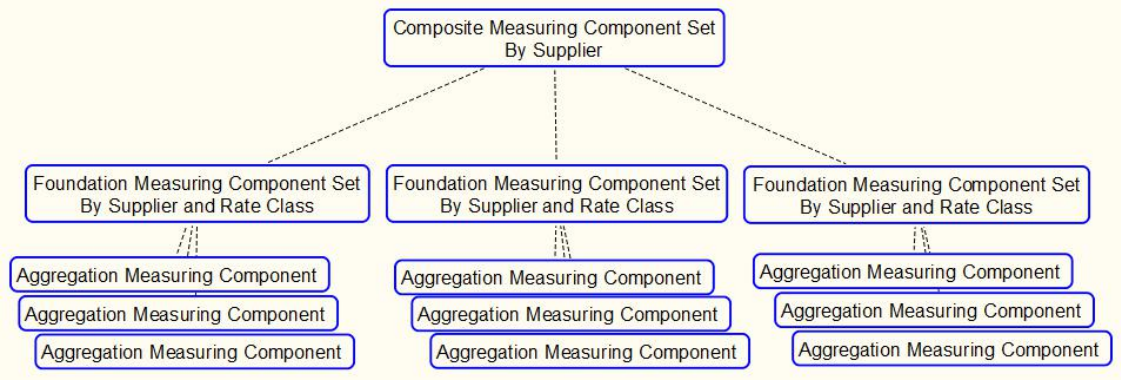
Aggregation Calculation and Anchor Time

Dynamic aggregation processing supports calculations based on an "Anchor Time". The Anchor Time is specified on dynamic aggregation measuring component types and defines the start and end time of the business day for purposes of aggregation processing. When processing aggregation for dynamic aggregation measuring components whose type specifies an **Anchor Time**, the Start Time and End Time of the calculation period should match the **Anchor Time** on the dynamic aggregation measuring component type.

Foundation and Composite Aggregation

Dynamic aggregation supports two “levels” of aggregation. Aggregating source data, from measuring components, items, or billed quantities is referred to as “Foundation” aggregation. Aggregation of aggregated data is known as “Composite” aggregation. Composite aggregation provides the ability to aggregate data from a set of other aggregations.

The diagram below illustrates a simple example of the relationship between foundation and composite measuring component sets. Each of the three foundation measuring component sets has a number of aggregation measuring component participants that aggregate data based on a set of dimensions and a particular supplier and rate class. Those in turn are participants in the composite measuring component set that aggregates based on the supplier (including data for all rate classes).



A common scenario where composite aggregation would be used is to consolidate data across several foundation aggregation measuring component sets that pulled data from a set of data sources ordered by precedence such that the best data was sourced when available and when not the aggregations fell back to a lesser quality data source:

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- Foundation: Interval measurements from usage subscriptions and / or service points
- Foundation: Scalar measurement from usage subscriptions and / or service points
- Foundation: Interval measurements from estimations (backcasted using actual weather)
- Composite: Aggregation by supplier

In this example the goal of the first aggregation would be to retrieve as much interval data as possible where that interval data covered the entire period being settled for. The second aggregation would take scalar data for those instances where interval data was not available and apply a profile to produce the appropriate intervals. The third aggregation would fill in any remaining gaps that were not covered by interval or scalar data with estimations based various forecasting models.

At the completion of those first three aggregations there would be the full resolution of data for the customer base. However, the values would be spread out across many aggregation measuring components tied to those measuring component sets. This is where the composite aggregation functionality comes into play. The composite aggregation measuring component would reference the first three foundation aggregations and sum together the data from each aggregation into a single instance that represents the total usage for the period being settled.

Let’s look at a slightly more involved example. The diagram below illustrates a set of foundation aggregations based on:

- Rate Class
- Strata
- Procurement Class

This shows how the physical measuring component data (designated by Customer A, Customer B, etc.) will be aggregated into separate aggregation measuring components based on source of data (interval or scalar). Then it shows how those aggregations are then aggregated to produce a total number that represents all 3 aggregation sources merged together.

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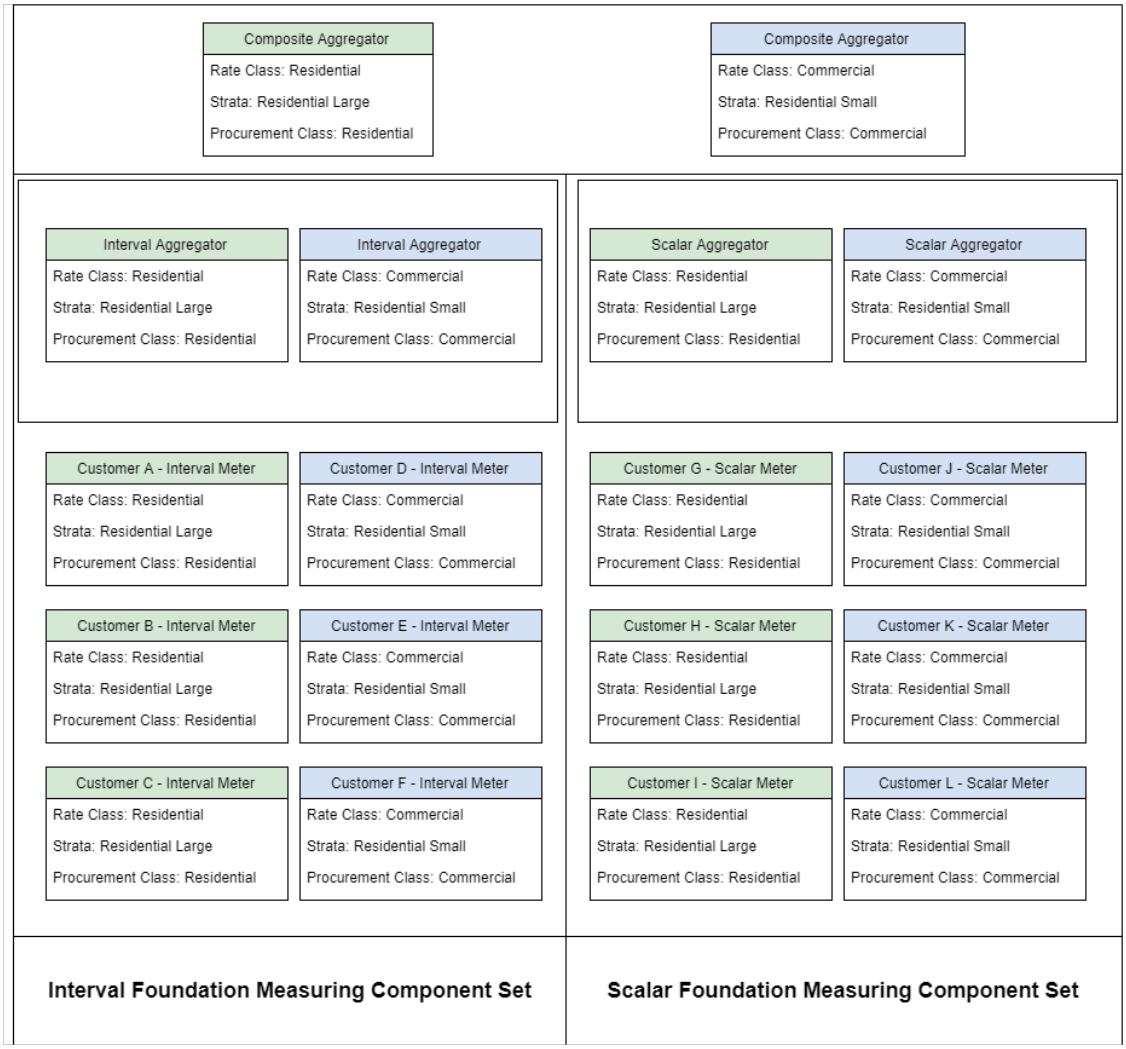

Types of Aggregations

This section describes the processing used by different types of aggregations, including:

- Aggregating Measurement Data (Interval and Scalar)
- Aggregating Item Data
- Aggregating Billed Service Quantities
- Aggregating Aggregated Data (Composite Aggregation)

- Aggregating Measurement Data
- Aggregating Item Data
- Aggregating Billed Quantities
- Aggregating Aggregated Data

Aggregating Measurement Data

Aggregating measurement data involves identifying constituent measuring components for an Aggregation Measuring Component, identifying the measurement data that falls within the aggregation period, and aggregating that data. The process varies slightly between interval and scalar measuring components.

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Interval Measuring Components

Aggregation of interval measurements is handled by the Aggregate Interval Measurements (D1_AGGINT) algorithm. The algorithm performs the following steps:

- It calls the Find Constituents for Dynamic Aggregation (D1-FINDCONST) algorithm and populates the GTT1 global temporary table (see Find Constituents for more details about this process).
- It deletes any constituents from the GTT1 table that do not have 100% coverage for the dates in the aggregation period.
- For each remaining constituent in GTT1, the algorithm inserts its measurements for the aggregation period into the GTT2 global temporary table. If the SPI and UOM are different from that of the Aggregation Measuring Component, the measurements are converted to a common SPI using Axis Conversion.
- It performs aggregation calculations on the measurement data in the GTT2 table, using data source template SQL, extended by the value identifiers defined on the measuring component type of the Aggregation Measuring Component.
- It either inserts or updates the results to the appropriate measurement table (the standard Measurement table, or the Aggregation Measurement table)
- If there is no data for any dates in the aggregation period and previously aggregated measurements exist, those measurements are deleted to indicate the absence of data.
- It updates the **Most Recent Measurement Date/Time** and **Latest Measurement Date/Time** values on the Aggregation Measuring Component.

Scalar Measuring Components

Aggregation of scalar measurements is handled by the Aggregate Scalar Measurements (D1_AGGSCL) algorithm. The algorithm performs the following steps:

- It calls the Find Constituents for Dynamic Aggregation (D1-FINDCONST) algorithm and populates the GTT1 global temporary table (see Find Constituents for more details about this process).
- It deletes any constituents from the GTT1 table that do not have 100% coverage for the dates in the aggregation period.
- For each remaining constituent in GTT1, the algorithm inserts its measurements for the aggregation period into the GTT2 global temporary table. If the UOM is different from that of the Aggregation Measuring Component, the measurement is converted to a common UOM before being inserted into GTT1.
- It performs aggregation calculations on the measurement data in the GTT2 table, using data source template SQL, extended by the value identifiers defined on the measuring component type of the Aggregation Measuring Component.
- It applies a profile to the aggregated scalar values to create interval measurements with the same SPI as the Aggregation Measuring Component.
- It either inserts or updates the results to the appropriate measurement table (the standard Measurement table, or the Aggregation Measurement table)
- If there is no data for any dates in the aggregation period and previously aggregated measurements exist, those measurements are deleted to indicate the absence of data.
- It updates the **Most Recent Measurement Date/Time** and **Latest Measurement Date/Time** values on the Aggregation Measuring Component.

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Aggregating Item Data

Aggregating item data involves identifying constituent items for an Aggregation Measuring Component, calculate item measurement data for the aggregation period, and aggregating that data.

Aggregation of interval measurements is handled by the Aggregate Item Data (D1_AGGITEM) algorithm. The algorithm performs the following steps:

- It calls the Find Constituents for Items (D1-FICONITEM) algorithm and populates the GTT3 global temporary table with groups of device types (for badged items) and/or service point types (for unbadged items) (see Find Constituents for more details about this process).
- It deletes any constituents from the GTT3 table that do not have 100% coverage for the dates in the aggregation period.
- For each remaining constituent in GTT3, the algorithm calculates measurements for the aggregation period and inserts them into the GTT4 global temporary table by applying the item counts for each group to the item interval (profile) data. If the SPI and UOM are different from that of the Aggregation Measuring Component, the measurements are converted to a common SPI using Axis Conversion.
- It performs aggregation calculations on the measurement data in the GTT4 table, using data source template SQL, extended by the value identifiers defined on the measuring component type of the Aggregation Measuring Component.
- It either inserts or updates the results to the appropriate measurement table (the standard Measurement table, or the Aggregation Measurement table)
- If there is no data for any dates in the aggregation period and previously aggregated measurements exist, those measurements are deleted to indicate the absence of data.
- It updates the **Most Recent Measurement Date/Time** and **Latest Measurement Date/Time** values on the Aggregation Measuring Component.

Aggregating Billed Quantities

Aggregating billed service quantities involves identifying constituent usage transactions for an Aggregation Measuring Component, retrieving the service quantity data that falls within the aggregation period, and aggregating that data.

Aggregation of billed quantities is handled by the Aggregate Billed Service Quantities (D1_AGGBSQ) algorithm. The algorithm performs the following steps:

- It calls the Find Constituents for Billing Data (D1-FINDCONSB) algorithm and populates the GTT5 global temporary table (see Find Constituents for more details about this process).
- It deletes any constituents from the GTT5 table that do not have 100% coverage for the dates in the aggregation period.
- For each remaining constituent in GTT5, the algorithm retrieves billing data for the aggregation period (based on the service quantity configuration on the data source) and inserts it into the GTT6 global temporary table. If the UOM is different from that of the Aggregation Measuring Component, the service quantities are converted to a common UOM.
- It performs aggregation calculations on the measurement data in the GTT6 table, using data source template SQL, extended by the value identifiers defined on the measuring component type of the Aggregation Measuring Component.
- It applies a profile to the aggregated values to create interval measurements with the same SPI as the Aggregation Measuring Component.

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- It either inserts or updates the results to the appropriate measurement table (the standard Measurement table, or the Aggregation Measurement table)
- If there is no data for any dates in the aggregation period and previously aggregated measurements exist, those measurements are deleted to indicate the absence of data.
- It updates the **Most Recent Measurement Date/Time** and **Latest Measurement Date/Time** values on the Aggregation Measuring Component.

Aggregating Aggregated Data

Aggregating aggregated data, also known as composite aggregation, involves identifying constituent aggregation measuring components for a composite Aggregation Measuring Component, identifying the measurement data that falls within the aggregation period, and aggregating that data.

Composite aggregation is very similar to aggregating interval measurement data, and uses the Aggregate Interval Measurements (D1_AGGINT) Find Constituents for Dynamic Aggregation (D1-FINDCONST) algorithm.

About Aggregation Measuring Components

Aggregation Measuring Components are measuring components used to store aggregated data. Aggregation measuring components do not use initial measurements. Aggregated measurements are stored in the Measurement or Aggregation Measurement table (based on the Measurement Business Object defined for the aggregation measuring component's type).

Aggregation Measuring Components are defined by the following:

- **Initiating Measuring Component Set**: The measuring component set that triggered creation of the aggregation measuring component via the Dimension Scanning process (see Dimension Scanning for more information).
- **Processing Information**: Details of aggregation processing for the aggregation measuring component, including the date and time through which aggregation has been performed.
- **VEE Groups**: The VEE groups used when performing validation, editing, and estimation for the aggregation measuring component.
- **Measuring Component Attributes**: Attributes that describe the dimensions and criteria for the aggregation measuring component (identified by the Dimension Scanning process)

The base package includes the following aggregation measuring component business objects for use with dynamic aggregation:

- Aggregator Interval (D1–AggregatorInterval): Used to aggregate interval measurements from interval measuring components
- Aggregator Scalar (D1–AggregatorScalar): Used to aggregate scalar measurements from scalar measuring components
- Aggregator Items Measuring Component (D1–AggregatorItems): Used to aggregate item data
- Aggregator Billed Service Quantities (D1–AggBilledServiceQuantities): Used to aggregate billed service quantities from usage transactions
- Aggregator Customer Quantities (D1–AggregatorCustomerQuantity): Used to aggregate specific types of customer quantities such as Peak Load Contribution (PLC) and usage factors
- Aggregator Composite (D1–AggregatorComposite): Used to aggregate aggregated data from aggregation measuring components (composite aggregation)

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These business objects define the Find Constituents and Aggregation algorithms used for aggregation calculations.

Maintaining Aggregation Measuring Components

You use the **Totals and Trends View** portal to maintain aggregation measuring components.

Refer to About Aggregation Measuring Components for additional information.

You can access this portal by selecting an aggregation measuring component from the **Measuring Component Set Participants** zone in the **Measuring Component Set** portal. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

This portal includes the following zones:

- **Measuring Component**: This zone displays the basic attributes of the aggregation measuring component
- **Measuring Component Attributes:** This zone displays attributes that describe the dimensions and criteria for the aggregation measuring component
- **Related Measuring Component Sets**: This zone displays the measuring component sets related to the aggregation measuring component
- **Final Values Overlay**: This zone graphs final measurements for a measuring component, and provides the ability to overlay the graphed data with final measurements from other measuring components. The zone also permits overlaying data from the same measuring component for different time periods, as well as data from measuring components that measuring different quantities, such as temperature.
- **Interval - Audit View**: This zone allows users to view an interval measurement curve for a given period overlaid with the count of audit records for each individual measurement. It also allows users to magnify a portion of the curve and see how the measurements looked at different points in time.
- **Measurements - Interval**: This zone displays measurement details for the aggregation measuring component
- **Usage Subscriptions Directly Linked to MC**: This zone displays usage subscriptions that are directly linked to the aggregation measuring component
- **Time of Use Overlay**: This zone displays an overlay of the TOU periods on measurement data along with totalized TOU consumption based on a user-defined time period and TOU map

About Customer Program Service Tasks

Customer program service tasks are used to manage various customer-focused processes such as enrollment, unenrollment, and service calls.. A service task is created for each customer process and orchestrates the various steps and tasks involved in that process.

System Data

Customer program service tasks are based on the following system data:

Data Type	Description
Maintenance Object	Service Task (F1-SVCTASK)

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Data Type	Description
Business Object(s)	Customer Program Enrollment Task (X1-DigitalAssetEnrollTask) Customer Program Unenrollment Task (X1-DigitalAssetUnenrollTask) Program Service Call (X1-ProgramServiceCall) DER Interconnection Request Task (X1-DERInterconnectionTask) Customer Program Enroll Additional Device Task (X1-DAAddDeviceToEnrollTask)

About Enrollment and Unenrollment

Enrollment involves identifying a specific customer that is eligible for a particular program, and establishing a relationship between the customer, the program, and if appropriate, a device location where one more controllable devices are (or have been) installed. The primary result of the enrollment process is a program subscription that links a customer with a program and (and in most cases) a device location. The process can also involve one or more actions performed to set up the controllable devices. For example, in the case of devices which the utility provides and installs at the customer's location, the enrollment process creates a work activity used to schedule a crew to install the device. Another common device setup action involves issuing a "device status check" command request in which the control system validates that the device can receive messages from the control system.

Unenrollment involves removing a previously enrolled customer from a program, and deactivating program subscriptions and related controllable devices.

The enrollment and unenrollment processes are managed by the following service task business objects:

- Customer Program Enrollment Task (X1-DigitalAssetEnrollTask)
- Customer Program Unenrollment Task (X1-DigitalAssetUnenrollTask)

To understand the enrollment and unenrollment processes, it’s important understand the lifecycle of these service task business objects. The table below outlines the lifecycle for the above business objects. Specifics for Enrollment and Unenrollment are noted in the descriptions below.

State	Description
Pending	The initial state for service tasks activities. The service task is transitioned to the next state via a monitor process.

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State	Description
Validate	Enrollment: an Enter algorithm validates the enrollment request, including: • If an existing customer can be retrieved for the customer program enrollment request and the request contains the necessary enrollment details to continue processing. • If the program is accepting enrollments • If the metered service points division is same as the programs division • If asset information is provided when the Installation Method is "Bring Your Own" • If an in store asset exists that is valid for the program when the Installation Method is "Bring Your Own" and Asset Ownership is "Utility Owned" Unenrollment: an Enter algorithm validates that the unenrollment request contains the necessary details to derive the program subscription record to be unenrolled. The service task is transitioned to the next state via a monitor process.
Validation Error	If the service task fails any of the validations in the Pending state, it enters this state. Service tasks in this state can be corrected and retried.
Validated	If the service task passes the validations in the Validate state, it enters this state.
Check Eligibility	Enter algorithms validate the the customer is eligible for the program (based on the Eligibility Criteria defined for the program's Initiative), and that the customer meets the program qualifications (based on the program's qualification questions). Applies to Enrollment service tasks only.
Eligibility Error	If the customer is either not eligible for the program or doesn't meet the program qualifications, the service task fails and enters this state. Service tasks in this state can be corrected and retried. Applies to Enrollment service tasks only.
Re-Evaluate Eligibility	If the service task failed and during the Check Eligbility state, it can enter this state temporarily before returning to the the Check Eligbility state. Applies to Enrollment service tasks only.
Setup Enrollment	An Enter algorithm creates a Program Subscription (in the "Inactive" state) and a Device Location (in the "Active" state). **Note** If the **Location Required Source** field is set to "No" on the program's program type, creation of the device location is skipped. If the Installation Method is "Bring Your Own" and Asset Ownership is "Customer Owned", a controllable device is also created and attached to the device location. Applies to Enrollment service tasks only.

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State	Description
Enrollment Setup Error	If an error occurs in the Setup Enrollment state, it enters this state. Service tasks in this state can be corrected and retried. Applies to Enrollment service tasks only.
Setup Unenrollment	An Enter algorithm deactivates the Program Subscription. Applies to Unenrollment service tasks only.
Unenrollment Setup Error	If an error occurs in the Setup Unenrollment state, it enters this state. Service tasks in this state can be corrected and retried. Applies to Uennrollment service tasks only.
Setup Device	Enrollment: An Enter algorithm determines the device setup actions configured under customer program enrollment service task type and creates the relevant setup actions required to setup the controllable device. Each setup action is captured in the Device Setup section of the service request (as well as in the service task's log). **Note** If the **Location Required Source** field is set to "No" on the program's program type, creation of the device is skipped. Unenrollment: An Enter algorithm determines the device setup actions configured under customer program unenrollment service task type and creates the relevant setup actions required to deactivate the controllable device. Each setup action is captured in the Device Setup section of the service request (as well as in the service task's log). See Device Setup Actions, below for more information.
Device Setup Error	If one or more device setup actions cannot be determined, the request is transitioned to this state. Service tasks in this state can be corrected and retried.
Awaiting Device Setup	The service task remains in this state until all device setup actions are complete. The service task is transitioned to the Device Setup Actions stage via a monitor process until all of the actions configured on the service task type have been completed.
Completed	The service task enter this state when all device setup actions have successfully completed. Enrollment: An Enter algorithm sets the Program Subscription's Status to "Active". Unenrollment: An Enter algorithm populates the "End Date/ Time" on the Program Subscription and sets its Status to "Inactive", and any controllable devices on the Program Subscription are deactivated.
Discarded	Service tasks discarded in previous states enter this state.
Canceled	Service tasks canceled in previous states enter this state.

Specifics of the service task, such as the type of program subscription and device location to creates and the types of device setup actions required to complete the enrollment are defined by the service task type associated with the program in which the customer is enrolling (or from

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which the customer is unenrolling). See Understanding Customer Program Service Task Types in the *Administrative User Guide* for more information.

Device Setup Actions

Enrollment or unenrollment processes can include a number of device setup actions performed to install, investigate, or test controllable devices as part of the enrollment or unenrollment process. Supported device setup actions include:

- **Create Activity**: Creates Service Order Management field activities to perform device installation or investigation.
- **Create To Do**: Creates To Do Entries.
- **Create Work Order**: Create Work and Asset Management work orders to perform device installation or investigation.
- **Initiate Controllable Device Command**: Create and send commands to controllable devices to test if they're capable of communicating with the control system.

See Understanding Customer Program Service Task Types in the *Administrative User Guide* for more information about configuring device setup actions.

Enrollment/Unenrollment Methods

Oracle Utilities Customer Program Management Cloud Service provides two methods of initiating the customer enrollment or unenrollment processes.

The first is through use of the **Process Flow** portal and functionality. The system provides two process flow types to support the enrollment and unenrollment processes:

- Program Enrollment Process (X1-DIGITALASSETENROLLMENT)
- Program Unenrollment Process (X1-DIGITALASSETUNENROLLMENT)

Enrollment/unenrollment service tasks are created by the process flow based on data entered by the user. See Enrolling and Unenrolling Customers using Process Flow for more information about using the **Process Flow** portal for enrollment and unenrollment. See Process Flows in the *Administrative User Guide* for general information the process flow functionality.

Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management also provide an inbound web service to enable submission of enrollment and unenrollment requests from external systems such as a customer information system. The Program Enrollments (X1-ProgramEnrollment) inbound web service provides the following operations:

- Create Program Enrollment (enrollProgram): Used to create an enrollment request to enroll a customer in a program
- Create Program Unenrollment (unenrollProgram): - Used to create an unenrollment request to unenroll (remove) a customer from a program
- Get Program Enrollment (getProgramEnrollment): - Used to retrieve enrollment information
- Get Program Unenrollment (getProgramUnenrollment): - Used to retrieve unenrollment information

About Service Calls

Service calls are created when a customer reports an incident of some kind related to a controllable device installed at their location. Service calls can have different levels of urgency

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(Emergency or Non-Emergency) and can be used to create a work order to address the incident, or can resolve or escalate a previous service call.

The system provides the following process flow type to support service calls:

- Program Service Call Process (X1-DAPROGRAMSERVICECALL)

Service calls are initiated from the **Current Enrollment** zone in the **Customer Program Summary** portal, and make use of the **Process Flow** portal and functionality. When the user clicks the **Service Call** button on the **Current Enrollment** zone, they are brought to the **Process Flow** portal where they can enter details of the service call. Service call service tasks are created by the process flow based on data entered by the user. See Creating Program Service Calls Using Process Flow for more information about using the **Process Flow** portal for service calls. See Process Flows in the *Administrative User Guide* for general information the process flow functionality.

The service call process is managed by the following service task business object:

- Program Service Call (X1-ProgramServiceCall)

To understand the service call process, it's important understand the lifecycle of this service task business object. The table below outlines the lifecycle for the above business object.

State	Description
Pending	The initial state for service tasks activities. The service task is transitioned to the next state via a monitor process (or as part process flow processing).
Validate	The service task is transitioned to the next state via a monitor process.
Validation Error	If the service task fails any of the validations in the Pending state, it enters this state. Service tasks in this state can be corrected and retried.
Escalated	This state applies only to service calls with an "Escalation" action. An Enter algorithm creates an "Escalated" To Do entry, based on the **Escalation To Do Type** defined on the service task type.
Work in Progress	This state applies only to service calls with a "Create a Work Order" action. An Enter algorithm creates a work order based on the selected template work order. The service task remains in this state until the word order and its related work activities are completed (via a Monitor algorithm).
Completed	The service task enters this state following either the "Escalated" or "Work in Progress" states.
Discarded	Service tasks discarded in previous states enter this state.

Specifics of the service task, such as the type of work order to creates are defined by the service task type associated with the program for which the customer is initiating the service call. See Understanding Customer Program Service Task Types in the *Administrative User Guide* for more information.

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Maintaining Controllable Assets and Devices

The **Asset** and **Controllable Asset** portals are used to display and maintain controllable asset and device records.

Refer to About Controllable Assets and Devices for more information.

You can access the portal from **Menu**, select **Asset Management**, then select **Asset**. The **Asset Query** portal and **Asset Search** zone open which you can use to search for the controllable asset/device you wish to view. When you select an asset, the **Controllable Asset** portal opens displaying the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Controllable Asset**: This zone displays basic information about the asset record associated with the controllable asset.
  - Click **Calculate Score** to manually calculate the control score for the asset. The score is calculated based on the Score Calculation Rule configured for the program subscription or program subscription type associated with the program in which the asset is enrolled. See Score Calculation Rule for more information the Score Calculation Rule. If no rule is configured, the **Calculate Score** button does nothing. This option is only available if the asset's **Status** and **Asset Disposition** are "Installed".
- **Attachments**: This zone lists any attachments related to the asset record associated with the controllable asset.
- **Asset Service History**: This zone displays a log of the service history that has been recorded for the life of the asset.
- **Notes**: This zone lists any notes for the asset record associated with the controllable asset.
- **Disposition History**: This zone displays a log of the status and location changes for the life of the asset

The following zones may appear as part of the portal's **Device** tab page:

- **Controllable Device**: This zone displays the device record associated with the controllable asset. (Controllable assets/devices have both asset and device records)
- **Device Attachments**: This zone lists any attachments related to the device record associated with the controllable asset.
- **Device Log**: This zone display log information for the device record associated with the controllable asset.
- **Device Entity Groups**: This zone lists the entity groups to assigned to the device. To add an entity group to the device, click **Add Entity Group to Device**. A dialog opens where you can select the entity group.

The following zones may appear as part of the portal's **Log** tab page:

- **Asset Log**: This zone display log information for the asset record associated with the controllable asset.
- **Asset Sync Requests**: This zone lists data synchronization requests associated with the asset record associated with the controllable asset.
- **Asset Shipping Memos**: This zone lists shipping memos associated with the asset record associated with the controllable asset.

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Maintaining Device Locations

The **Device Location** portal is used to display and maintain device locations.

Refer to About Device Locations for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Device Location**. You are brought to a query portal with options for searching for a specific record. Once a device location has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Device Location**: This zone displays location information for this device location record.
- **Customer Unavailability**: This zone lists periods of time during which one more controllable devices are unavailable to participate in program events. Click **Add** to define a new unavailability period for a controllable device at this location. To edit an existing unavailability period for a controllable device at this location, select the period from the list and click **Edit**. To cancel an existing unavailability period for a controllable device at this location, select the period from the list and click **Cancel**.

Maintaining Facilities

The **Facilities** portal is used to display and maintain facility records.

Refer to About Facilities for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Facility**. You are brought to a query portal with options for searching for a specific record. Once a facility has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Facility**: This zone displays general information about the facility.
- **Network Locations Related to Facility**: This zone lists the network locations associated with the facility record.
- **Downstream Service Points Related to Facility**: This zone lists the downstream service points associated with the facility record.

Maintaining Metered Service

The **Metered Service** portal is used to display and maintain metered service records.

Refer to About Metered Service for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Metered Service**. You are brought to a query portal with options for searching for a specific record. Once a metered service records has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

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- **Metered Service**: This zone displays general information about the metered service records.
- **Program Subscriptions**: This zone displays a list of "child" program subscriptions associated with the metered service record.
- **Attribute Values**: This zone displays a list of attribute values whose characteristic type are defined as valid characteristic types on the Metered Service Type.
- **Settlement Group Program Subscriptions**: This zone lists program subscriptions that have the metered service defined as their Settlement Group.

Maintaining Metered Service Points

The **Metered Service Point** portal is used to display and maintain metered service points.

Refer to About Metered Service Pointsfor more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Metered Service Point**. You are brought to a query portal with options for searching for a specific record. Once a metered service point has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Metered Service Point**: This zone displays basic information for this metered service point.
- **Service Point Attachments**: This zone lists attachments associated with the metered service point.
- **Metered Services**: This zone lists metered services associated with the metered service point.
- **Device Locations**: This zone lists device locations associated with the metered service point.
- **SP Network Locations**: This zone lists all network locations linked to any facility associated with the metered service point.
- **SP Business Flags**: This zone lists the 25 most recent business flags associated with the metered service point.

Maintaining Network Locations

The **Network Location** portal is used to display and maintain network locations.

Refer to About Network Locations for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Network Location**. You are brought to a query portal with options for searching for a specific record. Once a network location has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Network Location**: This zone displays general information about the network location, such as Facility ID, Start and End Date/Time, Feeder, and Substation.

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- **SP Related to Network Location**: This zone lists the service points associated with the network location record.

Maintaining Programs and Related Records

This section describes how demand response programs and related data are created and maintained in Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

Information about programs is maintained in Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management, but other systems such as Oracle Utilities Network Management System are responsible for initiating and creating program events.

- Maintaining Programs
- Maintaining Program Contacts
- Maintaining Contact Communications
- Maintaining Program Subscriptions
- Maintaining Program Control Scores
- Maintaining Program Events
- Maintaining Event Participation
- Maintaining Program and Customer Settlement Transactions
- Maintaining Interval Price Sets

Maintaining Programs

The **Program** portal is used to display and maintain programs.

Refer to About Programs for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Program**. You are brought to a query portal with options for searching for a specific record. Once a program has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Program**: This zone displays general information about the program, such as program type, status, and approval profile.
- **Specifications**: This zone lists one or more specifications for devices eligible for the program.
- **Rates**: This zone lists one or more rates used to determine eligibility for customers to enroll in the program (customer must be on one of the listed rates to join the program).
- **Rules**: This zone lists program rules associated with the program.
- **Qualifications**: This zone lists one or more qualification questions used to determine eligibility for customers to enroll in the program.
- **Informational**: This zone lists one or more informational questions used to determine eligibility for customers to enroll in the program.
- **Events**: This zone lists events associated with the program.

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The following zones may appear as part of the portal's **Calculation Groups** tab page:

- **Program Settlement Calculation Groups**: This zone lists effective-dated program settlement calculation groups associated with the program.

Approving Program Approval Requests

Programs with an Approval Profile must be approved before they are consider active and eligible for use. Users can use with the **Approval Dashboard** or the **Approval Requests** portal to view and approve program approval requests.

Maintaining Program Contacts

The **Contact** portal is used to display and maintain program contacts.

Refer to About Program Contacts for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Program Contact**. You are brought to a query portal with options for searching for a specific record. Once a program contact has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Contact**: This zone displays general information about the contact, such as the contact's name and contact information (phone number, email address, and so on).
- **Contact Communication List**: This zone lists customer communications for the contact.
- **Point of Contact Service Point**: This zone lists metered service points associated with the contact. Used with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

Maintaining Contact Communications

You use the **Contact Communication** portal to display and maintain contact communications and interactions.

Refer to About Contact Communications for more information.

To access the portal select **Menu**, select **Customer Program Management**, then select **Contact Communication**. You are brought to a query portal with options for searching for a specific record. Once a contact communication has been selected, you are brought to the maintenance portal to view and maintain the selected record.

You can also access the portal from the **Contact Communication List** zone on the **Contact** portal. When you select the communication you wish to view you are brought to a maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Contact Communication**: This zone displays the selected communication.

Maintaining Program Subscriptions

The **Program Subscription** portal is used to display and maintain program subscriptions.

Refer to About Program Subscriptions for more information.

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You can access the portal from **Menu**, select **Customer Program Management**, then select **Program Subscription**. You are brought to a query portal with options for searching for a specific record. Once a program subscription has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Subscription**: This zone displays general information about the program subscription, such as the customer, status, and event calculation groups.
  - If the program subscription is for a device control program and has Incentive and Fees Program Rules if effect, you can use the **Calculate** button to initiate calculations of program incentives and fees. A window opens enabling the user to enter a **Cutoff Date** and select one or more eligible **Incentive and Fee Types** (based on the Rule Parameters defined on the Program Rule) to process.
- **Event Participation List**: This zone lists the events in which program subscription was a participant.
  - To opt out of one more more scheduled event, select the events and click **Opt Out**.
- **Program Settlements**: This zone lists program settlements calculated for the program subscription.
- **Incentives and Fees Settlements**: This zone lists incentives and fees calculated for the program subscription.
- **Attribute Values**: This zone lists attribute values whose characteristic type have Program Subscription as characteristic entities and are defined as valid Program Subscription characteristic types on the Program Subscription Type.

Maintaining Program Control Scores

The **Program Control Score** portal is used to display and maintain program control scores.

Refer to About Program Control Scores for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Program Control Score**. You are brought to a query portal with options for searching for a specific record. Once a program control score has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Control Score**: This zone displays the selected program control score.

Maintaining Program Events

The **Program Event** portal is used to display and maintain program events.

Refer to About Program Events for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Program Event**, or select **Program Event** from the **Program** context menu when viewing either a Program Subscription or Program. When using either approach users are brought to a query portal with options for searching for a specific record. Once a program event has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

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- **Program Event**: This zone displays general information about the program event, such as the program, status, program category, the start and end date/time of the event, and an external event identifier (if applicable).

Maintaining Event Participation

The **Event Participation** portal is used to display and maintain event participation records.

Refer to About Event Participation for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Event Participation**. You are brought to a query portal with options for searching for a specific record. Once an event participation has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Event Participation**: This zone displays general information, such as Program Subscription, Dynamic Option ID, Reservation, Outcome, and so on, about the event participation record.

Maintaining Program and Customer Settlement Transactions

The **Program Settlement** portal is used to display and maintain program and customer settlement transactions, , including program incentives and fees.

Refer to About Program Settlement Transactions, About Program Incentives and Fees, and About Customer Settlement Transactions for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Program Settlement**. You are brought to a query portal with options for searching for a specific record. Once a settlement transaction has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Event Settlement**: This zone displays the selected settlement transaction.
- **Event Settlements**: This zone displays a list the program event settlements totalized in the selected customer settlement transaction.
- **Incentives and Fees Settlements**: This zone displays a list the incentives and fees settlements totalized in the selected customer settlement transaction.
- **Baseline Measurements**: This zone displays a list of baseline measurements used in calculating the program event settlement transaction (if applicable).

Maintaining Interval Price Sets

You use the **Interval Price Set** portal to display and maintain interval price sets and interval prices

Refer to About Interval Price Sets for more information.

You can access the portal from **Menu**, select **Interval Price**, then select **Interval Price Set**. You are brought to a query portal with options for searching for a specific record. Once an interval price set has been selected, you are brought to the maintenance portal to view and maintain the selected record.

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The following zones may appear as part of the portal's **Main** tab page:

- **Interval Price Set**: This zone displays the selected interval price set.
- **Interval Prices**: This zone displays the individual interval prices for the interval price set.

Maintaining Interval Prices

You use the **Interval Prices** zone to maintain interval prices for an interval price set. You can either manually add or upload prices.

To manually add prices, click **Add** in the upper right corner of the zone. The **Interval Prices Add** dialog opens. The **Interval Price Set ID** is prepopulated based on the interval price set.

- Enter the **Price Date/Time** and **Price** values for each interval price in the **Interval Prices** section.
- Click **Save** to save the interval prices.

To upload prices, click **Upload** in the upper right corner of the zone. The **Interval Prices Upload** dialog opens. The **Interval Price Set ID** and **Target Time Zone** are prepopulated based on the interval price set.

- Select the **Source Time Format** (Local or Standard) for the price data.
  - **Local** : Date/time values adjusted to "Standard" time (reflecting DST if applicable) and both are captured on the Measurement table
  - **Standard**: Date/time values are captured in both Standard and Local time on the Measurement table
- Specify the **Source Time Zone** for the price data. This is the time zone from which the price data originated. This allows for conversion to the time zone defined for the interval price set.
- To upload prices, click **Choose File** to search for and select a comma separated values (CSV) file containing price data and click **Submit**. The **Interval Prices Upload** dialog will display the price data contained in the file. Note that you can edit the price data before saving it.
- Click **Save**to save the interval prices.

Note: You can add prices using both manual entry and upload, but uploading data will overwrite existing prices for the same date/time.

To update one or more prices, select the price(s) to update and click **Edit**. The **Price** dialog opens displaying the selected prices. Edit the prices as needed and click **OK**. Click **Cancel** to close the dialog without making any changes.

To delete one or more prices, select the price(s) to delete and click **Delete**. The **Price** dialog opens asking you to confirm the deletion. Click **OK** to delete the selected prices. Click **Cancel** to close the dialog without deleting the prices.

Interval Prices File Format

The file format used to upload interval prices are comma separated values (CSV) files with the data described in the following table. The field names in the **Field** column must included in the first row of the input file.

Field	Data Type	Sample Content	Description
dt	DATE	2023-02-11-12.00.00	Date and time for the interval price

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Field	Data Type	Sample Content	Description
value	NUMBER	0.35	Interval price amount

Sample File

The following is a sample file for interval prices spanning a six hour event.

```
dt,value 2023-02-11-12.00.00,0.35 2023-02-11-13.00.00,0.35
2023-02-11-14.00.00,0.35 2023-02-11-15.00.00,0.35 2023-02-11-16.00.00,0.35
2023-02-11-17.00.00,0.35
```

Maintaining Devices and Measurements

This section describes how devices and measurement data are created and maintained in Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management .

- Maintaining Devices
- Maintaining Device Configurations
- Maintaining Measuring Components
- Maintaining Install Events
- Using 360 Degree Search
- Using 360 Degree View Device

Maintaining Devices

You use the **Device** portal to display and maintain devices.

Refer to About Meters for additional information about specific types of devices.

You can access the portal by selecting **Menu**, then **Device**, then **Device**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The **Device** portal includes the following zones:

- **Device**: defines the basic attributes of the device
- **Device Configuration List**: lists the device configurations for the device
- **Device Attachments**: lists attachments related to the device
- **Device Activities**: lists activities related to the device in date descending order
- **Device Exceptions**: lists the first 50 VEE exceptions for all measuring components for the device, sorted by the exception creation date in descending order
- **Device Events**: lists the most recent device events associated to the device in descending order
- **Device Characteristics**: displays characteristics defined for the device. To add device characteristics, click the **Edit** link in the zone title bar.

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> **Note**
>
> Only characteristics of types defined for the device's type in the **Valid Device Characteristic Types** zone on the **Device Type** portal can be defined for the device.

- **Device Entity Groups**: This zone lists the Entity Groups to assigned to the device. To add an entity group to the device, click **Add Entity Group to Device**. A dialog opens where you can select the entity group.

Maintaining Device Configurations

You use the Device Configuration portal to maintain device configurations.

Refer to About Device Configuration for additional functional information.

You can access the portal from **Menu**, then **Device**, then, **Device Configuration**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

This portal includes the following zones:

- **Device Configuration**: Defines the basic attributes of the device configuration
- **Measuring Components**: Lists the measuring components for the device configuration
- **Scalar Readings**: Displays a list of scalar readings for scalar measuring components associated with the current device configuration. To create a new reading for scalar measuring components associated with the device configuration, click **New Reading**. To edit an existing reading, click the edit icon for the reading you wish to edit.

Maintaining Measuring Components

You use the **Measuring Component** portal to maintain measuring components.

Refer to About Measuring Components for additional functional information.

You can access the portal by select **Menu**, then **Device**, then **Measuring Component**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

This portal includes the following zones:

- **Measuring Component**: defines the basic attributes of the measuring component
- **Initial Measurement Data History:** lists the last 50 initial measurements for the measuring component in reverse chronological order.
- **Measuring Component Profile Use:** lists all profile factors on which the measuring component is referenced as a factor value.
- **Measurements**: lists final measurements for the measuring component, including any derived values for each measurement. Note: depending on the type of measuring component this zone may be the Interval, Scalar, or Subtractive Interval variant.
- **Device Configuration Overview**: Displays an overview of the measuring component's parent device's configurations over time, including the measuring components associated with each configuration, and service points (along with the relevant install events) at which the device's configurations have been installed over time, if any exist.

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- **Data Requests**: Lists data requests for the measuring component. Applicable only for Standalone Data Request measuring components (based on the Standalone Data Request MC business object)
- **Measuring Component Comparison Period Details**: Lists comparison periods for the measuring component (created when the current measuring component is compared to another measuring component via the Interval Proxy Day Estimation VEE rule)

Maintaining Install Events

This portal is used to display and maintain an Install Event.

Refer to About Install Events for additional functional information.

You can access the portal from **Menu > Device Installation > Install Event**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Install Event**: defines the basic attributes of the Install Event, the on/off history for the Install Event, and removal information.

When creating a new record, the following options are available:

Name	Details	Business Object
Communication Component Install Event	This Install Event is intended for use with a Communication Component that is installed on top of a traditional Meter.	D1-CommComponentInstallEvent
Item Installation Event	This Install Event records the installation of an Item (i.e. streetlight).	D1-ItemInstallEvent
Manual Meter Installation Event	This Install Event is used for manually read meters.	D1-ManualMeterInstallEvent
Smart Meter Installation Event	This Install Event is unique to smart meters and has a lifecycle that's maintained by remote meter commands.	D1-SmartMeterInstallEvent

Using 360 Degree Search

The 360 Degree Search feature allows users to search for devices, measuring components, service points, and/or usage subscriptions using a variety of search criteria.

From the search results list, you can navigate to the 360 Degree View portal to view data on one of the following tabs:

- Measuring Component
- Device
- Service point
- Usage Subscription
- Contact

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When accessed, the 360 Degree View opens on the tab corresponding to the type of object (device, measuring component, etc.) you select. For example, if you click the Measuring Component description, the Measuring Component tab opens.

- **Search by Device:** Allows search by device identifier OR measuring component identifier. To search by name, click Go To Search by Name. To search by address, click Address.

Using 360 Degree View Device

This portal is used to view a broad set of information related to a Device.

You can access the portal by selecting **Main**, then **360 Search**, then **Device**. Once a Device has been selected you are brought to the 360 Degree View Device portal.

The following zones may appear as part of the portal's **Device** tab page:

- **Device Overview**: Displays the device, Service Point, Install Event, and Usage Subscription for the selected device.
- **Device Configuration Overview**: Displays an overview of the device's configurations over time, including the measuring components associated with each configuration, and Service Points (along with the relevant Install Events) at which the device's configurations have been installed.
- **Scalar Readings**: Displays a list of scalar readings for scalar measuring components associated with the current device and Device Configuration.
  - To create a new reading for scalar measuring components associated with the Device Configuration, click **New Reading**.
  - To edit an existing reading, click the edit icon for the reading you wish to edit. Editing a reading creates new initial measurements that are validated. If these edits do not pass validations, including VEE Rules, the changes are not saved.

Maintaining Event Impact Measurement & Verification Data

This section describes how records and data used with Event Impact Measurement & Verification (M&V) processing are created and maintained.

- Maintaining M&V Subscriptions
- Maintaining M&V Transactions
- Maintaining Service Point Event Outcome Snapshots

Maintaining M&V Subscriptions

You use the **M&V Subscription** portal to display and maintain M&V subscriptions.

Refer to About M&V Subscriptionsfor more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **M&V Subscription**. You are brought to a query portal with options for searching for a specific record. Once an M&V subscription has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

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- **M&V Subscription**: This zone displays general information about the M&V subscription, such as the customer, status, and event calculation groups.

Maintaining M&V Transactions

You use the **M&V Transaction** portal to display and maintain M&V transactions.

Refer to About M&V Transactions for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **M&V Transaction**. You are brought to a query portal with options for searching for a specific record. Once an M&V transaction has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **M&V Transaction**: This zone displays the selected M&V transaction.
- **SQ Details**: This zone displays service quantity details for the M&V transaction.
- **Baseline Measurements**: This zone displays interval data used in calculating the M&V transaction (if applicable).

Maintaining Service Point Event Outcome Snapshots

You use the Service Point Event Outcome portal to display and maintain Service Point Event Outcome snapshots.

Refer to About Service Point Event Outcome Snapshots for more information.

You can access the portal from **Menu**, select **Customer Program Management**, then select **Service Point Event Outcome**. You are brought to a query portal with options for searching for a specific record. Once a record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Point Event Outcome**: This zone displays general information about the Service Point Event Outcome.

Maintaining Customer Program Service Tasks

The **Service Task** portal is used to display and maintain customer program service tasks.

Refer to About Customer Program Service Tasks for more information.

You can access the portal from **Menu**, then select **Service Task**. You are brought to a query portal with options for searching for a specific record. Once a service task has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Task**: This zone displays general information about the service task.
- **DER Attributes**: This lists Distributed Energy Resource (DER) device attributes captured for DER devices related to the service task. Applicable only for enrollment service tasks involving DER devices.

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Distributed Energy Resource (DER) Device Service Tasks

The DER Device Management (X1-DERDeviceManagement) inbound web service is used to perform registration and/or enrollment of Distributed Energy Resource (DER) devices. This inbound web service includes the following operations:

- Register DER Device (registerDERDevice): Used by an external application to register and enroll a DER device. This operation creates a DER asset and device, as well as an enrollment service task to enroll the device in a program specified in the inbound web service request, or if a program is not provided based on the specification defined for the asset. The enrollment service task is created in the "Pending" state. The service task should be processed either manually or via the Service Task Monitor (Deferred) (F1-STKDF) batch process.
- DER Interconnection (interconnectDER): Used by an external application to send interconnection attributes of a DER asset from an external system that handles the interconnection process for the utility. The incoming data is validated against existing asset manufacturer and model combinations, leading to the creation of an interconnection service task to allow the initial creation of the DER asset. Enrollment for assets that require interconnection attributes must be performed separately via the Register DER Device operation. The interconnection service task is created in the "Pending" state. The service task should be processed either manually or via the Service Task Monitor (Deferred) (F1-STKDF) batch process.

The **DER Registration Flag** on the controllable asset type specifies whether registration of DER assets require both an interconnection request (using the DER Interconnection operation) and a DER registration request (using the Register DER Device operation), or just a DER registration request.

Enrolling and Unenrolling Customers Using Process Flow

Enrollment and unenrollment processing can be initiated, monitored, and maintained using the **Process Flow** portal and functionality. This allows users to step through a series of panels on which they enter information about the customer, their location, and the controllable device. See **About Enrollment and Unenrollment** for more information.

Enrollment and unenrollment process flows are initiated from the **Eligible Programs** zone of the **Customer View** portal.

When navigating between panels on the **Process Flow** portal, the Next and Previous buttons allow you to move to the next or previous panels in the process respectively. To save your progress and settings before moving on to the next panel, click **Save**. Click **Finish** on the **Summary** panel to mark the process flow as Closed. To cancel the process, click **Cancel Process**. This transitions the service task to the "Canceled" state. See Action Method in the *Administrative User Guide*for more information the process flow functionality.

The following sections describe the content on the different panels used in enrollment and unenrollment process flows.

> **Note**
>
> If the **Location Required Source** field is set to "No" on the program's program type, some enrollment steps are skipped.

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Customer

The **Customer** panel is used to specify data about the customer, associated with the enrollment or unenrollment process. This includes the following:

Customer Information: This section displays information about the customer, including:

- **Metered Service**: The customer's metered service record
- **Name**: The customer's name
- **Phone**: The customer's phone number
- **Email**: The customer's email address

Location Information: This section displays information about the customer's location, if applicable, including:

- **Metered Service Point**: The customer's metered service point.

Interaction Details: This section is used to capture details around customer interaction. The information in this section is used to create Customer Communications. See About Customer Communications for more information.

- **Channel**: The channel used for the communication, such as email or phone
- **Class**: The class of the communication, such as enrollment, unenrollment, trouble report, and so on
- **Category**: The category of the communication, such as written or verbal
- **Notes**: Notes associated with the communication

Program Enrollment / Program Unenrollment

The **Program Enrollment** panel is used to determine if the customer is eligible for the program, and includes the following: the program,

Program Information: This section displays information about the program, including:

- **Program**: The program in which the customer will be enrolled (or from which the customer will be unenrolled).
- **Start Date**: The start date of the customer's enrollment in the program (will be used as the program subscription's **Start Date**). Applicable only to enrollment processes.
- **Stop Date**: The stop date of the customer's enrollment in the program (will be used as the program subscription's **End Date**). Applicable only to unenrollment processes.

Qualification Questions: **Enrollment Only**. This section lists the qualification questions associated with the selected program. These are taken from the **Qualifications** configured on the program (see **About Programs**).

Informational Questions: **Enrollment Only**. This section lists the informational questions associated with the selected program. These are taken from the **Informational** questions configured on the program (see **About Programs**).

Controllable Devices: **Unenrollment Only**. A list of controllable devices installed at the device location

Interaction Details: This section is used to capture details around customer interaction. See description above.

When the use clicks Next on this panel, the system compares the answers provided in the Qualification sectionanswers the against "correct" answers configured on the program and

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checks the customer's eligibility for the program based in the program's **Program Initiative** (see **Understanding Program Initiatives**).

This panel is applicable only to enrollment processes.

Related Program Enrollment

The **Related Programs** panel is used to enroll the customer in a related program, and includes the following:

Related Programs: section allows you to select other programs that the customer may be currently enrolled in.

Qualification Questions: This section lists the qualification questions associated with the selected related program, if applicable. These are taken from the **Qualifications** configured on the program (see **About Programs**).

Informational Questions: This section lists the informational questions associated with the selected related program, if applicable. These are taken from the **Informational** questions configured on the program (see **About Programs**).

Interaction Details: This section is used to capture details around customer interaction. See description above.

This panel is applicable only to enrollment processes.

Device Setup

The **Device Setup** panel is used to manage device setup activities (based on the service task's service task type), and can include the following:

Asset Information: This section defines details regarding the asset related to the program enrollment or unenrollment, including:

- **Installation Method**: **Enrollment Only**. The installation method for the controllable devices associated with the enrollment process. Options include:
  - **Re-enroll**: The customer is re-enrolling a utility-owned device
  - **Ship Device**: The utility will ship the device to the customer.
  - **Utility Installation**: The utility will install the device at the customer's device location.
- **Devices to Re-Enroll**: A list of devices to be re-enrolled. At least one of the devices lists must be selected (applicable only if the **Installation Method** is "Re-enroll").
- **Removal Method**: **Unenrollment Only**. The removal method for the controllable devices associated with the unenrollment process. Options include:
  - **Keep**: The customer or utility will keep the device after its removal.
  - **Ship Device**: The customer will ship the device to the utility.
  - **Utility Removal**: The utility will remove the device at the customer's device location.
- **Asset Ownership**: Who owns the asset. Options include:
  - **Customer Owned**: The customer owns the asset/device.
  - **Utility Owned**: The utility owns the asset/device.

Work Order Activities: This section defines details regarding work order activities related to the program enrollment or unenrollment (if applicable). This includes the ability to select an appointment for work activities and field activities. Do the following for each activity type:

- Select a **Crew Shift Type** for the work order activity

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- Select a **Crew** for the work order activity (based on the selected crew shift type)
- Enter a date in the **Appointment Date** field to view a list of available appointments for that date . The appointment lists displays available appointments for the activity type, including start and end date and time, and the crew assigned.
- Select the appointment you wish to assign to the activity type. The list of available appointments is based on the **Appointment Date** and the **Appointment Slot Days** parameter defined in the Enrollment/Unenrollment Action Method.

> **Note**
>
> Crew types, crew shift types, crews, and crew shifts must be set up in order to select appointments. Refer to the **Scheduling** sections in the *Business User Guide* and *Administrative User Guide* for more information.

Interaction Details: This section is used to capture details around customer interaction. See description above.

Summary

The **Summary** panel displays a summary of information related to the enrollment or unenrollment process, including:

- **Enrollment Task**: The Service Task used by the process and its current status
- **Customer Information**: Contact and identification for the customer, including the customer's Metered Service record
- **Program Information**: The program the customer will be enrolled in (or unenrolled from) and the start date or stop date (respectively)
- **Location Information**: The device location, including the customer's Metered Service Point
- **Interaction Details**: Customer interaction details from previous panels

Click **Finish** on the **Summary** panel to mark the process flow as Closed. Click **Cancel Process** to cancel the process.

Creating Program Service Calls Using Process Flow

Service call processing can be initiated, monitored, and maintained using the Process Flow portal and functionality. This allows users to step through a series of panels on which they enter information about the customer, their location, and other information. SeeAbout Service Calls for more information.

Service call process flows are initiated from the **Current Enrollment** zone of the **Customer Program Summary** portal.

When navigating between panels on the **Process Flow** portal, the **Next** and **Previous** buttons allow you to move to the next or previous panels in the process respectively. To save your progress and settings before moving on to the next panel, click **Save**. Click **Finish** on the **Summary** panel to mark the process flow as Closed. To cancel the process, click **Cancel Process**. This transitions the service task to the "Canceled" state. See Action Method in the *Administrative User Guide* for more information the process flow functionality,

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The following sections describe the content on the different panels used in service call process flows.

Customer

The **Customer** panel is used to specify data about the customer associated with the service call. This includes the following:

Customer Information: This section displays information about the customer, including:

- **Metered Service**: The customer's metered service record
- **Contact**: Name and contact information for the customer who initiated the service call

Location Information: This section displays information about the customer's location, including:

- **Metered Service Point**: The customer's metered service point

Interaction Details: This section is used to capture details around customer interaction. The information in this section is used to create Customer Communications. See About Contact Communications for more information.

- **Channel**: The channel used for the communication, such as email or phone
- **Class**: The class of the communication, such as enrollment, unenrollment, trouble report, and so on
- **Category**: The category of the communication, such as written or verbal
- **Notes**: Notes associated with the communication

Program Service Call

The **Program Service Call** panel is used to specify details related to the service call. This includes the following:

Service Call Details: This section is used to select the service task type and other information for the service call, including

- **Related Service Call**: A related program service call. This is used if the current service call is somehow related to a previous service call. This is used often when selecting either "Escalate" or "Resolved" actions (below).
- **Service Call Type**: The service task type to use for the service call.
- **Questionnaire**: A questionnaire applicable to the service call. Available questionnaires are defined on the service task type.

Questions: This section displays questions from the selected questionnaire (if applicable). This section is only displayed if a questionnaire is selected in the **Service Call Details** section.

Action Details: This section is used to specify details regarding the service call, including:

- **Category**: The category of the service call. Options include "Emergency" and "Non-Emergency".
- **Action**: The action to be taken for the service call. Options include:
  - **Create a Work Order**: Creates a work order based on a selected **Template Work Order**. Available template work orders are defined on the service task type.
    - **Template Work Order**: The template work order for work order activities created for this service call.
    - **Crew Shift Type**: The crew shift type for the work order.

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        * **Crew**: The crew for the work order.
        * **Work Order Activities**: A list of work order activity types based on the selected **Template Work Order**.
        * **Appointment Date**: The date on which field work based on the work activity type is scheduled to be performed. Select an appointment slot from the list of available appointment slots for the selected **Appointment Date**. The list of available appointment slots is based on the selected Template Work Order, Crew Shift Type, and Crew.
    - **Escalate**: Escalates an existing service call. Used with a **Related Service Call**. This creates a To Do Entry based on the the **Escalation To Do Type** defined on the service task type. The To Do Entry can be assigned to one of the To Do Roles defined for the **Escalation To Do Type** from the **Assigned to** drop-down list.
        * **Call Back Required**: Indicates (Yes or No) if the customer must be called back.
        * **Keep Service Call Open**: Indicates (Yes or No) is the service call should be kept open due to the escalation. When set to "Yes", the service task is kept in the "Escalated" state, and can be then selected as a "Related Program Service Call" in a future service call process flow.
        * **Assigned to**: The To Do Role to which To Do entries related to the escalated service call can be assigned.
    - **Resolved**: Resolves an existing service call. Used with a **Related Program Service Call**. Service calls with this action are closed when finished.

Interaction Details: This section is used to capture details around customer interaction. See description above.

Summary

The **Summary** panel displays a summary of information related to the service call, including:

- **Program Service Call**: The Service Task used by the process and its current status.
- **Customer Information**: Contact and identification for the customer, including the customer's Metered Service record .
- **Location Information**: Location information for the service call, including the customer's Metered Service Point.
- **Interaction Details**: Details related to customer interaction. See description above.

Click **Finish** on the **Summary** panel to initiate the action selected on the **Program Service Call** panel. Click **Cancel Process** to cancel the process.

Manually Completing Work Activities Using Process Flow

Work activities in Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management can be manually completed using the Process Flow portal and functionality. This allows users to step through a series of panels on which they enter completion information about the work activity, including asset installation and removal and service histories (if any) for the asset and activity. This process creates a set of completion events which are used to update the system as needed to reflect the completion of the work activity. See Understanding Completion Events for more information about completion events. When used with work activities associated with enrollment and unenrollment, the enrollment or unenrollment service tasks associated with work activities completed using this process are transitioned to an appropriate status, facilitating progression and completion of enrollment and unenrollment processes.

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Work activity manual completion process flows are initiated from work activities. Clicking **Initiate Completion** on work activities open the process flow portal. Note that this option is available only if the work activity's activity type has either an 'Update Asset' or a 'Create Any Service History' Completion Event Type (or both) defined, and the activity is in the "In Progress", "In Progress External", "Active", "Sent", or "Finished" state.

When navigating between panels on the Process Flow portal, the **Next** and **Previous** buttons allow you to move to the next or previous panels in the process respectively. To save your progress and settings before moving on to the next panel, click **Save**. Click **Finish** on the **Summary** panel to mark the process flow as Closed. To cancel the process, click **Cancel Process**. This transitions the service task to the "Canceled" state. See Action Method in the *Administrative User Guide* for more information the process flow functionality,

The following sections describe the content on the different panels used in work activity manual completion process flows.

Field Work Details

The **Field Work Details** panel is used to specify completion information related to the asset and location such as installation and removal of assets, as well as recording details for customer-owned assets. This includes the following:

Install Controllable Device: Completion details for an installation of or more controllable devices at the work activity's location.

- To add a controllable device for installation, enter an **Effective Date** for each device's installation and each device's **Serial Number** (and optionally **Manufacturer** and **Model** if the same serial number is used with different Manufacturers and Models). The **Comments** column indicates if the device is present in the system.

Remove Controllable Device: Completion details for an removal of or more controllable devices at the work activity's location.

- To add a controllable device for removal, enter an **Effective Date** for each device's removal and each device's **Serial Number** (and optionally **Manufacturer** and **Model** if the same serial number is used with different Manufacturers and Models). The **Comments** column indicates if the device is present in the system.

Customer Owned Asset: Completion details for recording relevant customer owned assets, such as HVAC components, solar panels, inverters, batteries, or other assets that were discovered by a crew at the work activity's location.

- To add a customer owned asset, enter an **Effective Date**, select the **Manufacturer**, select the model **Model**, and enter the **Serial Number** for each customer-owned asset. The **Comments** column indicates if the asset exists in the system.

A completion event will be created to update the system to reflect installation or removal of the controllable devices specified, and to create new controllable devices based on customer owned assets.

Click **Next** to move to the **Activity Service History** panel.

Activity Service History

The**Activity Service History** panel is used for entering completion information related to service history related to the work activity (if applicable). This includes the following:

Activity Service History: Details for service history information related to the work activity, including the **Service History Type** and corresponding details (such as Effective Date/Time, questions, and so on).

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- To enter activity service history completion information, select the **Service History Type**, enter the **Effective Date/Time**, and then populate other data fields as appropriate. Required service history types (those that must be completed) are marked with an asterisk (*).

> **Note**
>
> This section is visible only when the work activity has a **Planned Service History** of category "Inspection" and subclass "Questionnaire" and whose activity type has a 'Create Any Service History' **Completion Event Type** defined. Otherwise, this panel displays a "There is no Activity Service History to Complete" message.

For each service history updated on this panel, an appropriate completion event will be created to update the service history in the system.

Click **Next** to move to the **Asset Service History** panel. Note that you must provide details for all required service histories for the activity before moving to the next panel.

Asset Service History

The**Asset Service History**panel is used for entering completion information related to service history. This includes the following:

Asset Service History: Details for service history information related to the asset, including the **Service History Type** and corresponding details (such as Effective Date/Time, questions, and so on).

- To enter asset service history completion information, select the **Asset**, select the **Service History Type**, enter the **Effective Date/Time**, and then populate other data fields as appropriate.

> **Note**
>
> This section is visible only when the assets from the work activity **Asset List** and/or assets defined on the **Field Work Details** panel (in the **Install Controllable Device** and **Remove Controllable Device** sections) have associated service histories. Otherwise, this panel displays a "There is no Asset Service History to Complete" message.

For each service history updated on this panel, an appropriate completion event will be created to update the service history in the system.

Click **Next** to move to the **Summary** panel. Note that you must provide details for all required service histories for the activity before moving to the next panel.

Summary

The **Summary** panel displays completion events related to the work activity, including those defined on the **Field Work Details**, **Activity Service History**, and **Asset Service History** panels.

When initially opened, the Summary panel is empty. Click **Finish** on the **Summary** panel to create completion events based on details defined on the previous panels.

Completion events are created as follows:

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- A single completion even is created for the assets/devices defined on the **Field Work Details** panel.
- A completion event is created for each service history defined on the **Activity Service History** and **Asset Service History** panels.

These completion events can be viewed on the work activity that created the process flow.

Click **Close Out** on the work activity to execute the completion events and update the system as needed to reflect the completion of the work activity.

Using the Customer Program Summary Portal

The **Customer Program Summary** portal is used to view customer information, such as currently enrolled programs, programs the customer is eligible to enroll in, and program activity, such as specific events in which the customer participated.

To access the **Customer Program Summary** portal, select **Main**, select **Customer Program Management**, and select **Customer Program Summary**. Once you've selected this menu option, you're immediately brought to the initial tab of the portal.

The **Customer Program Summary** portal displays information about the customer on which you are currently working. This is customer currently “in context” or the customer most recently viewed on any of the following portals: **Controllable Asset**, **Device Location**, **Metered Service**, **Metered Service Point**, **Program Subscription**, or **Program Contact**, The **Customer Program Management Full Context Zone** dashboard zone also displays information about the customer currently in context.

The **Customer Program Summary** portal includes the following zones:

- **Current Enrollment**: This zone displays current program enrollment for the customer (for a single location). Each program enrollment is displayed in a separate **Information** box. Click **Unenroll** to unenroll the customer from a program. Click **Service Call** to initiate a service call for a program. Click **Opt Out** to navigate to a list of pending program events for the customer where you can select one or more events from which the customer wishes to opt out. Click **Schedule Unavailability** to navigate to a portal where you can define an unavailability period for a controllable device..
- **Customer Insights**: This zone displays any currently in progress service tasks and work activites related to enrollment or unenrollment. Options on this zone include:
  - **Go To**: Used to navigate to the Process Flow for the enrollment/unenrollment or to the work activity.
  - **Cancel**: Opens the **Cancel "In Progress" Service Task** window that allows the user to cancel the enrollment/unenrollment service task. This also creates a contact communication record as part of this.
  - **Reschedule**: Opens the **Reschedule "In Progress" Service Task** window. Allows the user to specify a new date for the start date of the program subscription. This also creates a contact communication record as part of this.
- **Eligible Programs**: This zone displays programs for which the customer is eligible based on currently installed devices (at a single metered service point). Click **Enroll** to enroll the customer in a program.
- **Customer Program Activity**: This zone displays the customer’s activity in the programs in which they are enrolled. This includes a graphic view of the percentage of successful vs. non-successful event participation (referred to “non-responsive device” or “NRD”), as well

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as a list of the events in which the customer participated, and other activity such as device installation.

Using the Program Dashboard

This portal is used to display the **Program Dashboard**.

To access this portal select **Main**, select **Dashboards**, and select **Program Dashboard**. Once you've selected this menu option, you're immediately brought to the initial tab of the dashboard.

The **Program Subscription Trends** zone displays enrollments, unenrollments by period (week or month) as well as active subscription for that period. The x-axis displays the end date of the monthly or weekly period. The left y-axis shows the number of enrollments and unenrollments. The right y-axis shows the number of active program subscriptions. You can filter the data displayed using the following controls:

- **Time Scale**: Allows specifying the time scale of the graph is weekly or monthly.
- **Period View**: Allows specifying the range of data displayed, such as “Last X Weeks” or “Last Month” and so on.
- **Program Category**: Allows filtering the data based on a selected program category (such as “Device Control”)
- **Program**: Allows filtering the data based on a selected program.
- **Division**: Allows filtering the data based on a selected division.

Click **Configure** to navigate to the Program Dashboard Configuration master configuration. See Configuring the Program Dashboard in the *Administrative User Guide* for information regarding configuration of the dashboard.

Click **Capture** (next to **Snapshot Date/Time** in the lower right corner of the zone) to navigate to the **Statistics Control** portal where you can view a list of snapshots for the statistics control, and create a new snapshot if needed.

Using Unified Search with Customer Program Management Cloud Service / Customer Program Management

The Unified Search feature allows the use of the toolbar search field to search for business entities as well as to search for menu items. See **Search** for more information about the general use of the unified search field.

In Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management, the Unified Search field allows searching by a program subscription's contact (Name), address (Address), customer information system account ID (External Account ID), contact information such as a phone number or email address (Contact Information), or a controllable device's serial number (Serial Number).

You can use the following filters to indicate your specific search criteria:

Filter	Filter Rule
Name	Minimum of 5 characters excluding whitespaces

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Filter	Filter Rule
Address	One or more numeric characters followed by space and an alphanumeric character.
External Account ID	Up to 10 characters followed
Contact Info	Phone Number: Plus character and 1-3 numeric characters (country code, optional) followed by a space, period, dash or open parentheses, 3 numeric characters (area code), followed by a space, period, dash or close parentheses, followed by 3 numeric characters (exchange code), followed by a space, period or dash, followed by 4 numeric characters (subscriber number).] Email Address: Non-whitespace characters followed by an @ sign, non-whitespace characters, a period, non-whitespace characters
Serial Number	Minimum of 5 characters excluding whitespaces.

For example, to search for a program subscription located at 1401 Flower Street, you could enter “1401 Flower”.

To search explicitly using a specific filter, precede the filter value with one of the following predefined hints:

Filter	Hint	Example
Name	n:	n:Smith, J
Address	ad:	ad:1401 Flower
External Account ID	ac:	ac:1234567890
Contact Info	c:	c:555-2287 c:mbrazil@oracle.com
Serial Number	sn:	sn:678912

Examples:

- To search for a metered service point located at 1401 Flower Street, you could enter "ad:1401 Flower" (hint) or “1401 Flower” (no hint)
- To search for a contact named John Smith, you could enter "n:Smith, J" (hint) or “Smith,J” (no hint)
- To search for an external (CIS) account with an ID of ACCT01 you could enter "ac:ACCT01" (hint) or "ACCT01" (no hint)
- To search for a contact whose phone number is 555-2287 , you could enter "c:555-2287" (hint) or “555–2287” (no hint)
- To search for a controllable device whose serial number is 6789, you could enter "sn:6789" (hint) or “6789” (no hint)

Clicking the **Advanced Search** link opens the **Metered Service Query** portal and the **Metered Service Search** zone.

For information about configuring the Unified Search for your implementation, refer to **Understanding Unified Search** in the *Administrative User Guide*.

Search Results

Each result in the search result list may include any of the following:

- Name (highlighted when using the Name filter) or “No Person Information”

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- Address (highlighted when using the Address filter) or “No Premise Information”
- External Account ID (highlighted when using the Account ID filter) or “No Account Information”
- Contact Info (highlighted when using the Contact Information filter) or “No Contact Information”
- Controllable Device Info (highlighted when using the Serial Number filter)
- Filter Name and Search Criteria (always displayed)

To select an item from the search results, click the result. The **Customer Program Summary** portal opens displaying information for the selected result.

Other Related Functionality

Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management both share significant functionality with Oracle Utilities Work and Asset Management. The following functional areas are also available with Oracle Utilities Digital Asset Cloud Service and Oracle Utilities Customer Program Management.

Asset Management

Operational Device Management

Inventory

Purchasing

Service History

Work Management

Preventive Maintenance

Scheduling

Approvals

Resource Usage

Financials

> **Note**
>
> Menu items for some features in the above functional areas may may have moved in Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Digital Asset Management. To access to a specific menu item, enter the name of the menu item in the **Unified Search** field. For instance, to access the "**Work Order, Search**" menu item, you could enter "work order" (the search is case-insensitive) in the **Unified Search** field, and select "Work Order" from the list that appears below the text field.

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To Do Processing

There are numerous events that trigger the creation of email-like messages describing work that requires human attention. For example, if a bill segment has an error, a message is created to highlight such. We refer to each message as a **To Do Entry**. In this section, we describe how to view, manage and work To Do entries.

> **NOT_SUPPORTED**
>
> We recommend familiarizing yourself with the topics described in The Big Picture of To Do Lists to fully appreciate how To Do entries are managed by the system.

- Understanding To Do Processing
- Managing To Do Entries

Understanding To Do Processing

The topics in this section provide background information on To Do processing functionality.

- To Do Role
- To Do Priority
- Work Distribution
- Working On A To Do
- To Do Characteristics
- Related To Do Entries
- Complete A To Do
- Log Entry Events

To Do Role

Each To Do entry is assigned a specific To Do Role. The role defines the users who may work on the entry. The permissible roles that may be assigned to a To Do entry are defined on the entry's To Do type. One or more users within a role may be designated as a supervisor, who is allowed to assign To Do entries to other people. Supervisors are determined through application security access.

Refer to To Do Entries Reference A Role to learn more about role assignment.

After an entry is created, its role may be changed to any role defined as valid for the entry's To Do type. Manual changes of a To Do entry's role are recorded on the To Do entry log.

To Do Priority

A To Do entry is associated with a priority level representing its processing order compared to other entries. Refer to The Priority Of A To Do Entry for more information on how an entry's priority is initially assigned and how it may be automatically updated by the system.

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A user may manually override a To Do entry's priority at any time. Once overridden, automatic recalculation of the priority is no longer performed so as not to override the value explicitly set by the user. Manual overrides of a To Do entry's priority are recorded on the To Do entry log.

> **Note**
>
> Only users that are currently **Assigned** to a To Do entry or ones that are valid for the role of an **Open** To Do entry may manually change the priority.

Work Distribution

This topic goes overs the various possible actions a user can take to adjust what role or what user is associated with a To Do entry while it is in a non-complete state.

Adjusting the Role

A To Do entry must always reference a role. When a To Do entry are created in the **Open** state and is associated with a role. The following points highlight ways to adjust the role associated with a To Do entry.

- A user viewing a record on the To Do Entry page may use the Forward or Send Back action to change the role.
- A supervisor using the To Do Search page may assign a user not linked to the current role. In this case, the system will update the role to one valid for the assignee.

Assigning a To Do to a User

There are several ways to **Assign** a To Do entry to a user:

- The To Do Management portal provides many filters and viewing options to review To Do entries for a give To Do Type. In addition, it displays a rich amount of detail for the resulting To Do entries, helping users to make decisions. Users may use this page to assign work to themselves and supervisors may use this to assign work to others.
- A user viewing an entry on the To Do Entry page may use the Forward to a User or the Send Back action to assign the entry to a different user.
- **On demand assignment**. The system can be configured to dynamically assign the highest priority work to a user on demand from the Assign me a To Do button on the Current To Do Zone. One of the main benefits of the assignment on demand approach is that work is allocated real-time based on most current information such as skills, priority, user availability, etc. This also means that work remains unassigned until a user is actually going to work on it making it available to any qualified user.

  > **Note**
  >
  > Refer to On Demand Assignment Configuration for information on configuring the system to support this feature.

- Several legacy pages include assignment capability
  - A supervisor can use the Supervisor Functions pages to review, assign and reassign To Dos to users.
  - A user may use the To Do list pages to review and assign To Dos to themselves.

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– All of the above assignment functions may also be performed using the To Do Search page.

Reopening / Unassigning a To Do

It is possible to transition a To Do entry from **Assigned** back to **Open**.

- A user viewing a record assigned to them on the To Do Entry page may use the Forward to a role action to move the entry back to **Open**.
- The **Unassign** button on the To Do Management portal or the **Reopen** button on the To Do Search page causes the To Do entry to go back to **Open**.

Working On A To Do

The To Do entry you are actively working on is your **In Progress** To Do entry. This To Do entry is visible in the Current To Do zone. Refer to that zone's help topic for all the features enabled on that zone.

> **Important**
>
> The information here assumes that you have configured the system to use the ability to have a substatus of Assigned, which includes the **In Progress** value. If you are not taking advantage of the substatus, then see below for information about how the functionality described here works differently.

If you don't currently have an **In Progress** To Do entry, there are several ways to choose a To Do and indicate that you want to start working on it. Doing so proactively populates the To Do into the Current To Do zone and navigates you to the related object (or if the To Do type is configured to launch a script, the script is launched).

If your organization's practice is to assign work to users up front, then a typical approach is that you would start by reviewing a list of entries assigned to you using one of the base pages and indicate that you want to work on an entry in the list. Or your organization may allow you to review To Do entries that are open and in a role that you are in. In some pages, there is a way for you to enable a list of To Do Entries that you can work through without needing to return to the query page to get the next entry.

The following points highlight the available base pages and their supported functionality.

- To Do Management allows you to use filters to view a list of entries assigned to you or that are open. Click the Work List icon in the Action column to populate the Work List zone in the sidebar with the results of the search. Click the **Work** button to choose the To Do entry you wish to start with. This drills you into the related object and populates the Current To Do zone with this To Do. It marks the To Do **In Progress**. (If the To Do entry was not already assigned to you, it will first assign it to you). Use the entries in the Work List zone to subsequently work on other To Do entries.
- If you are viewing a record on To Do Entry that you are allowed to work on, click the **Work** button to indicate that you want to start working on the record. This drills you into the related object and populates the Current To Do zone with this To Do. It marks the To Do **In Progress**. (If the To Do entry was not already assigned to you, it will first assign it to you).
- To Do List allows you to start working on a To Do by clicking the entry's message description link. It marks the To Do **In Progress**. (If the To Do entry was not already assigned to you, it will first assign it to you). Any other To Do entries that were in that results list on that page become an internal work list and the **Previous** button and **Next** button are enabled in the Current To Do zone to work through that list. Note that clicking

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the next or previous button does not automatically assign the entry to you. Use the **Start Progress** button on the Current To Do zone to change the status. If you don't start progress, it means the To Do in this zone is not your current In Progress to do entry. It remains in this zone until you perform another action to populate a different To Do in this zone. If you open another browser window, the Current To Do zone will not have this same To Do entry populated.

- To Do Search allows you to drill into the details of a To Do by clicking the entry's message description link, but it does not automatically assign it to you or update it to **In Progress**. You can click **Start Progress** on the Current To Do zone once it's populated. Any other To Do entries that were in that results list on that page become an internal work list and the **Previous** button and **Next** button are enabled in the Current To Do zone to work through that list. As with the first To Do selected, the subsequent To Do entries will not be assigned to you or progress started automatically.

> **Note**
>
> The To Do Search works differently than other pages in that you can drill in on a To Do entry and push the details into the Current To Do zone even if the To Do entry is assigned to someone else or if you are not allowed to work on that To Do. If you have an **In Progress** To Do entry and use the To Do Search to drill in on a different To Do Entry that doesn't get assigned to you, that To Do is now the one in the Current To Do zone and remains there until you do something else to refresh the data in that zone. If you open another browser window, the Current To Do zone will not have this same To Do entry populated.

Refer to Current To Do for more information about actions available to update To Do entries that you are working on.

Additionally, you may have the option to click on the **Assign me a To Do** button on the Current To Do zone to request your next task. The returned To Do entry automatically becomes the your **In Progress** To Do. This does not enable any work list functionality.

> **Note**
>
> If you do already have an **In Progress** To Do and you perform one of the above actions that results in a different To Do to become **In Progress**, the To Do entry that was already **In Progress** is updated to **On Hold**.

> **Important**
>
> If your implementation is not taking advantage of the substatus as described in The Lifecycle Of A To Do Entry, then the system doesn't have a persistent way of marking which To Do entry is the one you are working on. You may still perform any of the steps described above to make the To Do entry your 'current' To Do. If any of the above steps indicate that the To Do will be assigned to you, that action still occurs, but the To Do entry is not moved to 'in progress'. The To Do entry is only considered the 'current To Do' for your current session. If a different session is opened, you must perform the explicit action again to make the To Do the 'current To Do' for that session.

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To Do Characteristics

Characteristics are used to associated related information to a To Do entry. Refer to Linking Additional Information to a To Do Entry for more information.

Several pages in the system allow you to view a To Do entry's characteristic values and / or search for To Do entries by their characteristics.

- The To Do Management portal and the To Do Details tab on the To Do Dashboard portal include up to five filters to search for To Do entries by a characteristic value. In addition, the search results display all the current characteristics as name / value pairs.
- The To Do Entry includes a zone to display any existing characteristics. In addition, if a user is allowed to modify a To Do Entry, the edit dialogue allows a user to add or change characteristics. Note that for manual To Do types, the valid characteristic types are driven by the To Do type. For automated To Do types, if valid To Do characteristic types are configured on the To Do type, only those are available. Otherwise, any valid To Do characteristic type may be linked.
- The To Do Search includes a single characteristic type / value filter.

Related To Do Entries

A user working on a To Do may want to know of other To Dos that may be related to the same problem. If they can be worked by the same user they may get resolved faster. It seems almost impossible to programmatically determine whether two To Dos really stem from the same problem. The user should therefore be presented with a list of potentially related To Dos from which they can select the truly relevant ones.

A To Do entry is considered potentially related to a given To Do if they reference a common entity via a characteristic. For example, if a given To Do references a certain account then any To Do referencing that same account is considered related to it.

> **Note**
>
> The common entity is any characteristic value linked to the To Do entry where the characteristic type is a **Foreign Key** and the main table of the foreign key is classified as a **Master** or **Transaction** table.

There are various places where the user is informed as to whether or not the current To Do Entry is related to other To Do Entries.

- To Do entry maintenance displays in insight indicating the number of related To Do Entries for the current To Do. In addition, a Related To Do Entries zone shows information about each related To Do.
- The Current To Do zone includes related To Do information and actions.
- The To Do Management query includes a count of related To Do entries.
- The To Do Search page supports a **Related To Do filter** that lists all related To Do entries for a given entry.

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Complete A To Do

After you finish working on an entry, you can mark it as **Complete**. At this point, you may want to review potentially related To Do entries and complete those that have been addressed by resolving the problem associated with the current entry.

When you complete a To Do, a log entry is created that indicates when the To Do was completed and by whom.

There are multiple ways in which you can complete a To Do.

- The To Do Management page provides many filters in addition to To Do Type. One or more entries may be completed in this page.
- Use the To Do Entry page to complete a single To Do Entry. The user may also choose to add comments when completing a To Do on this page.
- You may use the Current To Do zone to complete the current entry you are working on and/or all related entries assigned to you.
- The To Do List page allows you to complete one or more selected entries of a specific To Do Type.
- The To Do Search page allows you to search for To Do entries using various search criteria and complete selected ones.

> **Note**
>
> It is possible for the system to automatically mark an entry as **Complete**. Refer to The Lifecycle Of A To Do Entry for more information.

Log Entry Events

Any user may add a **User Details** log entry to any To Do at any time (even after it's completed). Refer to To Do Entry page for more information.

The To Do Management portal also allows users to add a **User Details** log entry to one or more selected entries.

In addition, there are several log entries created automatically by the system. The log includes a status column, which captures the status of the To Do at the time of log. If the To Do entry is **Assigned** and its substatus **In Progress** or **On Hold**, the log captures the substatus value, otherwise it captures the status value.

The following table contains the list of all possible log events.

Event	Log Type	Log Status	Content of Details	Content of Assigned To (on To Do entry and To Do Log)	Log User ID	Contents of Sent By (on To Do entry)
A To Do is created (by the system or by a user)	**Created**	**Open**			ID of user who created the To Do	

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Event	Log Type	Log Status	Content of Details	Content of Assigned To (on To Do entry and To Do Log)	Log User ID	Contents of Sent By (on To Do entry)
A To Do is created (by the system or by a user) in Assigned status	**Created**	**Assigned**		User ID of user who was assigned this To Do	ID of user who created the To Do	Creating user's ID
A To Do is completed (by the system or by a user)	**Completed**	**Complete**			ID of user who completed the To Do	
A user takes an open To Do	**Assigned**	**Assigned**	Selected by user	Assigned To User ID	Assigned To User ID	ID of user who assigned the To Do
A supervisor assigns a To Do to a user (also happens if they reassign)	**Assigned**	**Assigned**	Assigned to user	Assigned To User ID	ID of user who assigned the To Do	ID of user who assigned the To Do
A user forwards an entry to a user	**Forwarded**	**Assigned**	*Log details entered by user*	Forwarded To User ID	ID of user who forwarded the To Do	ID of user who forwarded the To Do
A user forwards an entry to a role	**Forwarded**	**Open**	Forwarded to role *Role Description (Role ID)* + *Log details entered by user*		ID of user who forwarded the To Do	ID of user who forwarded the To Do
A user sends back a To Do	**Sent back**	**Assigned**	*Log details entered by user*	Sent Back To User ID	ID of user who sent back the To Do	ID of user who sent back the To Do
The status is updated (aside from the cases that have an explicit log type)	**Status Updated**	Current status of To Do		User currently Assigned, if applicable	ID of the user the made the status update	
A user adds a log entry	**User Details**	Current status of To Do	*Log details entered by user*		ID of user who added the entry	
A user manually overrides priority	**Override Priority**	Current status of To Do	Priority changed from *old value* to *new value*	Assigned To User ID	ID of user who made the change	

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Event	Log Type	Log Status	Content of Details	Content of Assigned To (on To Do entry and To Do Log)	Log User ID	Contents of Sent By (on To Do entry)
Priority is updated by a calculate priority algorithm	**Calculated Priority**	Current status of To Do	Priority changed from *old value* to *new value*		ID of user that added or updated the To Do or the user associated with the Recalculate Priority batch job.	

Managing To Do Entries

This section describes the various pages available to view and work on To Do entries.

- To Do Management
- To Do Dashboard
- To Do Entry
- Legacy UI Features

To Do Management

The To Do Management portal provides a multi-query zone that includes a search for To Do entries using To Do Type and other To Do information. Users may search for entries using multiple criteria and perform common actions, such as assignment and completion, on selected entries.

It is intended to be used by both supervisors and non-supervisor To Do users. Supervisors are identified by their security access to the portal.

Use **Menu**, and then **To Do**, and then **To Do Management** to navigate to the portal.

To Do Information Search

This zone allows you to search for non-closed To Do entries using various attributes of the entries, and to perform actions on selected ones.

> **Note**
>
> **Results are restricted by role.** For supervisors, this search returns To Do entries that meet the search criteria and are in a role of which the supervisor is a member. For non supervisors, the search returns open To Do entries that meet the search criteria and are in a role of which the user is a member or entries currently assigned to the user. Refer to To Do Entries Reference A Role for more information about roles.

The following sections describe the features of this zone.

Search Filters

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The following table describes each of the different filters supported by this zone.

Search Filter	Description
To Do Type	Use this filter to restrict the search to To Do entries of a specific type. Only To Do Types where the user is a member of at least one valid role for the type will be available for selection. If the To Do Role filter is populated, the list is further restricted to valid To Do Types for the To Do Role.
Status	Use this filter to restrict the search to To Do entries with a status of **Open** , **Assigned**, **In Progress** or **On Hold**. If you choose Assigned, then it includes the To Do entries that are In Progress and On Hold. Note that the underlying query excludes completed To Do entries.
Days Old	On the **To Do Management** portal, this option is represented by a pair of filter fields. Use these filters to restrict the search to To Do entries whose age falls within a given range in days. For example, entering values of 2 - 5 will restrict the search to entries that are greater than or equal to two days old and less than or equal to five days old. On the **To Do Dashboard** portal, this option lists the To Do Summary age ranges as set up for the user. Select a specific age range to restrict the search to To Do entries whose age falls within the given range in days.
To Do Role	Use this filter to restrict the search to To Do entries of a specific role. Only To Do Roles where the user is a member will be available for selection. If the To Do Type filter is populated, the list is further restricted to valid To Do Roles for the To Do Type.
Assign To User	Use this filter to restrict the search to To Do entries assigned to a particular user. This filter only appears if the current user has To Do supervisor access.
Priority	Use this filter to restrict the search to To Do entries with a specific priority.
Key Value	Use this filter to restrict the search to To Do entries with a sort key value containing the entered value.
Message	Use this filter to restrict the search to To Do entries with a specific message. This filter appears after the To Do Type filter has been populated and shows a list of the message texts from all non closed To Do entries of the selected To Do Type.
Characteristic	Use these filters to restrict the search to To Do entries with a specific **Characteristic Type** and value. Up to five characteristic type and value pairs may be entered. If the To Do Type filter is populated and the To Do Type is 'manual', the list of characteristic types will be restricted to the characteristic types defined for the To Do Type. For automated To Do Types, if valid To Do characteristic types are configured for the To Do type, only those are shown. If an automated To Do Type doesn't define valid characteristics or if no To Do Type filter is populated, all valid characteristic types for the To Do Entry entity are shown. Note that if you have populated characteristic filters and then you change the To Do Type filter, the system retains the characteristic filter as long as the characteristics are applicable to the newly selected To Do Type.

The system shows the total number of To Do entries displayed and the total number that satisfy your search criteria immediately below the set of results.

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> **Note**
>
> For performance reasons, because the filter criteria may be broad, the search zone is configured to only get the first 5000 records that match the criteria and will then sort that number to then display the first 400 sorted by priority and age. The To Do Dashboard portal may be used to get exact counts of records with certain criteria. Use additional criteria to narrow down the search as needed.

Search Results

The zone will display all To Do entries that meet the search criteria, up to the limit defined. The following columns are displayed initially:

- The Action column includes the button Work. Click this button to drill into the page on which the entry's respective object is displayed. If the To Do type has been configured to associate a script with this To Do entry's message number, then instead of being taken to the respective page, the associated script is launched. Refer to What Happens When You Work A To Do Entry for more information.

  > **Important**
  >
  > **Automatic Assignment** When you click the Work button for an open entry, the system changes the status of the entry to **Assigned** / **In Progress** and assigns it to you. It also causes this To Do entry to be your current To Do. Refer to Working On A To Do for more information.

  > **Note**
  >
  > **Work List**. This column has a Work List icon. Clicking this icon populates the Work List zone with the results. Clicking on entries in the Work List zone performs all the logic described here when clicking the Work button for one entry. It will drill into the related object or launch a script, if configured. It will make this To Do the 'current' To Do, it will assign it to you if it is **Open** and update it to **In Progress**.

  > **Note**
  >
  > Only 1 **In Progress** To Do entry. If you had a different To Do entry in progress before clicking the Work button, the other To Do entry will be put **On Hold**.

- Entries are sorted by their **Priority**. Highest in priority are listed first.
- **Days Old** is the number of days since the To Do entry was created by the system. Entries are sorted from youngest to oldest within priority.
- **Status** is the current status of the To Do entry. If the assignment substatus is populated, that value is displayed, otherwise the To Do entry status is displayed.
- **Assign To User** is the user currently assigned to the To Do entry.
- **Message** is the message associated with the To Do entry.
- **Related** displays a count of entries that are potentially related to the current entry based on having the same foreign key characteristic values. Click the hyperlink to navigate to the To Do Search page with the current entry as the Related To Do Filter value.

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- **Note** displays a Comment icon if there are either comments or a log entry of type **Forwarded**, **Sent Back** or **User Details** on the To Do Entry. Click the icon to open a pop-up window which displays the To Do entry information, message, comments and logs.
- **Characteristics** displays the characteristic types and values for the entry as a concatenated string. By default this list is collapsed to one line to save vertical space. If additional characteristics exist, you can use the expand arrow to display them.

> **Note**
>
> A feature configuration option is supplied to opt out of the compact view. Under the **To Do Options** feature configuration type, define the **Collapse Characteristics Column** option and set the value to "N".

- **Related Entity** displays the information for the object related to this entry. The information string allows you to navigate to the page on which the entry's respective object is displayed.
- **To Do ID** is the system generated key of the entry. Click the hyperlink to navigate to the To Do Entry page to view or maintain the current entry.

Click the **Column Configuration** icon in the zone header to show the Column Configuration Area in which additional columns can be added to the results. The additional columns include the following:

- **Create Date/Time** contains the date and time the To Do entry was created by the system.
- **Key 1** to **Key 5** contain the first five sort key values for the entry.
- **To Do Role** displays the description of the role for the To Do entry.

Actions

The zone provides the ability to perform certain actions on one or more selected To Do Entries.

Click the check box in the results list heading to select all entries displayed in the grid or click the box in a row to select a specific entry. The following actions are available:

- Use the **Update** button to open a pop-up window in which you can update the priority and/or add a **User Details** log entry to the selected To Do entries.
- Use the **Assign** button to assign a user to the selected To Do entries. Supervisors will be presented with a pop-up window in which they can choose the assignee from a list of users who are members of at least one role for the To Do Type. The user search includes information about the number of To Do entries already assigned to each user. For users without supervisor access, the current user is assumed to be the assignee and the window is not displayed. Note that the system does not allow a non supervisor to assign themselves a To Do that is assigned to another user.
- Use the **Unassign** button to reopen the selected To Do entries and remove the assignee. Note that the system does not allow non supervisors to reopen a To Do that is assigned to another user.
- Use the **Complete** button to complete the selected To Do entries. Both supervisors and non supervisors may complete any To Do entry, including those assigned to other users.

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To Do Dashboard

This portal provides a high level summary of open and assigned To Do entries by various criteria. It is intended to be used by both supervisors and non-supervisor To Do users. An implementation may introduce additional zones to this portal as needed.

> **Note**
>
> **Results are restricted by role.** For supervisors, the charts consider To Do entries that are in a role of which the supervisor is a member. For non supervisors, the charts consider open To Do entries that are in a role of which the user is a member or entries currently assigned to the user. Refer to To Do Entries Reference A Role for more information about roles.

Use **Menu**, and then **To Do**, and then **To Do Dashboard** to navigate to the portal.

The following zones may appear as part of the portal's **Main** tab page

- **Filters.** This zone displays and manages filters restricting the information being displayed.
- **To Do Entries By Role.** This zone summarizes To Do entries by their currently assigned role.
- **To Do Entries By Status.** This zone summarizes To Do entries by their current status.
- **To Do Entries By Priority.** This zone summarizes To Do entries by their priority.
- **To Do Entries By Age.** This zone summarizes To Do entries by age based on age ranges defined for the current user.
- **To Do Entries By Type.** This zone summarizes To Do entries by their to do type.

Selecting a specific slice of data on any of these zones sets it as a filter and broadcasts its value to the other zones on the portal allowing them to filter their data accordingly.

The following zone appears as part of the portal's **Details** tab page

- **To Do Details** This zone lists To Do entries that match various criteria and allows the user to work and manage the list.

To Do Details

This zone allows you to search for non-closed To Do entries using various attributes of the entries, and to perform actions on selected ones.

> **Note**
>
> **Results are restricted by role.** For supervisors, this search returns To Do entries that meet the search criteria and are in a role of which the supervisor is a member. For non supervisors, the search returns open To Do entries that meet the search criteria and are in a role of which the user is a member or entries currently assigned to the user. Refer to To Do Entries Reference A Role for more information about roles.

The following sections describe the features of this zone.

Search Filters

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The following table describes each of the different filters supported by this zone.

Search Filter	Description
To Do Type	Use this filter to restrict the search to To Do entries of a specific type. Only To Do Types where the user is a member of at least one valid role for the type will be available for selection. If the To Do Role filter is populated, the list is further restricted to valid To Do Types for the To Do Role.
Status	Use this filter to restrict the search to To Do entries with a status of **Open** , **Assigned**, **In Progress** or **On Hold**. If you choose Assigned, then it includes the To Do entries that are In Progress and On Hold. Note that the underlying query excludes completed To Do entries.
Days Old	On the **To Do Management** portal, this option is represented by a pair of filter fields. Use these filters to restrict the search to To Do entries whose age falls within a given range in days. For example, entering values of 2 - 5 will restrict the search to entries that are greater than or equal to two days old and less than or equal to five days old. On the **To Do Dashboard** portal, this option lists the To Do Summary age ranges as set up for the user. Select a specific age range to restrict the search to To Do entries whose age falls within the given range in days.
To Do Role	Use this filter to restrict the search to To Do entries of a specific role. Only To Do Roles where the user is a member will be available for selection. If the To Do Type filter is populated, the list is further restricted to valid To Do Roles for the To Do Type.
Assign To User	Use this filter to restrict the search to To Do entries assigned to a particular user. This filter only appears if the current user has To Do supervisor access.
Priority	Use this filter to restrict the search to To Do entries with a specific priority.
Key Value	Use this filter to restrict the search to To Do entries with a sort key value containing the entered value.
Message	Use this filter to restrict the search to To Do entries with a specific message. This filter appears after the To Do Type filter has been populated and shows a list of the message texts from all non closed To Do entries of the selected To Do Type.
Characteristic	Use these filters to restrict the search to To Do entries with a specific **Characteristic Type** and value. Up to five characteristic type and value pairs may be entered. If the To Do Type filter is populated and the To Do Type is 'manual', the list of characteristic types will be restricted to the characteristic types defined for the To Do Type. For automated To Do Types, if valid To Do characteristic types are configured for the To Do type, only those are shown. If an automated To Do Type doesn't define valid characteristics or if no To Do Type filter is populated, all valid characteristic types for the To Do Entry entity are shown. Note that if you have populated characteristic filters and then you change the To Do Type filter, the system retains the characteristic filter as long as the characteristics are applicable to the newly selected To Do Type.

The system shows the total number of To Do entries displayed and the total number that satisfy your search criteria immediately below the set of results.

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> **Note**
>
> For performance reasons, because the filter criteria may be broad, the search zone is configured to only get the first 5000 records that match the criteria and will then sort that number to then display the first 400 sorted by priority and age. The To Do Dashboard portal may be used to get exact counts of records with certain criteria. Use additional criteria to narrow down the search as needed.

Search Results

The zone will display all To Do entries that meet the search criteria, up to the limit defined. The following columns are displayed initially:

- The Action column includes the button Work. Click this button to drill into the page on which the entry's respective object is displayed. If the To Do type has been configured to associate a script with this To Do entry's message number, then instead of being taken to the respective page, the associated script is launched. Refer to What Happens When You Work A To Do Entry for more information.

  > **Important**
  >
  > **Automatic Assignment** When you click the Work button for an open entry, the system changes the status of the entry to **Assigned** / **In Progress** and assigns it to you. It also causes this To Do entry to be your current To Do. Refer to Working On A To Do for more information.

  > **Note**
  >
  > **Work List**. This column has a Work List icon. Clicking this icon populates the Work List zone with the results. Clicking on entries in the Work List zone performs all the logic described here when clicking the Work button for one entry. It will drill into the related object or launch a script, if configured. It will make this To Do the 'current' To Do, it will assign it to you if it is **Open** and update it to **In Progress**.

  > **Note**
  >
  > Only 1 **In Progress** To Do entry. If you had a different To Do entry in progress before clicking the Work button, the other To Do entry will be put **On Hold**.

- Entries are sorted by their **Priority**. Highest in priority are listed first.
- **Days Old** is the number of days since the To Do entry was created by the system. Entries are sorted from youngest to oldest within priority.
- **Status** is the current status of the To Do entry. If the assignment substatus is populated, that value is displayed, otherwise the To Do entry status is displayed.
- **Assign To User** is the user currently assigned to the To Do entry.
- **Message** is the message associated with the To Do entry.
- **Related** displays a count of entries that are potentially related to the current entry based on having the same foreign key characteristic values. Click the hyperlink to navigate to the To Do Search page with the current entry as the Related To Do Filter value.

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- **Note** displays a Comment icon if there are either comments or a log entry of type **Forwarded**, **Sent Back** or **User Details** on the To Do Entry. Click the icon to open a pop-up window which displays the To Do entry information, message, comments and logs.
- **Characteristics** displays the characteristic types and values for the entry as a concatenated string. By default this list is collapsed to one line to save vertical space. If additional characteristics exist, you can use the expand arrow to display them.

> **Note**
>
> A feature configuration option is supplied to opt out of the compact view. Under the **To Do Options** feature configuration type, define the **Collapse Characteristics Column** option and set the value to "N".

- **Related Entity** displays the information for the object related to this entry. The information string allows you to navigate to the page on which the entry's respective object is displayed.
- **To Do ID** is the system generated key of the entry. Click the hyperlink to navigate to the To Do Entry page to view or maintain the current entry.

Click the **Column Configuration** icon in the zone header to show the Column Configuration Area in which additional columns can be added to the results. The additional columns include the following:

- **Create Date/Time** contains the date and time the To Do entry was created by the system.
- **Key 1** to **Key 5** contain the first five sort key values for the entry.
- **To Do Role** displays the description of the role for the To Do entry.

Actions

The zone provides the ability to perform certain actions on one or more selected To Do Entries.

Click the check box in the results list heading to select all entries displayed in the grid or click the box in a row to select a specific entry. The following actions are available:

- Use the **Update** button to open a pop-up window in which you can update the priority and/or add a **User Details** log entry to the selected To Do entries.
- Use the **Assign** button to assign a user to the selected To Do entries. Supervisors will be presented with a pop-up window in which they can choose the assignee from a list of users who are members of at least one role for the To Do Type. The user search includes information about the number of To Do entries already assigned to each user. For users without supervisor access, the current user is assumed to be the assignee and the window is not displayed. Note that the system does not allow a non supervisor to assign themselves a To Do that is assigned to another user.
- Use the **Unassign** button to reopen the selected To Do entries and remove the assignee. Note that the system does not allow non supervisors to reopen a To Do that is assigned to another user.
- Use the **Complete** button to complete the selected To Do entries. Both supervisors and non supervisors may complete any To Do entry, including those assigned to other users.

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To Do Entry

Refer to Understanding To Do Processing for detailed explanations about many To Do entry features.

To view a To Do entry, use **Menu**, and then **To Do**, and then **To Do Entry**, and then **Search** . You are brought to a query portal with options for searching for a To Do Entry. Note that some query options limit the results. Refer to the inline help for more information.

> **Note**
>
> **Restricted by role.** Any user may change Comments for any To Do Entry. In addition, any user may add user Log details. However, for all other changes and actions, you may only change To Do entries that are assigned to you or ones that are **Open** and assigned to a role to which you belong. Refer to To Do Entries Reference A Role for more information about roles.

Once a To Do Entry has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The inline help provides information about several fields. The following points highlight information about some of the fields that may be visible.

If the To Do entry has non-complete related entries an insight appears indicating the number of related entries. In addition, details about the related entries are shown in the Related To Do Entries zone.

If the To Do entry was **Created By** a background process, information about that background process appears with a link allowing the user to drill into the batch run, if desired. Refer to To Dos Created for Object-Specific Error Conditions for more information.

If the To Do type is configured to To Do Entries May Be Routed Out Of The System, the **Extract Info** appears. If the extract process is pending, the information indicates that. Otherwise, if it has run, information about the background process appears with a link allowing the user to drill into the batch run, if desired.

The **Characteristics** collection shows existing characteristics. This collection is maintained using the Edit action for users that are allowed to update this To Do entry. Refer to To Do Entry Characteristics for more information.

Actions

Most of the actions are self-explanatory and are related to simply updating the status value. This page has three special actions.

- Using the **Work** button causes several things to occur. You drill into the page on which the entry's respective object is displayed. If the To Do type has been configured to associate a script with this To Do entry's message number, then instead of being taken to the respective page, the associated script is launched. If the To Do entry is Open, it gets assigned to you and the assigned substatus is set to **In Progress**, if your implementation has implemented this functionality. Refer to What Happens When You Work A To Do Entry for more information.
- Use the **Forward** to assign a To Do to another user or role. When a To Do is forwarded, a log entry indicates who forwarded the To Do, to whom it was forwarded, and the specified reason. The dialogue prompts for whether to send to a User or a Role. The search for User

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includes information about the number of To Do entries already assigned to this user. When choosing a User, confirm the correct Role. The Details provided are captured in the log entry.

- **Send Back** is only applicable if the **Sent By** user is populated. When a To Do is sent back, a log entry is created that indicates when the To Do was sent back and by whom. If the To Do is **Open**, this dialogue allows you to send it back to a different role. If the To Do is assigned to you, the dialogue allows you to re-assign the To Do to the person who assigned it to you. The Details provided are captured in the log entry.

Related To Do Entries

If the To Do has related To Do entries, this zone appears with information about the related entries. Use this zone to perform actions on the current To Do and its related entries.

- Adding a Manual To Do Entry

Adding a Manual To Do Entry

If your system is configured with manual To Do types, you can add a To Do entry online.

Open the **Menu**, and then **To Do**, and then **To Do Entry**, and then **Add.**

You are prompted for a **To Do Type**. Only To Do types that are set up for manual usage appear in the list.

The default **To Do Type Priority** is displayed adjacent. Use **Override Priority** to override the default priority assigned by the system.

Type a **Subject** for your To Do entry. Depending on how the To Do type is set up, the subject may appear as the message in the To Do entry and To Do lists.

Enter a **Comment** to provide a longer description of and more details about the To Do entry.

Send To indicates whether the new To Do will be assigned to a **Role** (the default) or **User**.

The **Role** indicates the role to which this To Do entry will be assigned. Only users of the specified role will be able to view and work on the To Do entry. The role is defaulted from the To Do type. If you want to assign the To Do to a different role, change the specified role. You can only assign the To Do entry to one of the roles specified on the To Do type.

User appears if **Send To** is set to **User**. Use this option if you want to assign the To Do to a specific user. The user must be a member of the selected role.

If the To Do type defines valid characteristic types, the **Characteristics** collection is visible. If any of the characteristic types are flagged as Default on the To Do type, the characteristic type with its default value (if applicable) are displayed.

Legacy UI Features

The pages described in this section are legacy pages that are retained for backward compatibility. The product plans to deprecate the pages described here in an upcoming release.

- To Do Supervisor Functions
- To Do List Functions
- To Do Search

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To Do Supervisor Functions

This section describes several To Do transactions that aid supervisors in the monitoring and assignment of To Do entries.

- Supervisor To Do Summary
- Supervisor User Summary
- Supervisor To Do Assignment

Supervisor To Do Summary

This Supervisor To Do Summary page summarizes To Do entries by To Do Type. Only entries that are **Open** (i.e., not assigned to a specific user) or **Assigned** are summarized.

> **Note**
>
> This page will be deprecated in a future release. Refer to the To Do Dashboard portal for the page that the product recommends using. Besides providing counts by To Do Type it provides other breakdowns and allows for interaction between graphs.

> **Note**
>
> Only To Do entries that are assigned to a role to which you belong are summarized on this page. Refer to To Do Entries Reference A Role for more information.

Use **Menu**, and then **To Do**, and then **Supervisor To Do Summary** to open this page.

Description of Page

This page summarizes all To Do entries that are **Open** or **Assigned**.

> **Note**
>
> This page does not further break down the assigned To Do entries by the substatus. Refer to The Lifecycle Of A To Do Entry for more information on the substatus values.

- **To Do Type** contains the description of the To Do type.
- **Priority** provides a total count of To Do entries of a given type by priority. For each distinct priority the description includes the priority value followed by the corresponding number of entries. If all entries are of the same priority no additional count is displayed.
- **Total** contains the total of **Open** and **Assigned** entries. The hyperlink navigates to the Supervisor To Do Assignment transaction, setting it to display all **Open** and **Assigned** entries for the given To Do Type.
- **Open** contains the number of To Do Entries whose status is **Open**. The hyperlink navigates to the Supervisor To Do Assignment transaction, setting it to display all **Open** entries for the given To Do Type.

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- **Assigned** contains the number of To Do entries whose status is **Assigned**. The hyperlink navigates to the Supervisor To Do Assignment transaction, setting it to display all **Assigned** entries for the given To Do Type.

The "age bars" that appear to the right of the totals highlight the age of the To Do entries. The colors red, yellow and green are used to highlight the relative number of old, middle-aged and new To Do entries. The age associated with each of these colors is user-configurable.

Supervisor User Summary

The Supervisor User Summary page summarizes To Do entries by the user who is assigned to work on the entries. Only entries that are **Assigned** are summarized.

> **Note**
>
> This page will be deprecated in a future release. Refer to the To Do Management portal for a page that allows you to view To Do entries currently assigned to users.

> **Note**
>
> Only To Do entries that are assigned to a role to which you belong are summarized on this page. Refer to To Do Entries Reference A Role for more information.

Use **Menu**, and then **To Do**, and then **Supervisor User Summary** to open this page.

Description of Page

This page contains a grid that displays all assigned To Do entries by User ID and To Do type. It indicates how many To Do entries of the displayed Type are assigned to the user (Assigned this Type) and how many To Do entries in total are assigned to the user (Assigned Total).

> **Note**
>
> This page does not further break down the To Do entries by the substatus. Refer to The Lifecycle Of A To Do Entry for more information on the substatus values.

Clicking the hyperlinks transfer you to the Supervisor To Do Assignment transaction. On this transaction, you can assign / reassign To Do entries to a specific user. The difference is that clicking the To Do Type hyperlink causes only **Open** entries to be displayed on the Assignment transaction. Clicking the count in the Assigned this Type column causes **Assigned** entries assigned to the displayed user to be shown.

Supervisor To Do Assignment

This page lists To Do entries of a given type and allows a supervisor to assign / reassign them to a designated user.

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> **Note**
>
> This page will be deprecated in a future release. Refer to the To Do Management portal for the page that the product recommends using. It provides many more filters to narrow down the results. In addition, it provides more data in the results and provides more actions for a supervisor to perform for To Do entries.

Use **Menu**, and then **To Do**, and then **Supervisor To Do Assignment** to open this page.

Description of Page

This page contains **Open** or **Assigned** To Do entries of a given type. These entries can be assigned to a specified user one-by-one or several at a time. The following points describe this functionality:

- You can select a different **To Do Type** by typing in a value or pressing the search button in the upper right corner. An **Info** description of the To Do type appears on the left.
- You can change the list of entries displayed according to their status. Select the **Filter by** status to be All (blank), **Open**, or **Assigned**.
- For **Assigned** entries, you may also **Filter by User** to limit the search to a specific user assigned to the To Do entries.
- If you want to re-sort the entries by a different value, click the search button adjacent to **Extra Information**. Each row's respective sort value is displayed in the **Extra Information** column.

> **Note**
>
> **Extra Information.** Each To Do list's default **Extra Information** is defined on the list's To Do Type. Also note that each To Do list's available **Extra Information** differs.

- Click the **Select All** button to select all entries displayed in the grid. Click the **Clear All** to remove the selections in the grid.
- Use the checkbox if you want to assign specific entries.
- Entries are further sorted by their **Priority**. Highest in priority are listed first.
- **Create Date/Time** contains the date and time the To Do entry was created by the system. Click the Create Date/Time hyperlink to navigate to the To Do page where additional information is visible and where additional actions are possible.
- Click the number of **Related** entries hyperlink to navigate to the To Do Search query to list potentially related entries to the current entry.
- **Worked By** shows the user currently assigned to the To Do entry.
- **To Do Entry Status** is the current status of the To Do entry. If the assigned substatus is populated, that value is shown, otherwise the status value is shown. Refer to The Lifecycle Of A To Do Entry for more information.
- **Message** contains a description of the To Do entry. Use the message description hyperlink to drill into the page on which the entry's respective object is displayed. If the To Do type has been configured to associate a script with this To Do entry's message number, then instead of being taken to the respective page, the associated script is launched. Note that clicking this action does not push the To Do Entry into the Current To Do zone and does

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not assign the To Do Entry to you. Refer to Working On A To Do for information about using that functionality.

- You can assign entries to a user:
  - Enter a user ID or search for a user using the **Assign To User** field. You can only select a user that is associated with a role that is associated with this **To Do Type**. Note that the current number of assignments is displayed adjacent.
  - Select one or more entries to assign to this user and click the **Assign** button. The entries' status becomes **Assigned**.

To Do List Functions

This section describes To Do pages that aid users in the assignment and working of entries in To Do lists.

- To Do Summary
- To Do List

To Do Summary

This page summarizes To Do entries that meet the following qualifications:

> **Note**
>
> This page will be deprecated in a future release. Refer to the To Do Dashboard portal for the page that the product recommends using. Besides providing counts by To Do Type it provides other breakdowns and allows for interaction between graphs.

- The entry is **Open** and you belong to the entry's To Do role. Refer to To Do Entries Reference A Role for more information about roles.
- The entry is **Assigned** and you are the user to which it is assigned.

Use **Menu**, and then **To Do**, and then **To Do Summary** to open this page.

Keyboard Shortcut	Alternate Shortcut
`Alt+X`	`Alt+Shift+X`

> **Note**
>
> Refer to Shortcut Key Summary for information about the alternate shortcut.

> **NOT_SUPPORTED**
>
> Refer to The Big Picture of To Do Lists for an overview of To Do functionality.

Description of Page

This page is dedicated to a grid that summarizes the To Do entries on which you can work. The following information is displayed:

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- **To Do Type** contains the description of the To Do type.
- **Priority** provides a total count of To Do entries of a given type by priority. For each distinct priority the description includes the priority value followed by the corresponding number of entries. If all entries are of the same priority no additional count is displayed.
- **Total** contains the total of **Open** and **Assigned to You** entries. The hyperlink navigates to the To Do List transaction, setting it to display all **Open** and **Assigned** entries assigned to you for the given To Do Type.
- **Open** contains the number of To Do Entries whose status is **Open**. The hyperlink navigates to the To Do List transaction, setting it to display all **Open** entries for the given To Do Type.
- **Assigned to You** contains the number of To Do entries that are assigned to you whose status is **Assigned**. The hyperlink navigates to the To Do List transaction, setting it to display all **Assigned** entries for the given To Do Type.

> **Note**
>
> This page does not further break down the assigned To Do entries by the substatus. Refer to The Lifecycle Of A To Do Entry for more information on the substatus values.

The "age bars" that appear to the right of the totals highlight the age of the To Do entries. The colors red, yellow and green are used to highlight the relative number of old, middle-aged and new To Do entries. The age associated with each of these colors is user-configurable.

To Do List

This page lists To Do entries of a given type that are either **Open** (not assigned to a specific user) or are assigned to you.

> **Note**
>
> This page will be deprecated in a future release. Refer to the To Do Management portal for a page that the product recommends using. It provides many more filters to narrow down the results. In addition, it provides more data in the results and allows the user to adjust the priority of To Do entries.

> **Note**
>
> **Restricted by role.** Only those entries assigned to a role to which you belong may be seen on this page. Refer to To Do Entries Reference A Role for more information.

> **NOT_SUPPORTED**
>
> We recommend familiarizing yourself with the topics described in The Big Picture of To Do Lists to fully appreciate how To Do entries are managed by the system.

Use **Menu**, and then **To Do**, and then **To Do List** to open this page.

Description of Page

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This page contains a grid that summarizes the To Do entries of a given type on which you can work.

The **Info** section contains a concatenation of the **To Do Type**'s description and the user's name.

The area beneath **Info** provides you with options that control which To Do entries appear and the order in which they are displayed. The following points describe the various options:

- Use **Sort By** to define how you want the To Do entries sorted. The following options are available:
  - **Assigned Date - On or After.** This option sorts the To Do entries in chronological order (based on the date the entry was assigned to you) starting from the input **Date**. If you choose this option, the system assumes you want to start from the earliest To Do entry. If you want to start from a date other than the earliest To Do entry, enter the desired **Date** and click the adjacent search button.
  - **Assigned Date - On or Before.** This option sorts the To Do entries in reverse chronological order (based on the date the entry was assigned to you) starting from the input **Date**. If you choose this option, the system assumes you want to start from the today's date. If you want to start from a date other than today's date, enter the desired **Date** and click the adjacent search button.
  - **Create Date - On or After.** This option sorts the To Do entries in chronological order (based on the date the entry was created) starting from the input **Date**. If you choose this option, the system assumes you want to start from the earliest To Do entry. If you want to start from a date other than the earliest To Do entry, enter the desired **Date** and click the adjacent search button.
  - **Create Date - On or Before.** This option sorts the To Do entries in reverse chronological order (based on the date the entry was created) starting from the input **Date**. If you choose this option, the system assumes you want to start from the today's date. If you want to start from a date other than today's date, enter the desired **Date** and click the adjacent search button.
  - **Extra Information**. This option sorts the To Do entries by the value of the **Extra Info**.
- Use **Extra Info** to choose data related to the To Do Entry that should be used to sort the To Do entries. This information is displayed in each entry's **Extra Information** column.

> **Note**
>
> **Extra Info.** Each To Do types's available **Extra Info** is defined on the To Do Type Sort Keys. Also note that each To Do type's available **Extra Info** differs based on the configuration of the To Do Type.

- Use **Filter by** to restrict the To Do entries based on their status. The following options are available:
  - **All**. This option shows all entries that are **Open** or **Assigned**.
  - **Assigned**. This option shows all entries that are assigned to you.
  - **Open**. This option shows all entries that are **Open**.

The grid that follows contains the To Do entries that match your criteria. The following information appears:

- Click the **Select All** button to select all entries displayed in the grid. Click the **Clear All** button to remove the selections in the grid.

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- Use the checkbox if you want to mark specific entries as **Completed** or **Assigned** using the **Complete** or **Assign** buttons at the bottom.
- A Comment icon appears if there are comments on the To Do item and a Log Entry icon appears if there is a log entry of type **Forwarded**, **Sent Back** or **User Details** on the To Do item. This column appears if at least one To Do has either comments or a special log entry.
- Entries are further sorted by their **Priority**. Highest in priority are listed first.
- **Create Date/Time** contains the date and time the To Do entry was created by the system.
- Click the Create Date/Time hyperlink or either of the special icons to navigate to the To Do entry page.
- Click the number of **Related** entries hyperlink to navigate to the To Do Search query to list potentially related entries to the current entry.
- **Assigned Date/Time** contains the date and time the To Do entry was assigned to a user. This field is only populated on entries that are **Assigned**. If a user assigned the To Do entry, the user ID and name of the user who assigned the To Do entry are displayed beneath the Date/Time.
- **Message** contains a description of the To Do entry. Use the message description hyperlink to drill into the page on which the entry's respective object is displayed. If the To Do type has been configured to associate a script with this To Do entry's message number, then instead of being taken to the respective page, the associated script is launched. Refer to What Happens When You Work A To Do Entry for more information.

> **Important**
>
> **Automatic Assignment** When you drill into an open entry using the message link, the system changes the status of the entry to **Assigned** / **In Progress** and assigns it to you. It also causes this To Do entry to be your current To Do. Refer to Working On A To Do for more information.

- **To Do Entry Status** is the current status of the To Do entry. If the assigned substatus is populated, that value is shown, otherwise the status value is shown. Refer to The Lifecycle Of A To Do Entry for more information.
- **Extra Information** contains the data for the entry that corresponds to the Extra Info chosen in the sort options above.
- **To Do ID** contains the unique identifier of the To Do entry.
- If you want to mark one or more entries as **Assigned**, check the desired entries and then click the **Assign** button.
- If you want to mark one or more entries as **Completed**, check the desired entries and then click the **Complete** button. Completed entries do not appear on the To Do list (but they are retained on the database for audit purposes).

To Do Search

This page allows you to search for To Do entries using various search criteria, and perform various actions on selected ones. This page includes completed To Do entries in its search results, when applicable with respect to the filter criteria.

Use **Menu**, and then **To Do**, and then **To Do Search** to open this page.

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> **Note**
>
> This page will be deprecated in a future release. Refer to the To Do Management portal for a page that the product recommends using. It provides many more filters to narrow down the results. In addition, it provides more data in the results and allows the user to adjust the priority of To Do entries.

> **Note**
>
> **No restriction by role.** This page returns all To Do entries that meet the search criteria, regardless of the To Do entry's role. Using the search, a user may drill into the details of a To Do entry even if the To Do is not assigned to the user. Refer to To Do Entries Reference A Role for more information about roles.

The top half of the page is where you enter the criteria used to search for To Do entries.

> **Caution**
>
> Try to be as specific as possible when entering search criteria. Why? Because entering open-ended search criteria may have a severe impact on response times.

The following table describes each of the different search filters.

Search Filter	Description
Related To Do	If you're searching for potentially related entries for a given To Do entry, choose **Specific To Do** for the **Related To Do Filter**. Enter the **To Do ID**. A filter value of **Not Applicable** defaults.
To Do Type	If you're searching for a To Do entry and you know the value of a To Do Type linked to the To Do entry, choose **Specific To Do Type** for the **To Do Type Filter**. Enter the **To Do Type**. A filter value of **All** defaults.
Char Type	If you're searching for a To Do entry and you know the value of a characteristic linked to the To Do entry, choose **Specific Char Type** for the **Char Type Filter**. Enter the **Characteristic Type** and **Characteristic Value**. A filter value of **Not Applicable** defaults. Only characteristic types that include a characteristic entity of **To Do Entry** and that have been marked to allow searching by characteristic value are available.
User	Use this search method if you know the **Created By User**, **Assigned To User** or **Completed By User** for the To Do entry. Enter the appropriate **User Id**. A filter value of **Not Applicable** defaults.
Date Range	Use this field if you're searching for a To Do entry and know the **Date Created** or **Date Completed**. A filter value of **Date Created** defaults. The **Start Date/Time** defaults to the current date, 12:00AM and the **End Date/Time** defaults to the current date, 11:59PM. If you enter a **Date Range Filter** of **All**, the system ignores this search method.

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Search Filter	Description
Status	Use this search method to restrict the search to To Do entries with a specific status value. You may search for To Do entries in the status of **Open**, **Assigned** or **Completed**. You may also perform a combination search for To Do entries that have a status value of either **Open** or **Assigned**. A filter value of **All** defaults.

> **Note**
>
> **The system allows any combination of values.** The system does not try to validate your search combinations, even if they do not make sense. For example, if you enter a **User Filter** value of **Completed By User** and a **Status Filter** value of **Open**, you will not get an error. In this case, the system will find no records that match your criteria (because To Do entries that are Open do not have a Completed By User).

The system shows the total number of To Do entries that satisfy your search results immediately below the grid.

The first group of To Do entries is displayed in the grid at the bottom of the page.

- Click the **Select All** button to select all entries displayed in the grid. Click the **Clear All** to remove the selections in the grid.
- Use the checkbox if you want to perform actions (see below) on specific entries. Only **Open** or **Assigned** entries may be selected.
- A Comment icon appears if there are comments on the To Do item and a Log Entry icon appears if there is a log entry of type **Forwarded**, **Sent Back** or **User Details** on the To Do item. This column appears if at least one To Do item has either comments or a special log entry. Use either icon to navigate to the To Do entry page.
- Entries are sorted by their **Priority**. Highest in priority are listed first.
- **Create Date/Time** contains the date and time the To Do entry was created by the system. Use the hyperlink to navigate to the To Do entry page.
- Click the number of **Related** entries hyperlink to redisplay this page listing potentially related entries to the current entry.
- **Last Assigned Date/Time** contains the date and time the To Do entry was most recently assigned to a user, if applicable, along with the Assigned To user.
- **Message** contains a description of the To Do entry. If the To Do entry is in the status of **Open** or **Assigned**, the message description allows you to drill into the page on which the entry's respective object is displayed. If the To Do type has been configured to associate a script with this To Do entry's message number, then instead of being taken to the respective page, the associated script is launched. Refer to What Happens When You Work A To Do Entry for more information.

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> **Note**
>
> **Current To Do**. Drilling into the page by clicking the Message hyperlink does not automatically assign **Open** To Do entries to the user (as the To Do List page does when clicking on the Message). But it does treat this as the user's current to do, enabling the functionality in the Current To Do zone. Refer to Working On A To Do for more information.

- **Status** contains the current status of the To Do entry.
- **Completion Date/Time** contains the date and time the To Do entry was completed and the user who completed the entry, if applicable.
- **To Do Type** contains a description of the To Do type for the To Do entry.

Actions

- Use the **Assign** button to assign or reassign the selected entries to a user. Enter a user ID or search for a user using the **Assign To User** field. By default this field is populated with the current user's ID. Note that the user's current number of assignments is displayed adjacent. Upon successful processing, the selected entries are assigned to the specified user and the status of **Open** entries becomes **Assigned**. Additionally, a corresponding log entry is added to each To Do.

  > **Note**
  >
  > You may only assign To Do entries to yourself or to someone else if you are a valid user in the To Do entry's current role.

  > **Note**
  >
  > Only users with **Supervisor Assignment** access rights may reassign entries that are not currently assigned to them.

- Use the **Reopen** button to unassign the selected entries from their users. Upon successful processing, the selected entries become **Open** and a corresponding log entry is added to each To Do.

  > **Note**
  >
  > Only users with **Supervisor Assignment** access rights may unassign entries that are not currently assigned to them and the user must be a valid user in the To Do entry's current role.

- Use the **Complete** button to complete the selected entries.

Reports

The following section describes the functionality provided for submitting reports on-line and for viewing reports submitted through a third party reporting tool.

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NOT_SUPPORTED

For information about this functionality, see The Big Picture of Reports.

- On-line Report Submission
- Viewing Historic Reports

On-line Report Submission

The on-line report submission page enables you to request a specific report to be run. This is only available if your system is able to integrate with your third party reporting system on-line. The system comes configured to integrate with BI Publisher.

- Report Submission - Main

Report Submission - Main

This page allows you to submit a report on-line. Navigate to this page using **Menu**, and then **Tools**, and then **Report Submission.**.

Description of Page

To submit a report, choose the **Report Code** for the process you wish to submit. Refer to Defining Report Definitions for information about defining reports in the system.

A description of the report is displayed.

The parameters defined for the report on the report definition page are displayed in the grid. To see a description of a parameter, use the search button adjacent to the parameter label.

Note

Default note. The default values displayed for the parameters are defined on the report definition page.

When you have entered the appropriate parameter values, click the **Submit** button to submit the report. Refer to How To Request Reports for more information.

Note

Reports submitted via the on-line report submission page are not logged in the report history repository and are therefore not visible from the report history page. Only reports submitted through your third party reporting tool's batch scheduler are logged in the report history, if supported by the tool.

Viewing Historic Reports

If your third party reporting tool stores historic copies of reports in a repository, you may configure the system to allow a user to view these historic reports on-line.

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> **Note**
>
> This page currently does not display historical reports for BI Publisher.

- Report History - Main

Report History - Main

This page allows you to view a report stored in your third party reporting tool's report repository, if supported. Navigate to this page using **Menu**, and then **Tools**, and then **Report History**.

Description of Page

The top part of the page shows the **Report Code**, **Description** and **Long Description** for the selected report.

To select a report, search by either **Report Code** or **Description** and click the adjacent search button. The reports matching your search criteria are displayed. Choose the desired report from the selection list.

> **Note**
>
> **Displaying Report History**. When you choose a report, the system needs to interface with your reporting software to display a list of historical occurrences of this report.

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Part III

Application Framework Administrative User Guide

Welcome to the Oracle Utilities Application Framework Administrative User Guide. The topics in this guide describe how to administer the Oracle Utilities Application Framework.

- General Options
- Security & User Options
- User Interface Tools
- Database Options
- Configuration Tools
- To Do Lists
- Background Processes
- Attachments
- Monitoring and Analytics
- External Messages
- Integrations
- Market Transaction Management
- Content Migration Assistant (CMA)
- Facts
- Conversion
- Data Export

General Options

This section describes control tables that are used throughout your product.

- Defining Installation Options
- Support For Different Languages
- Defining Countries
- Defining Currency Codes
- Defining Time Zones
- Defining Geographic Types
- Defining Work Calendar
- Defining Display Profiles
- Defining Phone Types

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- Defining Feature Configurations
- Defining Master Configurations
- What's New Portal

Defining Installation Options

The topics in this section describe the various installation options that control various aspects of the system.

- Installation Options - Main
- Installation Options - Messages
- Installation Options - Algorithms
- Installation Options - Accessible Modules
- Installation Options - Installed Products

Installation Options - Main

Select **Admin**, and then **General**, and then **Installation Options - Framework** to define system wide installation options.

Description of Page

The **Environment ID** is a unique universal identifier of this instance of the system. When the system is installed, the environment id is populated with a six digit random number. While it is highly unlikely that multiple installs of the system at a given implementation would have the same environment ID, it is the obligation of the implementers to ensure that the environment ID is unique across all installed product environments.

System Owner will be **Customer Modification**.

The **Admin Menu Order** controls how the various control tables are grouped on Admin.

- If you choose **Functional**, each control table appears under a menu item that corresponds with its functional area. Note, the menu that is used when this option is chosen is the one identified with a menu type of **Admin**.
- If you choose **Alphabetical**, each control table appears under a menu item that corresponds with its first letter, using a Roman alphabet. For example, the Language control table will appear under the L menu item entry.

> **Note**
>
> The **Alphabetical** option only supports the Roman alphabet. For languages that do not use the Roman alphabet, the recommendation is to configure the system for the **Functional** setting.

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> **⚠ Caution**
>
> In order to improve response times, installation options are cached the first time they are used after a web server is started. If you change the Admin Menu Order and you don't want to wait for the cache to rebuild, you must clear the cached information so it will be immediately rebuilt using current information. Refer to Caching Overview for information on how to clear the system login cache (this is the cache in which installation options are stored).

The **Language** should be set to the primary language used by the installation. Note that if multiple languages are supported, each user may define their preferred language.

The **Currency Code** is the default currency code for transactions in the product.

If your product supports effective dated characteristics on any of its objects, define the date to be used as the **Characteristic Default Date** on objects without an implicit start date. The date you enter in this field will default when new characteristics are added to these objects (and the default date can be overridden by the user).

Active Owner displays the owner of newly added system data (system data is data like algorithm types, zones, To Do types, etc.). This will be **Customer Modification** unless you are working within a development region.

Country and **Time Zone** represent the default country and time zone that should be used throughout the application.

> **⚠ Caution**
>
> In most implementations, the time zone defined here matches the database time zone. However, if there is some reason that the database time zone does not match the installation time zone, an implementation may configure a setting in the properties file to automatically convert data from the database time zone to the time zone defined here when displaying dates. Note that when this property setting is defined, changes to the installation time zone will require the server and the thread pool workers to be restarted in order for the changes to take effect.

Turn on **Seasonal Time Shift** if your company requires seasonal time shift information to be defined. Note that this is currently only applicable to Oracle Customer Care and Billing > Interval Billing functionality.

Installation Options - Messages

Select **Admin**, and then **General**, and then **Installation Options - Framework** and the **Messages** tab to review or enter messages that will appear throughout the application when a given event occurs.

The **Message** collection contains messages that are used in various parts of the system. For each message, define the **Installation Message Type** and **Installation Message Text**. The following table describes the **Message Types** provided by the framework product and how they are used in the system. Your specific product may have introduced addition message types.

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Message Type	How The Message Is Used
Company Title for Reports	This message appears as a title line on the sample reports provided with the system. Generally it is your company name. It is only used if you have installed reporting functionality and are using the sample reports (or have designed your reports to use this message).
Domain Name	The text entered for this message type is meant to identify the environment. If populated, the text is displayed next to the product name in The Application Toolbar. It may be used in other cases where it is useful to indicate the environment for a user. For example, the email sent when a background process finishes includes this information, if populated.

Installation Options - Algorithms

Select **Admin**, and then **General**, and then **Installation Options - Framework** and the **Algorithms** tab to review or enter the algorithms that should be evoked when a given event occurs.

The grid contains **Algorithms** that control important functions in the system. You must define the following for each algorithm:

- Specify the **System Event** with which the algorithm is associated (see the table that follows for a description of all possible events).
- Specify the **Sequence Number** and **Algorithm** for each system event. You can set the **Sequence Number** to 10 unless you have a **System Event** that has multiple **Algorithms**. In this case, you need to tell the system the **Sequence** in which they should execute.

> ⚠ **Caution**
>
> These algorithms are typically significant processes. The absence of an algorithm might prevent the system from operating correctly.

The following table describes each **System Event**.

System Event	Optional / Required	Description
Validate Email Attachment	Optional	Algorithms of this type are used to validate the attachments for size and total count while sending attachments using the Email service. Refer to Sending Email for more information
Address Geocoding	Optional	Algorithms of this type use Oracle Locator to retrieve latitude and longitude coordinates using address information.

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System Event	Optional / Required	Description
Attachment Malware Scan	Optional	Algorithms of this type are invoked when adding attachment content. The algorithm receives the attachment ID and is expected to use a malware scanning tool to verify the contents of the attachment. Only one algorithm is allowed. Refer to Enabling Malware Scan for more information.
Global Context	Optional	Algorithms of this type are called whenever the value of one of the global context fields is changed. Algorithms of this type are responsible for populating other global context values based on the new value of the field that was changed. Refer to Global Context Overview for more information.
Guaranteed Delivery	Optional	Algorithms of this type may be called by processes that receive incoming messages that should 'guarantee delivery'. Refer to Guaranteed Delivery for more information. The business service `F1-GuaranteedDelivery` may be used to invoke this plug-in spot.
Ldap Import	Optional	Algorithms of this type are called for operations on users, groups, and group memberships after they have been processed.
Ldap Import Preprocess	Optional	Algorithms of this type are called to preprocess data retrieved from LDAP.
Next To Do Assignment	Optional	This type of algorithm is used to find the next To Do entry a user should work on. It is called from the Current To Do zone when the user asks for the next assignment. Refer to On Demand Assignment Configuration for more information about setting up this information.

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System Event	Optional / Required	Description
Reporting Tool	Optional	If your installation has integrated with a third party reporting tool, you may wish to allow your users to submit reports on-line using report submission or to review report history online. This algorithm is used by the two on-line reporting pages to properly invoke the reporting tool from within the system.
SMS Receive	Optional	This type of algorithm is used to provide SMS receive service. Only one algorithm of this type should be plugged in.
SMS Send	Optional	This type of algorithm is used to provide SMS send service. If your installation uses the base algorithm that uses BPEL, you will need to create a feature configuration with the SMS Send Configuration feature type to define your Oracle BPEL server and service call details. If your installation has integrated with a third-party SMS service, you may want to override this algorithm type with your own implementation. Only one algorithm of this type should be plugged in.
To Do Information	Optional	We use the term To Do information to describe the basic information that appears throughout the system to describe a To Do entry. Plug an algorithm into this spot to override the system default "To Do information".
To Do Pre-creation	Optional	These types of algorithms are called when a To Do entry is being added. Refer to Refining a To Do Entry's Details at Creation Time for more information.

Installation Options - Accessible Modules

Select **Admin**, and then **General**, and then **Installation Options - Framework** and the **Accessible Modules** tab to view the list of accessible modules.

Description of Page

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This page displays the full list of the application's function modules. A **Turned Off** indication appears adjacent to a module that is not accessible based on your system's module configuration setup.

> **NOT_SUPPORTED**
>
> Refer to Module Configuration for more information on function modules and how to turn off modules that are not applicable to your organization.

Installation Options - Installed Products

Select **Admin**, and then **General**, and then **Installation Options - Framework** and the **Installed Products** tab to view a read only summary of the products that are installed in the application version that you are logged into.

Description of Page

The **Product Name** indicates the name of the "products" that are installed. The collection should include **Framework**, an entry for your specific product and an entry for **Customer Release**.

Release ID shows the current release of the application that is installed. This field is used by the system to ensure that the software that executes on your application server is consistent with the release level of the database.

The **Release ID Suffix**, **Build Number** and **Patch Number** further describe the details of your specific product release.

> **Note**
>
> If you have developed implementation-specific transactions, you can populate the release ID, release ID suffix, build number and patch number for the **Customer Release** entry to define the latest version of implementation-specific logic that has been applied to this environment. The framework provides a script (`F1CustRelM`) to allow these fields to be updated manually. In addition, the `F1-InstallationOptions` inbound web service provides operations to view and update those fields via a REST call. Alternatively, your implementation team may populate these fields as part of their upgrade scripts.

The **Product Status** is used to indicate if a product installed by default in the version you are logged into is **Active** or **Inactive**.

The **Display** column indicates the product whose name and release information should be displayed in the title bar. Only one product sets this value to **Yes**.

Owner indicates if this entry is owned by the base package or by your implementation (**Customer Modification**).

Product Type indicates if the product is a Parallel Application. A parallel application is one that is independent of, and does not conflict with, other parallel applications. Multiple parallel applications can be installed in the same database and application server.

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> **Note**
>
> **About Information**. The information on this tab is used to populate the information displayed in the About window for your product.

Support For Different Languages

- User Language
- Customer Language
- Defining Languages

User Language

The language English (with the locale "en") is provided by the system and all system metadata are delivered with an English description or label. The system provides support for defining other languages and supports multiple languages in a single environment. System users can use the system in their preferred language, as long as a translation into that language has been provided. A user sees the system in the language defined on their user record. If enabled, users can use the Switch Language zone to switch to another supported language real time.

Supporting a New Language

Normally, setting up the system for another language (besides the delivered English language entry) is an implementation issue, not an administrative setup issue. However, there are several online administrative features that are used to set up a new language, and these are described here.

1. **Define a language code and indicate that it is enabled.** For details on this procedure, see Defining Languages.
2. **Install or confirm the existence of a language pack**. For an on-premise installation, if the product supplies a language pack with translations for the system metadata descriptions, follow the instructions for downloading the language pack and installing it into your environment. For a cloud installation, if the product supplies a language pack for a given language, no additional step is needed here. The language pack is already installed.
3. **Copy descriptions of all language-enabled tables from an existing translation (e.g., English).** The copied values act as placeholders while the strings are translated into the new language. It is necessary to do this as a first step in order to create records using the new language code created in the previous step. Language-based descriptions can be copied using a supplied batch process, `F1-LANG`. The batch copies all English labels in the system.

   The batch process will also update the new language rows with the translated metadata descriptions from the language pack, if installed.
4. **Translate additional content.** Translatable descriptions and labels for implementation data may be updated / entered in the application. First the user record must be updated to reference the new language. This may be done in one of the following ways:
   a. Switch to the new language using the Switch Language zone.
   b. If that zone is not available, navigate to the user page, assign the new language code to your User ID, sign out, and sign back in again.

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Any online functions that you access will use your new language code. You can change the language code for all users who plan to use/modify the new language.

> **Note**
>
> The language pack updates all language entries for base owned system data. If your implementation updates base owned labels and descriptions after applying a language pack, they will be overwritten the next time an updated language pack is applied. Note that most user facing labels and messages support defining an Override Label or Override Description. This information is not updated by the base product and should be utilized if your implementation desires a specific label or description.

Managing Multiple Languages

Once a non-English language has been set up, there are several points to note when adding or updating records that include translatable strings.

- When a new record is added through the user interface or through a REST service call or any other means that goes through the standard maintenance service, the system automatically generates entries for each supported language and copies the text of the entered description to all the generated languages.
- When the translatable string for a record is updated, only the user's language row is updated. The system does not ripple the change to other supported language entries (because it could be overriding a valid translation).
- When your system is upgraded to a new version, the new version typically includes new system data. The upgrade only includes the English language rows. Implementers should run the `F1-LANG` batch program to generate language rows for the your supported languages for this new data. If a new translation pack for your supported language is available at the time of upgrade, then running this process also applies the translated strings. (As mentioned above, for on-premise installations, you need to download and install the language pack before this step). If the language pack is not available at the time of upgrade, then the batch program should be run again when the language pack has been installed.
- New translatable objects may also be included in a patch / hot fix. In this situation, the `F1-LANG` batch program should be run after installing the patch in order to ensure there are language rows for your supported languages. Updated language packs are only provided for full release upgrades and not for hot fixes. So implementations may need to temporarily supply translations for the new strings until you update to the next release with the next updated translation pack.

Customer Language

Your specific product may also support capturing the language of a customer. Such that correspondence sent from the product may be produced in a language set on a customer record. Refer to your specific product documentation for more information about additional language support.

Defining Languages

Your product may support multiple languages. For example, the field labels, input text, and even outputs and reports can be configured to appear in a localized language. A language code for every potential language exists in the system to supply this information in various languages.

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Select **Admin**, and then **General**, and then **Language** to define a language.

This is a standard All-in-One portal.

When **Language Enable** is checked, the system adds a row for this language whenever a row is added in another language. For example, if you add a new currency code, the system will create language specific record for each language that has been enabled. You would only enable multiple languages if you have users who work in multiple languages. Languages that are configured as enabled, appear in the Switch Language zone.

> **Note**
>
> For on premise applications, the login page displays all the languages that are enabled, allowing the user to toggle the login instructions in that language. The list of enabled languages is captured on the server at startup time. If a new language is enabled, contact your server administrator to refresh the server in order to see the new language displayed in the login page.

The **Locale** is a string containing three portions:

- ISO language code (lower case, required)
- ISO country code (upper case, optional)
- Variant (optional).

Hyphens separate the various portions, and multiple variants are possible.

The locale along with the collator strength control how the contents of grids and search results are sorted by the Java virtual machine (JVM) on your web server: The specific JVM in use by your particular hardware/OS configuration constrains the available **Locales**. Validating the **Locale** against the JVM is outside the scope of this transaction. This means you are responsible for choosing valid **Locales**.

Additionally, external systems that communicate with the product and provide a language use a format that matches the locale. For example in the Accept-Language header for REST web service calls, a requested language is provided.

The following are examples of valid locales:

Locale	Comments
`en-US`	American English
`en-AU`	Australian English
`pt-BR`	Brazilian Portuguese
`fr-FR-EURO`	European French
`ja-JP`	Japanese

The **Collator Strength** parameter is used for the Java collation API . This parameter controls whether, for example, upper and lower-case characters are considered equivalent, or how accented characters are sorted. Valid values for collator strength are **PRIMARY**, **SECONDARY**, **TERTIARY**, and **IDENTICAL**. If you leave this field blank, Java will use its default value for the language. We'd like to stress that the impact of each value depends on the language.

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Please see https://docs.oracle.com/javase/7/docs/api/java/text/Collator.html for more information about the collator strength for your language.

Display Order indicates if this language is written **Left to Right** or **Right to Left**.

Note that all administrative control tables and system metadata that contain language-specific columns (e.g., a description) reference a language code. In addition, other tables may reference the language as a specific column. For example, on the User record you indicate the preferred language of the user.

Defining Countries

The topics in this section describe how to maintain countries.

- Country - Main
- Country - States

Country - Main

To add or review Country definitions choose **Admin**, and then **General**, and then **Country.**

The **Main** page is used to customize the fields and field descriptions that will be displayed everywhere addresses are used in the system. This ensures that the all addresses conform to the customary address format and conventions of the particular country you have defined.

Description of Page

Enter a unique **Country** and **Description** for the country.

The address fields that appear in the **Main** page are localization options that are used to customize address formats so that they conform to address requirements around the world. By indicating that an address field is **Optional**, you make that field available everywhere addresses for this country are used in the system. You can enter your own descriptions for the labels. These labels will appear wherever addresses are maintained in the system.

> **Note**
>
> Your specific product may also add the ability to mark an address field as **Required**. If that is available, then the product is also supplying appropriate validation in all places where a user defines an address.

> **Note**
>
> For any country where the **State** is enabled, the valid states for the country must be entered on the **Country - State** tab. When entering address constituents on a record that captures this detail, the value for State is verified against the data in the State table. For any country where there is a component of the address that represents a "state" but your implementation does not want to populate the valid states for that country, choose a different field such as County for this constituent (and define an appropriate label). When entering address constituents on a record that captures this detail, no validation is done for the County column.

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Country - States

To maintain the states located in a country, choose **Admin**, and then **Country**, and then **Search** and navigate to the **State** page.

Description of Page

For any country where you have enabled the State switch, use the **State** collection to define the valid states in the **Country**.

- Enter the standard postal abbreviation for the **State** or province.
- Enter a **Description** for this state or province.

Defining Currency Codes

The currency page allows you to define display options related to currency codes that are used by your system. Use **Admin**, and then **General**, and then **Currency** to define the currency codes in which financial information is denominated.

This is a standard All-in-One portal.

Most attributes are self explanatory.

> **Note**
>
> Please contact your specific product to verify whether it supports a currency with more than 2 **Decimals**.

The **External Reference** may be used to define a currency whose currency code is more than three characters. To support that type of currency, define a currency code that uniquely identifies the currency in the system and use the external reference to define the currency code recognized by external products. Note that your specific integration with an external system where financial information is included may need to be adjusted to use the external reference instead of the system's currency code. Refer to the specific documentation for your integrations to confirm.

Defining Time Zones

The following topics describe how to design and set up time zones.

- Designing Time Zones
- Setting Up Time Zones
- Setting Up Seasonal Time Shift

Designing Time Zones

The Time Zone entity is used to define all the time zones where your customers may operate. Each time zone should define an appropriate Time Zone Name. This is a reference to an external source that defines time zones, their relationship to Greenwich Mean Time, whether the time zone follows any shifting for summer / winter time (daylight savings time) and when this shift occurs.

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The following sections describe concepts and configuration topics related to managing time zones.

> **Note**
>
> Oracle Utilities Customer Care and Billing - Interval Billing applications customers should consult the topic *Time Issues* (search the Help index for "time issues") for specific information relating to that product's interval billing time related functionality.

The Base Time Zone

When designing your time zones, the first thing to determine is the base time zone. You may choose the time zone where the company's main office resides. Once this is done you can link the time zone code to the installation option as the base time zone. Refer to Installation Options - Main for more information.

> **Note**
>
> An attribute in the system properties file may be configured to indicate that the DB session time zone should be synchronized with the value defined on the Installation Options. Refer to the *Server Administration Guide* for more information.

If your company does business beyond your main office's time zone, define the other time zones where you may have customers or other systems with which you exchange data. At this point, your specific product may include configuration tables to capture default time zones, for example based on a postal code or geographic location.

Standard vs. Legal Time

The term **Legal Time** refers to the actual clock time as may be impacted by daylight saving (also called 'local time'). This time line has a gap hour on entry to the daylight saving period and a duplicate hour on exit from it.

The term **Standard Time** refers to a time line without any daylight saving shifts applied to it. This virtual time line has no gap hour on entry to the daylight saving period nor a duplicate hour on exit, i.e. it is continuous and non-ambiguous. As a general rule, it is recommended that all time sensitive data is stored in the standard time of the base time zone as defined on the installation options. This will prevent any confusion when analyzing data and will ensure that your algorithms do not have to perform any time zone or daylight saving shifting of data that may be stored in different time zones.

Depending on your specific product, entities may have their date/time information stored in either of the following options:

- Standard time of the base time zone.
- Standard time of another time zone related to the entity’s geographical location.
- Legal time of the base time zone.
- Legal time of another time zone related to the entity’s geographical location.

The metadata definition of a table specifies whether any of its date/time fields are stored in standard time or not. While typically all date/time fields of a table that supports standard time would be stored in the same way the system allows each field to specify either of these options.

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- **Physical Standard Time** indicates that the field is stored in base standard time and is pre-populated by the system. For example, creation time, status update time etc.
- **Logical Standard Time** indicate that the field is stored in base standard time.
- **Referenced Time Zone** indicate that the field is stored in standard time of a time zone related to the entity's geographical location.

Storage vs. Display

Regardless of the time zone option used for storing the data in standard time, all date/time information is entered and displayed on the user interface in the legal time of its respective time zone. If a field is defined to be stored in the standard time of the base or other time zone, the user interface is designed to accept the data in the legal time of the respective time zone and shift it to the standard time of the same time zone before saving the data and performs the reverse shift from standard time back to legal time before displaying the data to the user.

It is important to understand that time zone and daylight saving time conversions to and from standard time are performed behind the scenes as part of the user interface layer. Once data reaches the server it is already in its storage time option. The user should not be aware of these time conversions.

Time shifting between standard and legal times does not happen automatically. When dealing with fields stored in standard time, their data entry and display need to explicitly include time shifting features as part of their user interface and zone configuration.

Date / Time Schema Elements

When defining date / time fields in a business object schema, schema attributes can be used to define whether or not data should be stored in standard or legal time for the base time zone or if it should be stored in the standard time or legal time of another time zone (related to the data).

By default data stored in standard or legal time is displayed in the corresponding time zone's legal time. An additional schema attribute can be used to indicate if the display of the time should be shifted to the legal time of a different time zone. For example, if the data is stored in the base time zone but the data is related to a different time zone, the data will be shown in the time zone appropriate for the data (including the appropriate seasonal adjustment). Refer to Schema Nodes and Attributes- Standard Time Considerations for more information.

Exchanging Date / Time Information With External Systems

Date/time information should be exchanged between systems in standard XSD format as it includes a reference to the time zone of the specified time as an offset from Coordinated Universal Time (UTC). The system automatically converts date/time elements in an inbound message from XSD to internal format and vice versa for an outbound message. The latter is controlled by an explicit date/time format setting on the External System record for the outbound message type.

The offset is determined as followed and it is based on the time zone associated with the element as explicitly defined by the respective inbound or outbound schema:

- Elements defined as stored in the standard time of the base or other time zone would always have the same offset throughout the year as this time line is never shifted for daylight saving. The offset would be the standard offset of that time zone from UTC, i.e. not during daylight saving time.
- Elements stored in the legal time of the base time zone or other time zone would have the standard offset of the their storage time zone when the date/time value is outside the daylight saving period and the shifted offset when it is inside that period of time.

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User Time Zone

If your company does business in multiple time zones, the user record of each user may reference the time zone of their location. This time zone provides additional information about the location of the user and as such may be used by specific business rules that involve time zone settings.

> **Note**
>
> The time zone defined on the user record is not used to automatically display date/time information in the user's time zone. By default, the system displays date/time fields in the legal time of their respective time zone and not the user's time zone.

Setting Up Time Zones

Refer to Designing Time Zones for background information about defining time zones.

Open this page using **Admin**, and then **General**, and then **Time Zone**, and then **Search** .

This is a standard All-in-One portal.

Refer to the embedded help text for more information on the Time Zone attributes.

Setting Up Seasonal Time Shift

> **Note**
>
> The information in this topic applies only to Oracle Utilities Customer Care and Billing - Interval Billing applications.

Open **Admin**, and then **General**, and then **Seasonal Time Shift**, and then **Search** to define the seasonal time shift schedule.

Description of Page

Enter a unique **Seasonal Time Shift** code and **Description** for the seasonal time shift.

The Collection defines the **Effective Date/Time** (in standard time) that a time zone may shift in and out of standard time. If time is changed from standard time on the effective date/time, enter the **Shift in Minutes** that the time changes from standard time (usually `60`). If the time is changed back to standard time on the effective date/time, enter a **Shift in Minutes** of `0`.

Defining Geographic Types

If your company uses geographic coordinates for dispatching or geographic information system integration, you need to setup a geographic (coordinate) type for each type of geographic coordinate you capture on your premises and/or service points (geographic coordinates can be defined on both premises and service points).

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> **Note**
>
> **Product specific.** There is no framework functionality that uses this information. Refer to your specific product documentation to verify how this table is used in your specific product. In addition, you can determine if this object is a foreign key on any tables specific to your product. Navigate to the Table page in the application, search for and select the Geographic Type table and use the Relationships tab to view this information.

To define geographic types, open **Admin**, and then **Geographic**, and then **Geographic Type.**

This is a standard All-in-One portal.

The **Validation Format Algorithm**, if specified, is used to validate that the geographic location entered on the premise and/or service point for the geographic type is in the format as defined in the algorithm. If you require validation, you must set up this algorithm in the system.

Defining Work Calendar

This portal is used to view and maintain information about a work calendar. Work calendars are used to ensure system-calculated dates fall on a workday.

You can access the portal from **Admin**, and then **General**, and then **Work Calendar**. You are brought to a query portal with options for searching for a specific calendar. Once a calendar has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones will appear as part of the portal's **Main** tab page

- **Work Calendar.** This zone provides information about the selected calendar.
- **Work Calendar Holidays.** This zone lists the holidays observed by your organization for this calendar. Use the zone actions to add, maintain or duplicate a work holiday entry.

Defining Display Profiles

When you set up your users, you reference a display profile. A user's display profile controls how dates, times, and numbers displayed. Choose **Admin**, and then **General**, and then **Display Profile**, and then **Search** to maintain display profiles.

Description of Page

Enter a unique **Display Profile** and **Description** to identify the profile.

Enter a **Date Format**. This affects how users view dates and how entered dates are parsed. The following table highlights standard supported date mnemonics and what is displayed at runtime.

Mnemonic	Comments
dd	Day of the month.
d	Day of the month, suppressing the leading 0.
MM	Month number.
M	Month number, suppressing the leading 0.

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Mnemonic	Comments
yyyy	The 4-digit year.
yy	The 2-digit year.
y	Allows entry in either 2 or 4-digit form and is displayed in 2-digit form.

Other characters are displayed as entered. Typically, these other characters should be separators, such as "-", ".", or "/". Separators are optional; a blank space cannot be use.

Examples:

Configuration Format	Sample Output
MM-dd-yyyy	04-09-2001
d/M/yyyy	9/4/2001
yy.MM.dd	01.04.09
MM-dd-y	04-09-01 - In this case you could also enter the date as 04-09-2001

> **Note**
>
> For centuries, the default pivot for 2-digit years is 80. Entry of a 2-digit year greater than or equal to 80 results in the year being interpreted as 19xx. Entry of a 2-digit year less than 80 results in the year being interpreted as 20xx.

In addition, the following date localization functionality is supported. Note that in every case, the date is stored in the database using the Gregorian format. The settings below result in a conversion of the date for the user interface.

- **Hijri Dates**

  Entering **iiii** for the year is interpreted as a year entered and displayed in Hijri format. For example, the Gregorian date 2014–05–30 may be entered / displayed as 1435/07/30 for a user whose display profile date format is iiii/MM/dd. Note that this functionality relies on date mapping to be defined in the Hijri to Gregorian Date Mapping master configuration. entry. Refer to Additional Hijri Date Configuration for more information.

- **Taiwanese Dates**

  Entering **tttt** for the year is interpreted as a year entered and displayed in Taiwanese format where year 1911 is considered year 0000. For example, if the Gregorian date is 01-01-2005, it is displayed as 01-01-0094 for a user whose display profile date format is dd-mm-tttt.

- **Japanese Dates**

  There are two options available for configuring Japanese Era date support. The setting **Gyy** for the year is interpreted as a year entered and displayed using an English character for the era followed by the era number. The letter 'T' is used for dates that fall within the *Taisho* era. The letter 'S' is used for dates that fall within the *Showa* era. The letter 'H' is used for dates that fall within the *Heisei* era. The letter 'R' is used for dates that fall within the *Reiwa* era. For example, for a user whose display profile date format is Gyy/mm/dd the Gregorian date 2008/01/01 is shown as H20/01/01; the Gregorian date 1986/03/15 is

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shown as S61/03/15. The setting **GGGGyy** is interpreted as a year entered and displayed using Japanese characters for the era followed by the era number.

Japanese date limitations are as follows:

- The years 1912 through the current date are supported.
- Any functionality that displays Month and Year does not support Japanese Era dates. These dates are shown in Gregorian format.
- Graphs that display dates do not support the **GGGGyy** format.

Enter a **Time Format**. The following table highlights standard supported date mnemonics.

Mnemonic	Comments
hh	The hour 1-12.
h	The hour 1-12, suppressing the leading 0.
HH	The hour 0-23.
H	The hour 0-23, suppressing the leading 0.
KK	The hour 0-11.
K	The hour 0-11, suppressing the leading 0.
kk	The hour 1-24.
k	The hour 1-24, suppressing the leading 0.
mm	Minutes.
m	Minutes, suppressing the leading 0.
ss	Seconds.
s	Seconds, suppressing the leading 0.
a	Indicates to include **am** or **pm**. This is only needed for 12 hour formats, not 24 hour formats. (**hh**, h, KK, K). If an **am** or **pm** is not entered, it defaults to **am**.

Examples:

Configuration Format	Sample Output
hh:mma	09:34PM (can be entered as 09:34p)
hh:mm:ss	21:34:00
h:m:s	9:34:0

There are several options for displaying Numbers.

Decimal Symbol defines the separator between the integer and decimal parts of a number. Valid values are "." (a period) or "," (a comma).

Group Symbol defines the means to separate groups of bigger numbers. Valid values are as follows:

- A comma (","). Large numbers group by threes separated by a comma, for example 1,000,000.
- A period ("."). Large numbers group by threes separated by a period, for example 1.000.000.
- **None**. Large numbers do not have any separator, for example 1000000.

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- **South Asian**. This option uses a comma for its separator but will group large numbers as follows: the first comma is used for the thousands separation and numbers over 9,999 are grouped with 2 units, for example 10,00,000.
- **Space**. Large numbers group by threes separated by a space, for example 1 000 000.

Negative Format defines how negative values are displayed. Valid values are `-9.9`, `(9.9)`, or `9.9-`.

Currency values can have a different **Negative Format** from other numbers. Valid values are `-S9.9`, `(S9.9)`, or `S9.9-`, where the "S" represents the currency symbol.

- Additional Hijri Date Configuration

Additional Hijri Date Configuration

For implementations that wish to support displaying dates according to the Hijri calendar, besides appropriate configuration in the Display Profile, the mapping between the Hijri dates and the Gregorian dates must be entered. This mapping is defined in the **Hijri to Gregorian Date Mapping** master configuration record.

The mapping record contains a collection of entries for each year in the Islamic calendar.

For each year, clicking the Expand Zone icon shows the mapping collection with the first date of each month of the Hijri calendar. The corresponding date in the Gregorian calendar should be entered for each row.

Defining Phone Types

Phone types define the format for entering and displaying phone numbers.

To add or review phone types, choose **Admin**, and then **General**, and then **Phone Type.**

This is a standard All-in-One portal.

The **Phone Number Format Algorithm** for each phone type controls the format for entry and display of phone numbers.

Use **Phone Type Flag** is used to identify phone types that may have specific functionality associated with it. For example if your product had support for sending a facsimile transmittal, identify the phone type that captures a **Fax** number.

Defining Feature Configurations

Some system features are configured by populating options on a feature configuration.

You can access the portal from the **Admin Menu**, and then **General**, and then **Feature Configuration**. You are brought to a query portal with options for searching for a specific feature configuration. Once a feature configuration has been selected you are brought to the maintenance portal to view and maintain the selected record.

Because various options throughout the system may be controlled by settings in feature configuration, this section does not document all the disparate possible options. The administration documentation for each feature describes its options and whether an option supports multiple values. You may also refer to the detailed description of each option type when reviewing a configuration online for more information.

You can create options to control features that you develop for your implementation. To do this:

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- Review the lookup values for the lookup field EXT_SYS_TYP_FLG. If your new option can be logically categorized within an existing feature type, note the lookup value. If your new option warrants a new feature type, add a lookup value to this lookup field.
- Define the feature's option types. If you have identified an existing feature type to add the options to, find the lookup with the name xxxx_OPT_TYP_FLG where **xxxx** is the lookup value of EXT_SYS_TYP_FLG noted above. If you decided to create a new feature type (by adding a new lookup value to the EXT_SYS_TYP_FLG lookup, you must create a new lookup with the name xxxx_OPT_TYP_FLG where **xxxx** is the new value you defined above.
- Flush all caches.

The following zones may appear as part of the portal's **Main** tab page.

- **Feature Configuration.** This zone provides information about the selected feature configuration.
- **Options.** This zone is used to maintain various options associated with the feature type.
- **External System Messages.** If the feature exists to interface with an external system, you can use this zone to define the mapping between error and warning codes in the external system and our system. The zone is visible for feature types that their definition in the **Feature Type Configuration** Extendable Lookup supports this functionality.

> **Note**
>
> A corresponding message must be defined in the system message tables using a Message Category that is 90000 or greater so as to avoid collisions during upgrades.

Defining Master Configurations

A master configuration is an object that enables an implementation to define configuration for features in the system. It is an alternative to using feature configuration for defining options. A master configuration is defined using a business object. Typically one master configuration exists for a given business object yet some configurations may be designed to support multiple records.

Overview / Initial Setup

The product provides one or more master configuration that may be used for configuration. Some examples of base master configuration business objects are as follows

- **Hijri to Gregorian Date Mapping**. This allows an implementation that uses Hijri dates to define the mapping between those dates and Gregorian dates.
- **ILM Configuration.** For implementations that use Information Lifecycle Management, the ILM configuration record defines some parameters used by the process.
- **Migration Assistant Configuration.** For implementations that use the content migration assistant (CMA), the configuration record defines some parameters used by the process.

For a list of all the master configuration records provided by the product, navigate to the master configuration page in the application. To find help topics related to functionality controlled by the master configuration records, use the keyword ‘master configuration’ in the index.

Implementations may configure the business objects to limit the ones that are visible to users if desired.

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- If the master configuration does not apply to your implementation, navigate to the business object for this master configuration and update the Instance Control to **Do not allow new instances**. This ensures that the business object will not be visible to any user for the implementation.
- If a given master configuration record is only relevant for certain users in the system, application security may be used to limit the records visible by a given user. By default the base delivered business objects typically reference the Master Configuration MO application service. This may be overridden to link custom application services to the master configuration BOs to provide more granular security. Users will only see the master configurations that they have security for.

Configuration

You can access the portal from the **Admin**, and then **General**, and then **Master Configuration**. You are brought to a query portal with options for searching for a master configuration business object. If a configuration has not yet been set up for the business object use the add icon to define the record. If one or more configuration records exists for the business object you may select the master configuration business object. Once selected you are brought to this portal to view the selected record.

The following zones may appear as part of the portal's **Main** tab page.

- **Master Configuration** This zone provides information about the selected master configuration record. Please see the zone's help text for information about this zone's fields.
- **Related Configurations** This zone lists additional master configuration records for the same business object, representing different parts of the same configuration. You may add additional parts from this zone. The zone is only visible when the business object is designed to support multiple configuration parts and is explicitly marked as such by the **Multiple Configurations** business option.

What's New Portal

> **Important**
>
> This is only available for cloud implementations.

The What's New portal provides a list of maintenance pack fixes that have been applied to your environment along with a summary of the maintenance packs that have been supplied along with their dates. There is also a link for Release Notes. Clicking this link opens the Cloud Application Readiness page. Select the link corresponding to your product and version to see the new features added in your version.

To view the information, open the Help Menu in the toolbar and choose the What's New option.

The following zones appear on the Main page.

- **Maintenance Pack Details**. This zone is populated whenever a maintenance pack or a hot fix is applied to your environment. By default it shows fixes applied in your current maintenance pack and it suppresses copies if your environment already received this fix in a previous release. Use the filters to expand the search to other releases or to include copies. There are also filters to narrow the search based on various criteria. Refer to the zone inline help for more information.

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- **Installation History Summary**. This zone is visible if you click the 'View Installation Summary' link in the previous zone. It shows a distinct list of installation date and version information.

> **Note**
>
> This zone only has fixes that were applied to your environment after the enhancement to populate this data was fully supported. The system is not populating this zone with fixes applied to your implementation prior to the enhancement.

Security & User Options

The contents of this section describe how to maintain a user's access rights.

- Application Security
- Row Security
- Data Privacy
- Cryptography Keys

Application Security

The system restricts access to various components of the application using application services. The following sections provide more information about this mechanism.

- Understanding Application Security
- Defining Application Services
- Defining Security Types
- Defining User Groups
- Defining Users
- Application Security Query

Understanding Application Security

The contents of this section and supporting topics provide information about application security.

Users

Each user who is granted access to the application is stored in the User object. This object defines the attributes of the user including identifier, name, language, time zone, home page and display profile (which defines the preferred format of dates and amounts). In addition there is configuration related to using the product, including favorite links and scripts, portal preferences and valid To Do roles - controlling what types of To Do entries a user can work on. Additionally, Refer to Users and User Groups for additional information.

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Application Services

Each object in the system that may be secured is associated with an application service. For example, each page in the system defines its application service allowing you to control what users can view a given page.

An application service defines one or more Acces Modes, which typically correspond to an action associated with the application service. This allows you to control users that can only view a type of record (and grant security to the Inquire access mode) and users that can perform other actions such as add, change and delete. Refer to Secured Objects and Application Servicesto understand what objects are associated with an application service and the typical access modes associated with each type of secured object.
Application Services may also define additional configuration, called security types. Refer to Field Level Security for more information.

User Groups

User Groups are a mechanism for grouping users, usually around job roles. Users are attached to User Groups through a relationship that is effective-dated. This can be useful for the attachment of temporary employees such as contractors or for people who change roles regularly.

Each User Group is authorized to access appropriate Application Services and their access modes. In addition, user groups define access to the application service's security types, if applicable. Refer to Field Level Security for more information.

- Users and User Groups
- Secured Objects and Application Services
- Field Level Security
- Importing Security Configuration from an External Source

Users and User Groups

A user group defines the application services and access modes its users have access to. A user may be associated to more than one user group. The user groups may have overlapping security configurations and the security access for a user is the union of all security granted by all of its user groups.

A major effort for implementations is to decide how to define their user groups. User groups can be created to represent roles or other job-related categorization; or based on organizational factors; or a combination of both. Refer to Secured Objects and Application Services for some guidelines on understanding what application services secure and tools provided to help security administrators identify what application services to grant access to.

The following sections provide additional topics related to users and user groups, including some base functionality related to these objects as well as some best practices.

Base Delivered User / User Groups

The system is delivered with a base User linked to a base User Group, provided to facilitate an initial user accessing the application for an on-premises implementation.

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> **Note**
>
> Cloud implementations should refer to the Cloud Services Administrative Guide for information on setting up users.

The system supplied user is **SYSUSER**. This user is delivered so that when an on-premises environment is provisioned, there is at least one user authorized to use the system. It has access to the base delivered user groups. An initial administrator can sign in as this user and proceed to create the actual users that should get access to the environment.

> **Important**
>
> Once appropriate users have been defined, it is recommended to update SYSUSER to set it to disabled. (In cloud implementations, this user is delivered as disabled.)

The product provides several base user groups that serve as a kind of library of services. They are meant for documentation purposes and as a way to easily access the system in a development or testing environment. Some user groups are meant to define a list of services associated with a distinct set of features or functions in the system. The user group `ALL_SERVICES` is a catch-all user group that defines services that are not part of a specific use case. (Note that some services may be defined in ALL_SERVICES as well as another specific user group). You cannot change or remove the information delivered for the base user groups. System administrators should define user groups appropriate for their business requirements.

> **Important**
>
> It is not recommended for any production user to have access to the base delivered user groups that are provided as a library of services. The product often adds or changes records in the base user groups for a new release when there is new or changed functionality. It means that your production users would have a change in what they have access to without the ability to opt in to new features.

Defining a Read-Only User Group

The product does not supply a user group that is 'read only', but it is a common requirement for implementations. This section provides a guideline for creating such a user group.

1. Create the User Group with the desired name and description.
2. Navigate to the Service Manager tab. In the Add Application Service / Access Modes tab, you can use the filter to limit the results to those with Inquire access mode. Click the checkbox in the header to select all rows and click Add. You are prompted for an expiration date. Click Save. (Note that the zone has a limit to 1000 services so you may need to do this more than once to get all services added.)
3. In addition, you should give this user group access to all the access modes for the default application service: `F1-DFLTS` (Default Application Service). This application service is considered one that all users should have for basic access to the system.

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Template User

The system provides support for defining one or more users as a template user. There are two broad use cases for using a template user.

Inheriting Preferences or Favorites Configuration

Some implementations want all users of a certain team to have the same configuration of portal preferences and / or favorite links. This allows users in that team to have the same information in the same place on their respective displays, facilitating in helping each other with questions.

If your organization wants to implement this practice, define a template user with the desired portal preferences and / or favorite links. You may define different users with different configurations for more granularity.

For each user whose preferences or links should be taken from the template user, go to the User record via **Admin**, and then **Security**, and then **User.** If the portal preferences should be inherited from a template user, define the desired template user as the **Portals Profile User** . If the favorite links should be inherited from a template user, define the desired template user as the **Favorites Profile User**.

If applied, the specified user's portal preferences and / or favorite links will be those defined on the template user and they will be unable to customize those preferences.

Defining a Template User to help in User Creation

The user object in the product captures configuration related to many aspects of using the product. It includes application security configuration, such as its user groups; row level security configuration through its access groups; the To Do roles that define what types of To Do entries a user can work on, along with other configuration. Many users that are in a similar 'role' in the organization would have many of the same settings. As such, it may be useful for implementations to define a template user that represents a 'role' in the organization, with much of the configuration common for users in that role. When creating a new user, you can use the template user as the starting point and then duplicate that record to create the new user. Then you only need to adjust the information that is unique for the newly created user.

Many implementations provision their users first in an external identity management system and use an interface to import the user definition into the product. Refer to Importing Security Configuration from an External Source for more information. For these interfaces, the external system may have the ability to define custom information relevant to the product's user record, but the product also supports referencing a template user so that information from the template user is copied to the new user while creating the record.

How can you refer to a template user when creating a User from and external source?

- When the new user is uploaded to the system, the interface uses the user BO `F1-IDMUser` to create the user. The BO includes a pre-processing algorithm. This algorithm looks for the existence of a template user in the schema of the new user sent as a characteristic of type `F1-TMUSR`. If such a characteristic is found, it uses that template user. If not found, the algorithm supports defining a template user as an algorithm parameter. If a template user is identified, all the information from the template user will be copied onto the new user record except for the information passed in from the external source. The template user is captured on the newly created user via a characteristic for information / audit purposes.

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> **Note**
>
> **Bookmarks** are not included in the data that is copied from a template user.

- Once the new user is created, its configuration can now be adjusted, if applicable. Note that the template user is only a tool used when adding a user. Updates to the template user will not "ripple" to all the other users that were created based on this template.
- Not all external sources may have the ability to define a template user and send it as a characteristic or via another field. For these integrations, using a single template user on the algorithm as a parameter may be used to define basic configuration applicable to a large percentage of new users. (More information on this below). For those integrations that are able to associate a new user with a template user in the external system and provide that template user along with the new user information allows you to associate the new user with a template user that is more aligned with the user's role. Refer to Importing Security Configuration from an External Source for more information on how each integration supports the definition of a template user.

Designing your Template Users for helping Create Users

Before configuring template users, all the administrative control tables that are part of User configuration must be defined, including time zones, display profiles, To Do roles, data access roles and user groups.

If your integration will use a single template user defined as an algorithm parameter, you need to define a template user with the basic information that is applicable to all or at least most users. See below for guidance on referencing this template user as an algorithm parameter.

If the way you create users allows you to associate the user with a more specific template user, the next step is to define the user configuration for your system users. During this exercise, you will find that you have broad categories of users. But you will also see that within a given category of user there may be variations in the user privileges and preferences. For example, perhaps there are supervisors within the Customer Service role that have more security privileges than a typical Customer Service user. In addition, there may be variations based on the attributes of the users themselves. For example, maybe your organization exists in multiple time zones and some of your workers are in one time zone and some are in the other.

At this point your security users that are designing their user provisioning procedures must decide the following:

- What information about a new user will be captured in the identity system (besides the expected information like Name, Email and the User IDs)? For example, for the case of multiple time zones, maybe the best solution is to capture the time zone when defining the user.

  What information is defined on the template user and how many template users should be created to reduce the need for manual steps or additional data captured in the identity management system? In the case of multiple time zones, proliferating the template users to have one set for one time zone and another set for the other time zone may not make sense since this is one field that is different. However it may be reasonable to create additional templates in the case of striations in the levels of privileges for workers of a different category. So rather than template users for Dispatcher, Mobile Worker, System Administrator and Contractor, your organization may have template users for Dispatcher, Mobile Worker, Mobile Worker (Supervisor), System Administrator, Contractor (Short Term) and Contractor (Long Term).

  What information is must be configured on the User record in the application after the user is added? If only a small number of users have a variation from other users, it may be that

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the easiest way to deal with those variations is to simply update those user records manually. Using the above examples:

- If your organization covers 2 time zones but only a small group of people work in one of the time zones whereas the bulk of the users are in the other time zone, the simplest procedure may be to define the template users for the main time zone and use that for the creation of all users. Then for the small group of users in the separate time zone, navigate to the User page to adjust the time zone after the record is added.
- If only a small number of Mobile Workers are supervisors with separate privileges, rather than defining a special template user for those type of workers, the simpler procedure may be to use the Mobile Worker template and then navigate to the User page to add the additional privileges to the supervisor users after the record is added.

Defining a Template User

Regardless of which use case is applicable for your organization, the procedure for defining a template user is the same.

Navigate using **Admin**, and then **Security**, and then **User.**

- Define a User ID. If you are using a template user to help create users from an external system and the external system is able to capture the template user to send in with the new user information, this is the ID that should be referenced in the external system.
- Be sure to choose a **User Type** of **Template User**.
- Define all the information appropriate based on the use case.
  - For template users used as a Portal Profile user, be sure to define the appropriate portal profile information.
  - For template users used as a Favorites Profile user, be sure to define the appropriate favorite links.
  - For template users acting as a type of 'role' to help with creation of users, define all the information that should be copied onto a new user that references this user as its template user. (Note that **Bookmarks** are not included in the data that is copied from a template user.)

Defining a Default Template User for Integrations

Define the default template user on the algorithm that defaults data from this user as follows:

- Navigate using **Admin**, and then **System**, and then **Algorithm.**
- Search for and select the algorithm `F1-OIMUSR` (Populate User Data from a "Template" User).
- Edit the record. Add a new row in the Algorithm Versions collection. Enter an appropriate date (later than the date of the existing entry, but on or before the current date). Populate the template user you want to use as the default.

Secured Objects and Application Services

The system restricts access to transactions or explicit services using an application service. The following sections provide more information about what objects are secured, how to find out what is secured by each app service as well as additional information related to managing application services.

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What is Secured by an Application Service

- The following points highlight security related to viewing and modifying individual records in the system:
  - All maintenance objects define an application service that includes the basic actions available, typically **Add**, **Change**, **Delete**, and **Inquire**. The base product supplies an application service for every maintenance object. Some objects that include a fixed lifecycle, may define additional access modes on the maintenance object's application service. The application service for the maintenance object is defined on its related service program.

    > ⚠ **Caution**
    >
    > Important! If an application service supports actions that modify the database other than **Add**, **Change**, and **Delete**; you must provide the user with **Change** access in addition to the other access rights. Consider a maintenance object that includes access modes **Freeze**, **Complete** and **Cancel**). If you want to give a user access to any of these special actions, you must also give the user access to the **Change** action.

  - For maintenance objects whose user interface page is not portal-based, the application service also controls whether the menu entry appears. If a user doesn't have access to the maintenance object's application service, the menu item that corresponds with the application service will not be visible.
  - For portal based user interfaces, each main (stand-alone) portal defines an explicit application service with the access mode **Inquire**, allowing the user interface to be secured independently of the underlying object security. If a user doesn't have access to the portal's application service, the menu item that corresponds with the application service will not be visible. The base product supplies an application service for every portal that is accessible from the menu. Note that the application service for the portal is defined on its related service program, which is derived via its navigation option and navigation key.
  - Menu items may define an application service / access mode. Typically the security supplied for portals and maintenance objects provides enough granularity to suppress menu items that a user does not have access to. In addition, by default, the system populates application services / access modes on menu items related to a BPA script. A common use case is the 'Add' menu item for maintaining an object. In this case, typically the application service for the maintenance object is used along with the **Add** access mode. Other types of BPA related menu items may have other appropriate configuration.

    Clients may choose to linking an explicit application service / access mode to further suppress a menu item. For example, imagine your implementation creates a special BPA script to add a To Do Entry and would like users to use the special BPA rather than the base supplied Add dialogue for To Do Entry. The base delivered menu item for adding a To Do Entry uses the To Do Entry maintenance object application service with the Add access. Users need that security setting to be able to add a To Do Entry even from a different dialogue. To suppress the base Add dialogue, override the setting for the base supplied menu item for To Do Entry Add with a special application service and access mode. Then define a menu entry for the new special BPA for adding.
  - Zones define an application service.

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        * For zones linked to a portal, if a user doesn't have access to the zone's application service, the zone will not be visible on the portal. In most cases the zone is delivered with the same application service as its portal. In special cases, such as the zones on the Sidebar, the product supplies separate application services for each zone allowing implementations to determine at a more granular level which users should have access to which zones.
        * For query zones that are configured on a multi-query zone, if a user doesn't have access to the zone's application service, the zone will not be visible in the dropdown on the multi-query zone. In most cases all zones in a multi-query zone define the same application service as the multi-query zone. The product may supply a special application service for one or more zones in a multi-query zone if the functionality is special to certain markets or jurisdictions and not applicable to all implementations.
        * For zones that are used by business services to perform SQL queries, the product supplies a default application service (`F1-DFLTS`). Security for these zones is not checked by the product as they are used for internal purposes.
    - For portal based pages, individual elements may be shown or hidden based on security using the **oraHasSecurity** function in a UI map's HTML or in UI Hints in a schema. Refer to Check User's Security Access for more information.
    - Business objects define an application service. If the business object defines a lifecycle, the application service must include access modes that correspond to each state. In addition, the standard maintenance object access modes of **Add**, **Change**, **Delete** and **Inquire** are included. The base product business objects are supplied with appropriate application services. In addition, implementations may override the configured application service if desired.

      > ⚠ **Caution**
      >
      > Important! If an application service supports actions that modify the database other than **Add**, **Change**, and **Delete**; you must provide the user with **Change** access in addition to the other access rights. Consider a business object that includes lifecycle states **Freeze**, **Complete** and **Cancel**). If you want to give a user access to any of these special actions, you must also give the user access to the **Change** action.

    - Batch controls define an application service which provides the ability to secure submission of individual batch processes. The application service must include an access mode of **Execute**. The base product batch controls are supplied with appropriate application services. These services will typically have an ID that matches the batch control ID.
    - Report Definition records define an application service. The application service must include an access mode of **Submit / View Report**.
- The following objects are securable but are typically executed via internal processes. The security is provided to ensure that any access to the objects from an external source is secured.
    - BPA scripts may define an application service with the access mode **Execute**. The base BPA scripts are typically not configured with any application service. An implementation may define one. Note that as mentioned above, a menu item may also be configured with an application service and access mode. This allows for a BPA that is invoked via a menu entry to be secured in more than one way.

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- Business Services and Service Scripts define an application service with the access mode **Execute**. This is needed for services that may be executed from an external system, for example via an inbound web service. Base business services and service scripts that are linked to an inbound web service are configured with special application service. All other business services and service scripts are delivered with a default application service (`F1-DFLTS`), which may be overridden by an implementation.
- Scripts may also check security within an Edit Data step type if there is some functionality that should or should not execute based on a user's security access. The Edit Data step would include a call to the business service `F1-CheckApplicationSecurity`
- Service Programs define an application service. As mentioned above, for Portals and Maintenance Objects, their application service is taken from the related service program. In base, specific application services are released for each of these types of service programs. All other service programs are typically delivered with a default application service (`F1-DFLTS`), which may be overridden by an implementation. Note that for service programs linked to a Business Service, the application service on the business service takes precedence when invoking the business service.

Determining What an Application Service Secures

Because the product wants to provide as much granularity as possible so that implementations can have the greatest control over what users can do, there are a large number of application services provided out of the box and it can be daunting to understand who needs to have access to what application services to do their job. The product provides several online tools to help security administrators to understand what application services exist and what they are for.

- On the application service page itself, there is a Secured Objects zone that indicates all the metadata that is related to this application service. There are a small number of application services that are securing functionality that is not discoverable by the Secured Objects zone. For those services, the detailed description of the application service should indicate what it's for.
- A large percentage of security is related to a specific page in the system that is accessible via the menu. Because of the different layers of security, to be able to view a record you may need access to several application services: the one associated with the query portal, the one associated with the maintenance portal, the one associated with the maintenance object of the record and the one associated with the business object governing the record. When viewing a menu, there is an Application Security tab, which allows you to review each menu line and see a list of all the application services a user may need access to for viewing or maintaining data on that related page.
- The Application Security Query portal provides various filters for viewing what objects are being secured by what services. Besides menu items, it shows batch controls, reports, web services and other functionality. In addition, it allows you to view what users and what user groups currently have access to what application services and allows you to compare the security of two users.
- The User Group portal includes several zones that help security administrators to configure security options or review security configuration. The main tab includes a zone to Add Application Services. This zone only shows application services that are not already linked and provides several ways to narrow down the list of application services. The Service Manager tab has a similar zone, but breaks down the information to a combination of application service and access mode. Finally, the Secured Components tab is similar to the Application Security Query. It allows you to query the objects secured by application services in this user group.

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Application Services Introduced in a Release

When new functionality is provided that includes any object that is associated with an application service, new application services may be introduced. The product release notes indicate the new application services included in the release. In addition, the product includes a special Entity Tag that includes a list of the new application services. The tag's description uses the cloud release reference rather than the on-premise release reference to identify itself.

Field Level Security

Sometimes transaction and action security is not sufficient. There are situations where you may need to restrict access based on the values of data. For example, in Oracle Utilities Customer Care and Billing you might want to prevent certain users from completing a bill for more than $10,000. This is referred to as "field level security".

Field level security can be complex and idiosyncratic. Implementing field level security always requires some programming by your implementation group. This programming involves the introduction of the specific field-level logic into the respective application service(s). The recommendation is to use a business object validation algorithm for checking field level security.

> **Note**
>
> The check for field level security must exist in validation logic to ensure that data is not added or updated if it does not pass the field level security rules.
>
> It is not straight forward to implement user interface changes related to field level security, such as protecting elements under certain conditions. This is because overriding the base product delivered user interface to check for implementation specific conditions is not always supported, depending on how the user interface is built, or requires a full duplication of product artifacts, which is not recommended.

The definition of a user's access rights is performed using the same transactions used to define transaction / action level security. This is achieved as follows:

- Create a security type for each type of field-level security.
- Define the various access levels for each security type. For example, assume you have some users who can complete bills for less than $300, and other users who can complete bills for less than $1,000, and still other users who can complete bills for any value. In this scenario, you'd need 3 access levels on this security type:
  - Level 1 (lowest): May authorize bills <= $300
  - Level 2 (medium): May authorize bills <= $1,000
  - Level 3 (highest): May authorize all bills
- Link this security type to each application service where this type of field level security is implemented. This linkage is performed on the security type transaction.
- Defining each user group's access level for each security type (this is done for each application service on which the security type is applicable).

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> **Note**
>
> Highest value grants highest security. The system expects the highest authorization level value to represent highest security level. Moreover, authorization level is an alphanumeric field so care should be taken to ensure that it's set up correctly.

Importing Security Configuration from an External Source

The product provides support for importing security information from an external source. In all cases, the product uses a special user BO `F1-IDMUser` to create the user and the recommendation is to take advantage of the Template Userfunctionality. More information about the out of the box support for using this feature is described in the related links.

- If your organization uses Lightweight Directory Access Protocol (LDAP), you can import your existing LDAP users and groups into the system. Once imported, all user and group functions are available. You can import a user group, or a single user. You can resynchronize your LDAP users and groups at any time.

  > **NOT_SUPPORTED**
  >
  > For more information refer to LDAP Integration.

- The system provides an integration with Oracle Identity Manager. When a user is created in the identity manager product, its information can automatically be interfaced to the product. Once the user is successfully created in the system, all functions are available.

  > **NOT_SUPPORTED**
  >
  > For more information refer to Oracle Identity Manager Integration.

- The system provides a web service with add, update and get operations that follow the System for Cross-domain Identity Management (SCIM) specification for provisioning users.

  > **NOT_SUPPORTED**
  >
  > For more information refer to Provision Users with SCIM Open Standard.

Defining Application Services

Please refer to Understanding Application Security for a description of how application services are used when you grant user groups access rights to transactions and the significance of an application service's access modes.

You can access the portal using **Admin**, and then **Security**, and then **Application Service.** You are brought to a query portal with options for searching for a specific application service. Once a record has been selected you are brought to the maintenance portal to view and maintain the selected record.

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> **Note**
>
> When introducing a new record, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page

- The **Application Service** zone provides the information about the application service and its access modes.
- The **Secured Objects** zone displays the object (or objects) that are secured by this application service. Refer to Secured Objects and Application Services for details about the types of objects that may be secured.

The **Application Security** tab includes zones to view and manage which user groups have access to the application service and which ones do not have access .The following zone may appear as part of this tab page:

- The **User Groups Linked** zone lists the user groups that currently have a link to the application service. Note that expired links are included when the zone is first displayed. Use the zone filters to exclude expired links and to limit the user groups shown by user ID, user group ID, and user group description.
- The **User Groups not Linked** zone lists the user groups that do not have a link to the application service. Use the zone filters to limit the user groups shown by user ID, user group ID, and user group description.

Defining Security Types

Security types are used to define the types of field level security.

> **Note**
>
> **Programming is required.** You cannot have field level security without introducing programming code. Refer to Field Level Security for more information on how security types are used to define field level security.

- Security Type - Main

Security Type - Main

Select **Admin**, and then **Security**, and then **Security Type** to define your security types.

Description of Page

Enter a unique **Security Type** and **Description**.

Use the **Authorization Level** grid to define the different authorization levels recognized for this security type. Enter an **Authorization Level Number** and its **Description**.

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> **Note**
>
> **Programming is required.** Note that the values that you enter are not interpreted by the system itself, but by the user exit code used to implement the special security. Check with the developer of the user exit logic for the correct values. Refer to Field Level Security for more information on how security types are used to define field level security.

Use the **Application Services** grid to define the application service(s) to which this security type is applicable. If this application service is already associated with user groups, you must update each user group to define their respective security level. This is performed on the User Group portal.

Defining User Groups

A user group is a group of users who have the same degree of security access. Think of a user group as a "role"; associated with a role are:

- The users who play this role
- The application services to which the role's users have access (along with the actions they can execute for each service and their field level security authorization levels).

Refer to Secured Objects and Application Services and Field Level Security for more information about access modes and security types.

> **Caution**
>
> Important! If an application service supports actions that modify the database other than **Add**, **Change**, and **Delete**; you must provide the user with **Change** access in addition to the other access rights. Consider a transaction that supports actions in addition to **Add**, **Change**, and **Inquire** (e.g., **Freeze**, **Complete**, **Cancel**). If you want to give a user access to any of these additional actions, you must also give the user access to the **Inquire** and **Change** actions.

This portal allows a security administrator to view and manage information about a user group.

You can access the portal from the **Admin Menu**, and then **Security**, and then **User Group**. You are brought to a query portal with options for searching for a specific user group. Once a user group has been selected you are brought to the maintenance portal to view and maintain the selected record.

> **Caution**
>
> Application services may not be changed or removed from any Base Delivered User / User Groups.

The following zones may appear as part of the portal's **Main** tab page

- **User Group.** This zone provides information about the selected user group.

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- **Application Services.** This zone lists application services linked to the selected user group. You may use this zone to edit the information for an specific application service or use mass actions to remove selected services or update their effective date.
- **Add Application Services.** You may use this zone to add application services to the selected user group.

The following zones may appear as part of the portal's **Users** tab page

- **Users.** This zone lists users linked to the selected user group. You may use mass actions to remove selected users or update their effective date.
- **Add Users.** You may use this zone to add users to the selected user group.

The following zones may appear as part of the portal's **Service Manager** tab page

- **Application Service / Access Modes.** This zone lists application service and access mode combinations currently linked to the selected user group. You may use mass action to remove a selected set of records.
- **Add Application Service / Access Modes.** You may use this zone to add application service access mode records.
- **Security Type Authorization.** This zone maintains field level security for application services included in the selected user group.

The following zone may appear as part of the portal's **Secured Components** tab page

- **Application Components.** This zone allows you to review various types of application components secured by the selected user group. The query is similar to the Application Security Query restricted to the current user group.

Defining Users

The user maintenance transaction is used to define a user's user groups, data access roles, portal preferences, default values, and To Do roles. To access the user maintenance transaction, select **Admin**, and then **Security**, and then **User**.

The user maintenance transaction is the same transaction invoked when the user launches Preferences from the user menu or shortcut key.

Application Security Query

This portal allows a security administrator to review application security configurations across users, user groups and the various types of application components they secure.

While application security is configured at the granular level of an application service and its access modes, it is more intuitive to review access rights to top level broader components:

- **Menu line.** Several application services may be related to a single menu line and impact the ability to properly leverage various aspects of its functionality:
  - The application service of the transaction page or portal, which also controls the visibility of the menu line or its 'search' part when the line is composed of 'add' and 'search' items.
  - The application services associated with any zones on that portal.
  - The application service of the underlying maintenance object when applicable, which also controls the 'add' item of the menu line.
  - The application services of business objects for the underlying maintenance object.

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- The application services of portals used to maintain these business objects.
- The application services of related portals.
- The application services of related maintenance objects, their business objects and portals.
- and more

You may review the list of application services associated with a menu line on the **Application Security** tab on the **Menu** portal.

- **Sidebar Zone.** This is a regular or context sensitive zone that the user has access to on the sidebar area.
- **System.** This is a Toolbar or other system wide option a user is allowed to use.
- **Batch Control.** This is a batch process a user is allowed to submit.
- **Report Definition.** This is a report a user is allowed to submit.
- **Web Service.** This is a web service a user is allowed to invoke.
- **Miscellaneous.** This is a special service that a user is allowed to invoke.
- **Internal.** This is an internal item that is secured by default but is assumed to be called in a context that does not require security check.
- **Unclassified.** Some application services may not be related to any type of application component and as such remain unclassified. For example, there are situations where previously released services are enhanced to be associated with dedicated application service in a later release. In this situation the services may retain their original or even custom application service and the new application services may appear as not associated with any component.

Refer to Secured Objects and Application Services for details about the types of objects that may be secured.

Open this page using **Admin**, and then **Security**, and then **Application Security Query**.

Row Security

Some products allow you to limit a user's access to specific rows. For example, in Oracle Utilities Customer Care and Billing, row level security prevents users without appropriate rights from accessing specific accounts.

A combination of framework configuration and configuration in your edge product is required for row level security. The following points describe the configuration:

- For each record that should be secured, associate it with an **Access Group**. Note that if your edge product supports row level security, that product is providing a link between the secure-able record and Access Group. Your access groups may be granular and only referenced by one secured record or they may be more broad and be referenced by multiple secured records that require the same type of security restriction.
- To define which users have access to the secured records, you define a **Data Access Role**. For each data access role, define which Access Groups the role has security clearance for. An access group may be linked to one or more data access roles. In addition, define the **Users** that have access rights to these secured records. When you grant a data access role rights to an access group, you are giving all users in the data access role rights to all secured records in all the referenced access groups. A user may belong to many data access roles.

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If your edge product supports row level security, it will include logic in the appropriate areas of the system to limit the secured rows that a user may view or maintain based on this configuration. For example, in Oracle Utilities Customer Care and Billing, throughout the system users are only able to view and maintain information about an account and any of its detail if the user is in a Data Access Role for the account's Access Group (or the account is not linked to an Access Group).

> **NOT_SUPPORTED**
>
> Refer to your product's documentation for more information on row level security, if applicable.

- Defining Access Groups
- Defining Data Access Roles

Defining Access Groups

Refer to The Big Picture of Row Security for a description of how access groups are used to restrict access to specific objects.

Access groups control which groups of users (referred to as Data Access Roles) have rights to accounts (or other objects) associated with the access group. You can access the portal using **Admin**, and then **Security**, and then **Access Group**. You are brought to a query portal with options for searching for a specific access group. Once a record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The **Access Mode** zone provides the information about the access group and its data access roles.

- The **Data Access Role** collection defines the data access roles whose users have access to the access group's secured objects. Keep in mind that when you add a **Data Access Role** to an **Access Group**, you are granting all users who belong to this role access to all of the objects linked to the access group.

  > **Note**
  >
  > You can also use Data Access Role - Access Group to maintain a data access role's access groups.

- The **To Do Role Assignment** collection may be used to route To Do Entries of a given To Do Type to a specific To Do Role if the objects related to the To Do Entry are associated with the access group. Refer to Adjusting the To Do Role for more information.

Defining Data Access Roles

> **NOT_SUPPORTED**
>
> Refer to The Big Picture of Row Security for a description of how access groups are use to restrict access to specific objects.

The data access role transaction is used to define two things:

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- The users who belong to the data access role.
- The access groups whose accounts (or other objects) may be accessed by these users.
- Data Access Role - Main
- Data Access Role - Access Group

Data Access Role - Main

Select **Admin**, and then **Security**, and then **Data Access Role** to define the users who belong to a data access role.

Description of Page

Enter a unique **Data Access Role** code and **Description** for the data access role.

The scroll area contains the **Users** who belong to this role. A user's data access roles play a part in determining the accounts (or other objects) whose data they can access.

To add additional users to this data access role, press the add button and specify the following:

- Enter the **User** ID. Keep in mind that when you add a **User** to a **Data Access Role**, you are granting this user access to all of the accounts (or other objects) linked to the data access role's access groups.
- Use **Expiration Date** to define when the user's membership in this data access role expires.

> **Note**
>
> **Also maintained on the user page.** You can also use User - Access Security to maintain a user's membership in data access roles.

Data Access Role - Access Group

Select **Admin**, and then **Security**, and then **Data Access Role** and navigate to the **Access Groups** tab to define the access groups whose accounts (or other objects) may be accessed by the users in this data access role.

Description of Page

Use the **Access Group** collection to define the access groups whose objects can be accessed by this role's users. Keep in mind that when you add an **Access Group** to a **Data Access Role**, you are granting all users who belong to this role access to all of the accounts (or other objects) linked to the access groups.

> **Note**
>
> You can also use Access Group - Main to maintain an access group's data access roles.

Data Privacy

Personally Identifiable Information (PII) is any information that identifies or could be used in combination with other information to identify an individual. Many countries have data privacy

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laws governing the use of such information. A key aspect of these laws is an organization's obligation to erase personal information when there is no compelling reason to retain it. This obligation can be fulfilled either by deleting data or altering the data in such a way that it is no longer possible to associate the data with the individual.

Organizations are likely to have other legal obligations that impact how long they retain personal data. For example, there could be financial audit requirements that oblige the organization to retain relevant information for a fixed number of years after termination of a contract.

Object Erasure is designed to address right to erasure issues, with a combination of configuration and processes that may be extended to implement the appropriate policies for the PII within your data.

- Encryption and Masking
- The Approach to Implementing Object Erasure
- Data Redaction for Export and Logging
- Defining Redaction Rules
- Obfuscation Configuration

Encryption and Masking

"Encryption" refers to encrypting data stored in the database using an encryption key. There are two different types of encryption described in the sections below. System encryption refers to columns in the system identified by the product to use encryption. Application encryption refers to the ability for an implementation to configure fields and elements that should be encrypted in the database.

"Masking" refers to overwriting all or part of an un-encrypted field value with a masking character. For example, perhaps only the last 4 digits of a tax ID number are visible with the other digits changed to an asterisk. The system provides support for masking fields on the user interface that may be stored as plain text in the database. In addition, there are cases where encrypted fields are shown to the user interface using masked values rather than the encrypted value.

The following sections provide more information about each feature.

- System Encryption
- User Interface Masking
- Application Encryption

System Encryption

The system automatically encrypts certain fields captured in various option tables or context tables. This is mainly used for passwords. For example, passwords captured in Message Sender context or password

In addition, batch control supports configuring a security option for parameters that capture sensitive information, such as a password. Refer to Defining Batch Controls for more information.

It is also possible to enable system encryption using the characteristic type `F1-PWD`. However, the maintenance object must include specific code to enable system encryption for characteristics of this type. In Oracle Utilities Application Framework, the only maintenance

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object that supports this is extendable lookup. Refer to Extendable Lookup Advanced Topics for more information.

User Interface Masking

The functionality described in this section is used to take data that is stored in plain text in the database and mask the value before it is presented to a user (or an external system). This feature includes the ability to allow some users to view the data unmasked using security configuration. The system allows different masking rules to be applied to different fields. For example, a credit card number can be masked differently than a social security number.

The following topics describe how to mask field values.

Identify the Data to be Masked

Identify the data that is stored as plain text, but should be masked for display to users. For example, imagine that you have identified that Credit Card Numbers and a person's federal ID number (for example, in the United States, the Social Security Number or SSN). Each field identified may be displayed and maintained in different user interfaces throughout the system, but the masking rules for a given field are probably uniform regardless of where the data is displayed.

Primary keys cannot be masked. A field defined as a unique identifier of a row cannot be configured for masking. Masking a field that is part of the primary key causes a problem when attempting to update the record. This restriction also applies to elements that are part of a "list" in an XML column on a maintenance object. One or more elements in the list must be defined as a primary identifier of the list. Be sure that primary key elements in the list are not ones that require masking.

List members that contain different "types". Consider a page with a list that contains a person's identification numbers. You can set up the system so that a person's social security number has different masking rules than their drivers license number. If your implementation has this type of requirement, the list of masked fields should contain an entry for each masking rule.

For each field, if there are some users that may see the data unmasked on one or more of the user interfaces, then security configuration is required. If the value of a field should be masked for all users across all pages in the application, then the security configuration is not needed.

Security Configuration

Define a security type for each field with two authorization levels:

- 1 - Can only see the element masked
- 2 - Can only see the element unmasked

Link all of the security types to an application service of your choosing. We recommend linking every masking-oriented security type to a single application service (e.g., `CM_MASK`) as it makes granting access easier.

For each security type, identify which users can see its data unmasked and which users can only see its data masked. If the masked and unmasked users fit into existing user groups, no additional user groups are necessary. Otherwise, create new user groups for the masked and unmasked users.

After the user groups for each security type are defined, link each user group to the application service defined above. When a user group is linked to the application service, you will define the authorization level for each security type linked to the application service. If a user group's

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users should see the security type's field values unmasked, set the authorization level to 2; otherwise set it to 1.

> **Note**
>
> Updating masked values. The system supports allowing a user that sees a masked value to update the value. For numbers that are masked, the masked value is typically all 9s. If there is some chance that a user is allowed to update a masked number, the recommendation is that the user is configured with authorization to see the number unmasked. Otherwise, there is a corner case where the user sees the masked number and needs to update the number to a value that exactly matches the masked value. In this case, the update won't go through because the system doesn't recognize it as a change.

> **Note**
>
> Flush the cache. Remember that any time you change access rights you should flush the security cache (by entering flushAll.jsp on the URL of the application) if you want the change to take effect immediately.

Configure a Masking Algorithm

A data masking algorithm (using the algorithm entity value of **Feature Configuration - Data Masking**) must be created for each combination of masking rules and security type. These algorithms determine if a user has the rights to view a given field unmasked, and, if not, how the field should be masked.

The base package provides two algorithm types. Both support configuration to allow a set of users to see the data unmasked. Parameters capture the application service, security type and authorization level defined above used to evaluate this.

- `F1-MASK`: this is for masking alphanumeric data. Its parameters are designed to handle most masking needs. Parameters allow you to configure how much of the data to mask and what masking character to use. Refer to the algorithm type description for more information.
- `F1-MASKNBR`: this is for masking numbers. Refer to the algorithm type description for more information.

Determine How the Fields are Displayed

The masking configuration differs based on how a field is retrieved for access to the user interface. So for the masking of one "logical" field (like a person's SSN), there may be multiple configuration entries required to cover all the access methods. Review each user interface where a given field is displayed and create the following categories:

- The field is an element that is retrieved by invoking a business object, a business service, or a service script
- The field is stored as an ad hoc characteristic
- The field is displayed on a fixed maintenance page (and is therefore retrieved by invoking a page service)
- The field is displayed on a fixed search page (and is therefore retrieved by invoking a search service)

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Create a Feature Configuration for Each Masked Element

Create a feature configuration with a Feature Type of **Data Masking**. An option entry with option type of **Field Masking** is needed for every combination of field to mask and the method used to display the data. The value will contain mnemonics that reference the appropriate data masking algorithm along with configuration that differs depending on how the field is retrieved for display as described below.

Schema Based Object Field Masking

For data that is accessed via a schema-based object call and displayed in a UI map, the field to be masked must reference a meta-data field name in its schema definition: `field="fld_name", alg="algorithm name"`

If the element references an mdField in the schema, that is the field used to identify the masking rule. If there is no mdField reference but only a mapField reference, that is the field used to identify the masking rule. For example, if you want to mask a credit card number, let's assume that field is defined in the schema is the following:

```
<creditCard mdField="CCNBR" mapField="EXT_ACCT_ID"/>
```

In this case, the option value should be `field="CCNBR", alg="algorithm name"`. An option value of `field="EXT_ACCT_ID", alg="algorithm name"` would not result in masking.

A "where" clause may also be specified. This is useful for data that resides in a list where only data of a certain type needs to be masked: `field="fld_name", alg="algorithm name", where="fld_name='value'"`

For example, person can have a collection of IDs and only IDs of type 'SSN' (social security number) should be masked. If the person data including its collection of person IDs is displayed on a UI map via a business object call, let's assume the collection is defined in the following way:

```
<personIDs type="list" mapChild=CI_PER_ID">
  <isPrimaryId mapField="PRIM_SW"/>
  <idType mapField="ID_TYPE_CD"/>
  <personIdNumber mapField="PER_ID_NBR"/>
</personIds>
```

The option value may look like this: `field="PER_ID_NBR", alg="algorithm name", where="ID_TYPE_CD='SSN'"`

Please note the following important points for schema based masking:

- **Limitation of 'where' field** Although the main use of a 'where' clause for schema oriented elements is to mask certain elements in a list based on a 'type', it is also possible to mask a single field in the schema based on the value of another field. For example, imagine that a customer submits a registration form that defines an ID type and ID value. Although this data is not in a list, the implementation may still want to only mask the ID value if the ID type is "SSN". The framework is only able to mask an element in the schema based on a 'where' clause if the element in the 'where' clause is a "sibling" in the schema.
  - If the element to be masked is in a list, the element in the 'where' clause must be in the same list.

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- If an element to be masked maps to a real column in a table, the element in the 'where' clause must also map to a real column in the table.
- If an element to be masked maps to and XML column in the table as a single element, the element in the 'where' clause must map to the same XML column as a single element.

- **Multiple feature option entries for the same field.** It's possible that different schemas in the system have a similar type of data that may be masked based on different conditions. For example, imagine that an implementation has different schemas that captured or referenced person identifiers in different ways:
  - One schema captures a single person ID without any corresponding "type" record and it should always be masked using Algorithm CM_SSN_MASK:

    ```
    <personSSN mapXML=BO_DATA_AREA mdField=PER_ID_NBR/>
    ```

  - One schema captures a person ID and a corresponding ID Type and it should be masked with Algorithm CM_SSN_MASK if the type is "SSN" and masked with algorithm CM_FEIN_MASK if the type is "FEIN".

    ```
    <personIdType mapXML=BO_DATA_AREA mdField=ID_TYPE_CD/>
    <personId mapXML=BO_DATA_AREA mdField=PER_ID_NBR/>
    ```

  - One schema captures a person ID and a corresponding ID Type and it has the same masking rules as the previous schema, but a different field name is used for the ID Type code. (This scenario could happen if for example a different label is desired for ID Type on the user interface for this schema.)

    ```
    <personIdType mapXML=BO_DATA_AREA mdField=CM_ID_TYPE/>
    <personId mapXML=BO_DATA_AREA mdField=PER_ID_NBR/>
    ```

  For this scenario, the feature options may look like this:

  1. `field="PER_ID_NBR", alg="CM_SSN_MASK"`
  2. `field="PER_ID_NBR", alg="CM_SSN_MASK", where="ID_TYPE_CD='SSN'"`
  3. `field="PER_ID_NBR", alg="CM_FEIN_MASK", where="ID_TYPE_CD='FEIN'"`
  4. `field="PER_ID_NBR", alg="CM_SSN_MASK", where="CM_ID_TYPE='SSN'"`
  5. `field="PER_ID_NBR", alg="CM_FEIN_MASK", where="CM_ID_TYPE='FEIN'"`

  For each schema, the system will first find whether the element applies to any masking option. It will find 5 masking options for the field PER_ID_NBR. Then it will determine if any sibling elements match the 'where' clause.

  - If more than one sibling element matches a 'where' clause, a runtime error is issued. For example if a schema has an element that references "mdField=ID_TYPE_CD" and an element that references "mdField=CM_ID_TYPE", this is an error. Additionally, if multiple elements reference mdField=ID_TYPE_CD", this is an error.
  - If one and only one sibling element matches a 'where' clause, the value of the element is compared to the values defined in the 'where' clause. If it finds a match on the value, the appropriate masking algorithm is applied. If no match is found (for example, the Person ID Type is "LICENSE") the element is displayed as is.

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- If no sibling element matches a 'where' clause and a feature option exists with no 'where' clause (option 1 above), then the masking algorithm of the option with no 'where' clause is applied.

- **Changing the value in the 'where' clause.** If your implementation has some users that are allowed to change records where some data is masked based on a condition, it is recommended to design the user interface to reset the masked value when the value in the 'where' clause changes. For example, if a user is prevented from viewing a person's social security number, but the user is allowed to make updates to the person's record, changing the value of the Person ID Type should reset the Person ID Number. This would ensure that the user does not 'unmask' the social security number by simply changing the ID Type.

Records Maintained Using Page Maintenance

For data that is accessed via a page maintenance service call, indicate the table name and the field name where the data resides: `table="table_name", field="fld_name", alg="algorithm name"`

For example if the Person record and its collection of identifiers are displayed and maintained using page maintenance, the option value should be `table="CI_PER_ID", field="PER_ID_NBR", alg="algorithm name"`

A "where" clause may also be specified: `table="table_name", field="fld_name", where="fld_name='value'", alg="algorithm name"`

This is useful for data that resides in a child table where only data of a certain type needs to be masked. For the person ID example, `table="CI_PER_ID", field="PER_ID_NBR", alg="algorithm name", where="ID_TYPE_CD='SSN'"`

Characteristic Data

For data that is stored as a characteristic, simply indicate the characteristic type: **CHAR_TYPE_CD='char type', alg="algorithm name"**

This needs to be defined only once regardless of which characteristic entity the char type may reside on. Note that only Ad hoc characteristics are supported.

Masking Fields in Explorer Zones or Info Strings

In explorer zones data is often retrieved using SQL directly from the database. No masking is applied automatically in this case. If there is data in the explorer zone results that should be masked, the masking must be applied by calling a business service.

Similarly, an MO Info algorithm may not use BO interaction to get data. It may access data using SQL for efficiency purposes. No masking in applied when retrieving data via SQL. To apply masking to a string prior to including it in an info string, the masking must be applied by calling a business service.

The system supplies two business services to be called to determine if masking rules apply for a specific field.

- `F1-TableFieldMask`. Mask a Table field. This business service receives a table name, field name and one or more field values. If masking applies it returns the masked value.
- `F1-SchemaFieldMask`. Mask a Schema field. This business service receives a schema name and type, XPath and field value. If masking applies it returns the masked value.

Search Service Results

For data that is displayed on a 'fixed' search page, it is retrieved via a search service call. Indicate the search name and the appropriate field to mask along with the masking algorithm.

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For example: `search="SearchServiceName", field="PER_ID_NBR", where="ID_TYPE_CD='SSN'", alg="algorithm name"`

To find the name of the search service, launch the search in question, right click in the filter area and choose **Inspect**. Search for "serviceName". The service name is listed there. To find the field name to mask, search for "Widget Info". There should be two results found, one for the filter area and one for the results area. This results area has the text "SEARCH_RESULTS" as prefix for each field. The field names are the ones after the x$. Do not reference the x$ when defining the field name. Note, the "where" statement can only apply to fields that are also part of the search results.

Additional Masking Information

The following points provide additional information to assist in your masking configuration:

- If the demonstration database includes a **Data Masking** feature configuration, review the settings because it will probably contain masking rules that will match your own.
- On data input pages, a user might be able to enter or change masked data, such as a bank account number, but not be able to subsequently see what they added or changed.
- External systems can request information by performing a service call via a web service. Please keep in mind that some web service requests require data to be masked and some do not. For example, a request from an external system to synchronize person information needs the person's social security number unmasked; whereas a request from a web self service application to retrieve the same person information for display purposes needs the person's social security number masked. To implement this type of requirement, different users must be associated with each of the requests and these users must belong to separate user groups with different access rights.
- If a maintenance object (MO) contains a field that holds an XML document and a service call invokes the MO's service program directly, the system will mask individual XML elements in the field if a **Determine BO** algorithm has been plugged into the maintenance object and the element(s) in the respective BO schema have been secured as described above.

Application Encryption

The functionality described in this section allows implementations to configure fields to encrypt when storing it in the database. This functionality is mutually exclusive from the User Interface Masking functionality. This feature also supports encrypting specific elements stored within a CLOB or XML column.

The following points highlight the features of the encryption functionality:

- The encryption key is defined using a key ring. Refer to Field Encryption for information about defining encryption key rings.
- When a field is configured to be encrypted, the encrypted data is stored in a special encryption field that is not the source field (the one exposed to the user on the user interface). The source field captures the data as masked. Because a special field is required to support encryption, the product must provide support for that field to be encrypted.
- For encrypted data that must allow searching, the system supports capturing a hash value in a special field. The product must provide support for this functionality. Besides providing a special field to capture the hash value, base search functionality for that data must also cater for this configuration.

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- The system supports encrypting data that is captured as an element within an XML field. If the XML field is provided in a schema owned by the product, then the product must provide specific support for the capture of the encrypted data.
- For backward compatibility, the system also supports encryption keys and hash keys defined using a keystore. This is not the recommended method going forward, but further information about defining the keystore in the system can be found in the Installation Guide. Refer to Moving from Keystore to Key Ring for information about adopting the key ring functionality if you are currently using the keystore.

The following sections provide additional information about the support for encryption provided by the framework. Refer to the security chapter of the administration guide for your particular product for more information.

Encrypting and Masking the Data

When a product enables encryption for a given field, a special encryption field should be created to capture the encrypted value. Because encrypting is optional, the source field (the one exposed to the user) should not be this special encrypted field. If encryption is configured, the system will internally populate the encrypted field. The source field will be populated with asterisks by default. That way the masked data is what is shown to the user on the page rather than the encrypted value.

The following points highlight how the system behaves when encryption is configured and when it is not. Assume as an example, the field is a credit card number. The user views and populates a field with the field name CC_NBR. The table also has a second field ENCR_CC_NBR. A user populates the credit card number:

- If encryption is not configured, CC_NBR will be updated with the entered credit card number and ENCR_CC_NBR will be empty. Note that in this case, an implementation may choose to configure user interface masking.
- If encryption is configured, CC_NBR will be updated with '**********' and ENCR_CC_NBR will contain the encrypted value. The asterisks for the standard field will fill the full field size up to 50 characters.

If for some reason the standard masking using all asterisks is not desired, the system supports supplying an explicit masking algorithm using the same Feature Configuration - Data Masking plug-in spot used for User Interface Masking.

> **Warning**
>
> Unlike user interface masking, the masking of encrypted fields is not driven by security. The data stored in the source field for all encrypted data should be masked. Be sure not to configure security authorization logic in algorithms used for this type of masking.

Feature Option Configuration

Create a feature configuration with a Feature Type of **Encryption**. For each source field you are encrypting, enter an option with option type of **Field Encryption**. The value will contain mnemonics that reference the appropriate encryption key ring along with configuration related to the field and its table location. Unlike the user interface data masking, the configuration for data encryption is related to how the data is stored rather than how it is displayed. In addition, each entry may define an explicit masking algorithm to override the default and if supported, may also define a hash field and hash key ring.

Refer to Field Encryption for information about defining encryption key rings.

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For data that is stored in a specific column on a table, an explicit field to capture the encrypted value must exist. Indicate the table name, source field name and encrypted field name along with the key ring: **table='table_name', field='fld_name', encryptedField='encr_fld_name', keyRing='key ring code'**

A "where" clause may also be specified when data resides in a child table and only data of a certain type needs to be encrypted.

Example, **table='CI_PER_ID', field='PER_ID_NBR', encryptedField='ENCR_PER_ID_NBR', keyRing='CM-SymmetricKey', where='ID_TYPE_CD='SSN''**

For data that is stored in an XML column in a record, the source field to be encrypted must reference a meta-data field name in its schema definition along with the element that captures the encrypted data and the alias: **field='field_name', encryptedField='encr_field_name', keyRing='key ring code'**

The syntax for adding a reference to a masking algorithm is **maskAlg='algorithm name'** .

The syntax for adding configuration for capturing a hash value for searching purposes is **hashKeyRing='key ring code' hashField='HASH_FLD_NAME'**.

The following is an example of configuration that uses all the possible options (specific masking algorithm, where clause and hash field support):

table='CI_PER_ID', field='PER_ID_NBR', keyRing='CM-SymmetricKey', encryptedField='ENCR_PER_ID_NBR', hashKeyRing='CM-HashKey' hashField='HASH_PER_ID_NBR', where='ID_TYPE_CD=SSN', maskAlg='CM-PERIDMASK'
For backward compatiblity, the product supports defining an encryption key using a keystore. For implementations that continue to use this configuration, you reference the alias or hash alias instead of the key ring. The following is an example of the configuration that uses all the possible options, but uses the alias instead of a key ring.

table='CI_PER_ID', field='PER_ID_NBR', alias='aliasKey', encryptedField='ENCR_PER_ID_NBR', hashAlias='hashAliasKey' hashField='HASH_PER_ID_NBR', where='ID_TYPE_CD=SSN', maskAlg='CM-PERIDMASK'
In addition, when using an alias, the encrypted field may optionally be "wrapped" with a special marker (e.g., ENC{}) to indicate that the field value is encrypted. This can be specified by the setting wrap="true" or wrap="false". The default is false. This should be set to false unless additional processing in your code is included to handle the special marker.

Refer to Moving from Keystore to Key Ring for information about adopting the key ring functionality if you are currently using the keystore.

Searching by an Encrypted Value

If the product supports a hashed value for an encrypted field for searching purposes, the following points highlight explorer zone configuration for this purpose

- The user filter value should reference the source field and should include an additional `encrypt=` mnemonic. For example

  ```
  type=STRING
  label=PER_ID_NBR
  encrypt=[CI_PER_ID,PER_ID_NBR,ID_TYPE_CD,F1]
  ```

  Refer to User Filters for more information.
- The SQL should include the hashed value in the WHERE clause. Note that because encryption is optional, a product zone that includes searching by a field eligible for

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encryption will include finding a match for the filter in the source field (as plain text) or in the hashed field. For example:

```
WHERE
   [(F2) (ID.PER_ID_NBR =:F2 OR ID.HASH_PER_ID_NBR = :F2)]
```

Customizing Encryption Algorithm

This feature is only applicable to implementations that use the keystore. This is not the recommended configuration going forward. The text is kept here for information purposes.

Although the encryption algorithm to use with a given key can be gleaned from the key in the keystore, there is sometimes extra information associated with an algorithm that might need to be used to encrypt or decrypt data.

The system provides a feature configuration option for the **Encryption** feature type using the option type **Algorithm Info** that can be used to adjust the behavior of the encryption.

- You can modify the default mode and padding of the encryption algorithm.
- If a key will be used to digitally sign anything, the signing algorithm can also be specified for the key.

For details about the syntax, refer to the feature option type's detailed description.

- Managing Encrypted Data

Managing Encrypted Data

The sections in this topic provide information about encrypting data when first implementing the application along with various use cases that may require re-encrypting data, such as key rotation.

The batch job `F1-FLENC` (Field Encryption for a Maintenance Object) is provided to handle encryption / re-encryption of all data for a given Maintenance Object. Review your encryption configuration and identify all the maitnenance objects that should have data encrypted. Run the batch once for each maintenance object. The below sections highlight various use cases that warrant running this batch for each maintenance object.

Initially Encrypting Data

Once your encryption / hash configuration is complete, any data added or updated from that point on is encrypted / hashed per the configuration. However, for all existing records that have data that should be encrypted / hashed, you need to run the batch job `F1-FLENC` for each maintenance object to go through and encrypt / hash the data in the existing rows.

Mass Key Rotation

If you introduce a new encryption key or hash key, as described in Key Rotation, or you introduced a new key ring as described in Key Ring Rotation, records added or updated from that point on will be re-encrypted / re-hashed with the latest key for the respective key ring. However, to rotate the key for all existing records that are encrypted / hashed with the previous key, you need to run the batch job `F1-FLENC` for each maintenance object to go through and re-encrypt or re-hash the data in the existing rows.

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> **Note**
>
> You can independently choose to introduce a new encryption key or a new hash key. The batch program will check each encrypted field or hashed field to confirm that they use the current active key and if not, the data is adjusted.

> **Note**
>
> When rotating a Hash Key, from the time the new key is activated until the time when all records have been successfully updated to use the new hash key, if any end users attempt to search for records via a hashed field, there may be inconsistent results. You should schedule rotation of hash keys to be during a time where end users are not impacted. Ideally you activate the new key and run the key rotation batch control for all maintenance objects during off hours.

Moving from Keystore to Key Ring

Using the key ring for defining your encryption and hash keys allows for key rotation. If your implementation has been using a keystore for field encryption / hashing and would like to use the key ring instead, you can do this as described in the following steps.

- Define a key ring for the Symmetric Key and a key ring for the Hash Key, if applicable.
- Generate and activate a key for each key ring.
- Go to the Feature Option Configuration. For each entry, add references to keyRing / hashKeyRing to define the newly created key rings. Be sure to keep the configuration for the alias mnemonic in place. The system needs this information to know how to unencrypt the existing data if it was encrypted using the keystore. Note that the system doesn't need the hashAlias if you are moving from using the keystore for the hash key to using the key ring. The system simply applies the new hash key.
- Records added or updated from that point on will be re-encrypted / re-hashed using the indicated key ring and its active key. To rotate the key for all existing records that are encrypted / hashed with the keystore alias, you need to run the batch job `F1-FLENC` for each maintenance object to go through and re-encrypt or re-hash the data in the existing rows.
- Once you have confirmed that all the data is using the key ring for encryption and hashing, you can update the feature option configuration to remove the reference to the old alias keys.

The "notes" listed in the Mass Key Rotation section also apply to this use case.

The Approach to Implementing Object Erasure

This section describes the product approach to implementing object erasure for its maintenance objects (MOs).

> **Note**
>
> The approach outlined is intended for managing erasure of master data objects. The assumption is that Information Lifecycle Management will be used for archiving any related transactional data.

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Various events in the system may signal the need to erase data at some future date. For example, closing an account may indicate the need to erase both the account and person data once there is no longer a need to maintain related financial details. There may also be events that re-establish the business relationship with a person and signal that data marked for erasure should now be retained.

The Object Erasure Schedule is used to capture key details of objects with data that needs to be erased. Records in the schedule are monitored periodically to determine if the date for erasure has been reached and if so, execute the erasure logic. The system will create and maintain records in the schedule when specific events occur for an MO that is marked for erasure.

The system provides the ability to mark an MO as eligible for erasure via a number of MO configuration entries. Included in these is an option that defines the business object for the MO's erasure schedule records. In addition to defining the erasure record elements, this BO defines the monitoring process and the specific erasure logic for the MO.

The following sections provide more information about configuring and managing object erasure.

- Configuring a Maintenance Object for Erasure
- Manage Erasure Schedule Algorithm
- Monitoring the Schedule and Performing Erasure
- Erasing User Information By Obfuscation
- Viewing an Object’s Erasure Status
- Viewing Erasure Configuration
- Archiving the Object Erasure Schedule

Configuring a Maintenance Object for Erasure

There are three types of maintenance object configuration entries that define how to manage erasure:

- An option to define the business object for erasure schedule records.
- An option to define the period between the date on which the need for erasure is detected and the date on which erasure should occur. The common logic provided by the system to add or update erasure records uses this option to determine the erasure date.
- One or more entries in the MO algorithm collection for the algorithms that determine whether a record should be scheduled for erasure, according to the current state of the record, and create or update the erasure schedule entries.

Some MOs that would commonly be regarded as eligible for erasure will be installed with a base Erasure BO already configured. The expectation is that the corresponding Erasure Period option and the algorithm for the Manage Erasure Schedule plug-in spot will be set up by your implementation with the appropriate entries for your organization's business rules.

> **Note**
>
> The presence of an Erasure Period option is the signal to the system that your implementation has enabled an object for erasure.

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It may not be necessary for all master data objects that contain personally identifiable information to manage their own erasure schedule. For example, the event which triggers erasure for a person record may also trigger the creation of erasure schedule entries for the person's other master data records. In this case, only the person maintenance object will need to be configured with a Manage Erasure algorithm (or algorithms). Refer to your product specific documentation for more information on the recommended approaches for your product's master data objects.

The portal Maintenance Object Configuration includes a zone that shows all the maintenance objects eligible for object erasure. You may use this zone to review or change the configuration for any of the maintenance objects.

Manage Erasure Schedule Algorithm

Algorithms of this type are responsible for determining a record's erasure status and creating or maintaining an entry in the Object Erasure Schedule for the record. They are triggered when certain events occur in the system for maintenance objects that are eligible for erasure. Multiple algorithms can be configured for the plug-in spot.

Depending on the determination made by the algorithm (or algorithms), a number of different actions may need to be taken. For example:

- A new schedule record may need to be added
- An existing schedule record may need to be updated with a new erasure date
- A pending record may need to be discarded if erasure is no longer applicable
- A discarded record may need to be reactivated if erasure now applies again

The base business service `F1-ManageErasureSchedule` performs the common logic to handle the possible actions and is recommended for use by these types of algorithms. The service can also optionally create a log entry for information purposes. Refer to the description of the business service for full details.

In certain circumstances, if one record is scheduled for erasure, other related records may need to be evaluated. The base business service `F1-ManageErasureScheduleDriver` performs the logic to execute an MO's Manage Erasure Schedule algorithms. It can be used to manage any related records from within another algorithm.

This type of algorithm is plugged into the Maintenance Object — Algorithm collection.

Your product may supply algorithms to manage the schedule for base MOs that are regarded as eligible for erasure. If your organization has special business rules that are evaluated to determine the erasure schedule for an MO, a custom algorithm can be created and applied by the implementation team.

Monitoring the Schedule and Performing Erasure

The erasure schedule is managed using the lifecycle of the erasure record's business object. A deferred monitor process is used to periodically check for records that are due for erasure and transition them from the 'pending erasure' state to the 'erased' state. An enter plug in on the 'erased' state is responsible for performing the erasure logic.

The system provides a 'root' business object for the object erasure schedule (`F1-ErasureScheduleRoot`) which defines the lifecycle that erasure schedule business objects should follow. The system also provides a monitor process (`F1-OESMN`) which is configured on the 'pending erasure' state of the 'root' business object. This process is configured to monitor object erasure schedule records whose erasure date is on or before the batch business date.

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Maintenance objects that are eligible for erasure should be configured with an erasure schedule business object that uses the ‘root’ business object as its parent. The algorithm that performs the erasure processing applicable to that maintenance object must be plugged in on the ‘erased’ state of the ‘child’ business object.

The system provides an erasure schedule business object (`F1-ErasureScheduleCommon`) which is designed to erase an object by deleting the main record and any child records. Your product may supply additional erasure schedule business objects for certain use cases. Refer to your product specific documentation for more information.

Erasing User Information By Obfuscation

Some implementations consider the base User object to have personally identifiable information. Erasing user information by deleting the records is not advisable as it can cause referential integrity problems. The recommended approach is to obfuscate the data instead.

The system provides a user erasure business object (`F1-ErasureScheduleUser`) which is designed to support obfuscating a user’s identifiable information by removing it or replacing it with a non-identifiable value if the field is required.

If the User maintenance object is configured to be eligible for erasure in your implementation, the manage erasure schedule algorithm for the record will be invoked whenever the **Enable** flag is changed for a record on the User maintenance page. The system provides a base algorithm (`F1-OBJERSUSR`) specifically for the User MO. This algorithm will add an entry to the object erasure schedule if the user record is disabled or deactivate an existing erasure schedule record if a disabled user record is enabled again.

Viewing an Object’s Erasure Status

The system provides a portal for viewing and editing an erasure schedule record. The portal is accessed from the **Object Erasure Schedule** sidebar zone. This is a context sensitive zone which only appears when accessing a record for a maintenance object that is configured to be eligible for erasure. It displays the information for the erasure schedule entry for the record in context, if applicable.

To add the zone to an eligible maintenance object:

- Navigate to Context Sensitive Zone and search for the navigation key for the maintenance object.
- Add the Object Erasure Schedule zone `F1-OBJESRSCD` to that navigation key.

Viewing Erasure Configuration

The erasure configuration may be viewed in the Maintenance Object Configuration portal.

Archiving the Object Erasure Schedule

The system provides the ability to archive older records in the object erasure schedule using Information Lifecycle Management. The object erasure schedule maintenance object is configured with a base ILM eligibility algorithm and an ILM crawler batch control.

The base object erasure schedule BO is configured to set the ILM archive switch when an erasure schedule record enters a final state and to reset it if the record becomes active again.

Refer to The Approach to Implementing Information Lifecycle Management for more information on archiving functionality.

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Data Redaction for Export and Logging

Personal identifiable information (PII) requires special handling when exported out of the application and written to files, including log files. Information that is encrypted at the database level remain encrypted and therefore protected when exported. With respect to non-encrypted information, the need to obfuscate it for added protection depends on how the exported data is intended to be used. If the exported information is part of an integration flow with an external system then the data should remain unchanged. However, when exporting data from a production environment for testing purposes sensitive information should be anonymized before they can be imported to a lower environment or written to logs for troubleshooting purposes.

The following are key aspects of this functionality:

- Redaction rules define how specific fields should be redacted when needed.
- When redaction rules exist, data redaction is performed by default by specific tools for export and logging. In absence of redaction rules, data is exported in its original form.
- Redaction rules are customer specific and may only be relevant to environments that contain sensitive data. As such, they are not released with the base product. Review your data redaction requirements and configure appropriate rules in relevant environments.
- Certain users may be allowed to export data in a non-redacted form based on application security.

The following sections provide additional information about this topic.

Redaction Rules Are Customer Specific

Redaction rules identify which fields should be redacted and how they should be anonymized. The list of fields to redact and the function to use to manipulate their values are customer specific and therefore are not released with the base product. A sample set of rules are provided as accelerator data for reference only.

It is important that you review your data redaction requirements and configure rules that reflect your business needs.

Redaction By Default

Processes that support data redaction on export and when logging do so by default when redaction rules exists. When rules are not defined, data is exported as is. Note that for this reason it is unnecessary to define such rules in lower environments that do not contain sensitive information.

Specific Export Tools Only

Data redaction is supported by the following tools only:

- **Content Migration Assistant (CMA).** Depending on application security, a user may indicate on a specific data set export request that data should be exported in its original form.
- **General Data Export (GDE) batch processes.** A batch parameter may be used to explicitly request that data is exported in its original form. This option is also protected by application security and enforced at batch submission time.

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> **Note**
>
> This type of process establishes a single export stream that may be sent to multiple targets. Review these integrations to ensure they do not have conflicting data redaction requirements and set the batch parameter accordingly.

- **Debug logging**. By default, data is redacted base on redaction rules when writing details to the various logs.
  - In an environment that is not a live production environment, a user with appropriate security may use a feature configuration to turn this off. Find the Feature Configuration record for the **General System Configuration** feature type. (It may need to be defined if it does not exist). Choose the option type **Turn Off Log Redaction** and define a value of **Y**.
  - The system uses a property (isLiveProduction) to check if an environment is a live production environment. In a cloud implementation, the development operations team sets the property when your implementation has indicated that you are live. In an on premises implementation, it is recommended to set this property when you are live. Refer to the system administration guide for more information.

Different Types of Redaction Rules

Sensitive information may reside in various types of storage fields which impact the way they are identified for redaction. You may define rules that target fields on specific tables or provide a more global rules that applies to all references of a specific field.

The application supports the following types of redaction rules:

- **Physical Field.** This type of rule applies to a value residing in a field on a specific table. An optional filter expression may be provided when only records of a certain type needs to be redacted.
- **XML Storage.** This type of rule applies a value associated with the specified field name that resides within an XML storage field on a specific table. This option also supports a filter expression.
- **Reference Field.** This type of rule applies to a value residing anywhere and associated with the specified field name. It does not include fields referenced in XML storage fields.

Redaction Function

A redaction function defines the format by which a value is anonymized. The type of function used depends on the field's data type. For example, to anonymize a numeric field the redaction function should only use numeric values etc.

Refer to the **Redaction Function** extendable lookup for a list of available functions. The base product provides a sample of common functions but the list may be extended by your organization as needed.

Fields May Contain Sensitive Information

The field definition record includes an indication as to whether the field may contained sensitive information or not. Note that the indication does not imply that the field is actually used to capture such data but rather that it can potentially be used this way. Use this indication to review fields that may need to be associated with a redaction rule.

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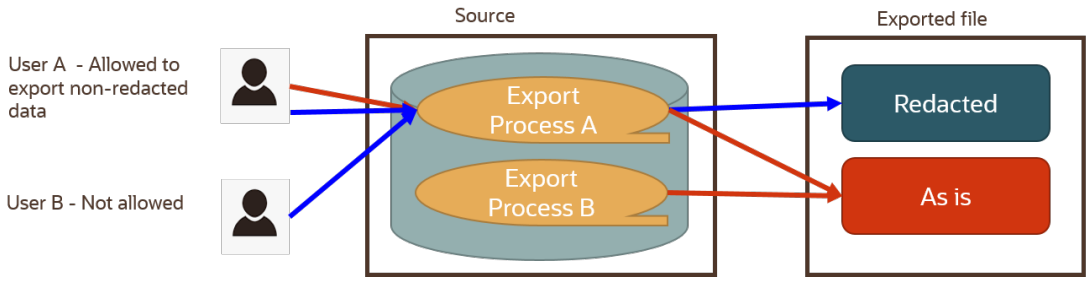
Exporting Non-Redacted Data Requires Security Rights

By default, the export tools redact data based on existing redaction rules. There are situations where certain users may be allowed to export data in its original form, that is, to request to not apply the redaction rules.



The following points describe the processes for exporting data:

- Some processes always export data as is, in case the target consumer needs the raw data. This is irrespective of the user requesting the export.
- Some processes perform data redaction by default and may offer an option for exporting data as is. The option to export data in its original form is secured by application security.
- In this example, process A supports data redaction by default with an option to export non-redacted data. User A has the right to export the data redacted (default) or explicitly request to export it in its original form. User B does not have the right to do so hence their export content is redacted by default.

The option to export data in its original form is associated with the **Do Not Apply Redaction Rules** access mode associated with the following relevant application services:

- For CMA, the additional access mode is associated with the migration data set export's application service. When granted, the user may select the special non-redacted export option when they create the export data set request.
- For GDE batch processes, the access mode is associated with their application service and is tied to the **Do Not Apply Redaction Rules** batch parameter they support. Only users with the proper application security can submit these batches using the special batch parameter option

Defining Redaction Rules

This portal is used to view and maintain rules that define how specific fields that containing personal information should be redacted when exported out of the application or written to a debug log. For example, an e-mail address may be redacted by replacing some or all characters with '*'.

Refer to Data Redaction for Export and Logging for more information.

You can access the portal from the**Admin Menu**, and then **Security**, and then **Redaction Rule**. You are brought to a query portal with options for searching for a specific redaction rule. Once a redaction rule has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page

- **Redaction Rule.** This zone provides information about the selected rule.

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Obfuscation Configuration

This portal is used to view and maintain all configuration options related to personal information obfuscation. It includes all masking, encryption and data redaction rules.

You can access the portal from the**Admin Menu**, and then **Security**, and then **Obfuscation Configuration**.

Refer to Encryption and Masking for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Redaction Rules.** This zone lists all redaction rules. You may add a new rule from this zone.
- **Masking.** This zone lists masking options. You may navigate to the masking related feature configuration to review and edit these options.
- **Encryption.** This zone lists encryption options. You may navigate to the encryption related feature configuration to review and edit these options.
- **Review Fields for Redaction Rules.** This zone lists fields that may contain personal identifiable information and are not associated with a redaction rule. Review these fields and add redaction rules when applicable.

Cryptography Keys

The system provides support for defining various types of cryptography keys to handle different use cases in the system related to encrypting / decrypting data, providing credentials and providing and reading signatures when exchanging data between two parties. This may be used when communicating information with an external system or for internal processing.

The following sections include information about the functionality provided to support this type of security.

- Understanding Key Rings
- Defining Key Rings

Understanding Key Rings

The Key Ring object is provided to define the specific use case and to reference the keys that are used over time for a given business use case. Each key ring references a specific business object, which defines all the rules related to managing the keys. For example:

- If the key ring is used to define a pair of private and public keys, then the business object includes actions for generating a key pair and for viewing the public key.
- If the key ring is used to capture the public key of a third party, then the business object includes actions for capturing the external public key.
- Each key ring defines the rules related to the possible lifecycle of the keys.

The following sections include information about the functionality provided to support different key ring classes for particular use cases.

- Field Encryption
- OAuth Keys
- RSA Signature Keys

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- File Encryption and Signing Keys

Field Encryption

The system supports encryption of certain sensitive fields in the database. This support includes the ability to capture hash values of encrypted data for searching purposes.

Refer to Application Encryption to understand how to configure which fields you want to encrypt.

The sections in this topic provide more information about the defining the encryption and hash key values and the key rotation support.

Symmetric Key

The product provides an AES Symmetric Key business object. It generates an encryption key using an AES 256 algorithm.

When defining a key ring for this business object, you provide a 3-character "wrap" prefix that is unique across key rings for the 'symmetric key' class. This aids in key rotation, described below.

The business object supports key rotation with respect to the keys. See the section below for more information about key rotation.

Once your symmetric key ring is defined and you have at least one active key, you can configure the fields that you want to encrypt and reference this key ring in the configuration. Refer to Application Encryption for more information.

Hash Key

The product provides an HMAC Hash Key business object. It generates an HMAC key and stores it in PEM format.

When defining a key ring for this business object, you provide a 3-character "wrap" prefix that is unique across key rings for the 'hash key' class. This aids in key rotation, described below.

Once your hash key ring is defined and you have at least one active key, for encrypted fields that support a hash value, you can reference this key ring in the configuration. Refer to Application Encryption for more information.

Key Rotation

Defining your encryption and hash keys using key rings allows for key rotation.

- When the system encrypts the data or creates the hash field, it uses a marker so that the system knows what key ring and key were used to encrypt / hash the data. Data is encrypted / hashed with the current Active key.
- If your organization wants to introduce a new key for either your symmetric key ring or your hash key ring, use the Generate Key button to create a new key. Click the Activate button adjacent to that Key to make it the key to use for all data that gets added or updated going forward. The previous key is marked Inactive.
- All records added or updated going forward use the new key.
- To rotate the keys across all the existing data encrypted / hashed with the previous key, you need to submit a batch. Refer to Mass Key Rotation for more information.

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Key Ring Rotation

The respective business objects for the symmetric key ring and the hash key ring define the algorithms to use for generating the key. If there comes a point where you want to use a different algorithm for generating the symmetric encryption key or the hash key, a new business object is needed so that the new desired algorithm can be defined. The following points highlight the steps needed to change the key generation algorithm.

- Define the new business object for the use case (symmetric encryption key or hash key). Ensure that the algorithm related to the Generate Key state has the desired key generation logic. This business object should include a field for the 'wrap prefix', similar to the delivered product business objects for the symmetric key ring or hash key ring.
- Define a new key ring for the new business object and be sure to choose a different wrap prefix value. This is needed for key rotation.
- Generate a key for the key ring and activate it.
- Go to the Feature Option Configuration and update the keyRing or hashKeyRing references for all the entries to point to the new key ring.
- All records added or updated going forward use the new key ring and its active key.
- To rotate the keys across all the existing data encrypted / hashed with the previous key ring and its key, you need to submit a batch. Refer to Mass Key Rotation for more information.

OAuth Keys

The system provides support for sending messages secured by OAuth authentication. To deliver the message, the application is required to provide a client ID and secret. The OAuth secret is sensitive data and needs to be stored securely in the application. The Message Sender configuration provides the ability to store the client ID and an encrypted secret directly in the sender context. Alternatively, the sender context can refer to a key ring that stores those details. Using a key ring allows users to apply new secrets over time without having to update the affected message sender configurations.

Refer to Message Sender - Context for more information about configuring a message sender for OAuth security.

The product provides an OAuth Keys business object that supports the following functions:

- Defining the external system related to the key ring
- Adding a client ID and secret key. The secret key is stored in an appropriate "secret store".
- Key rotation. For increased security, a new secret key may be entered periodically. The new key automatically becomes the active key.

RSA Signature Keys

RSA signature key pairs are used in the following cases:

- Certain processes in the system may need to write files to or read files from Oracle Cloud Object Storage. Cloud object storage has its own method for encrypting files, and products using the framework application do not need to define additional configuration for that. However, when communicating with cloud object storage, the application is required to provide a signature key.

  Refer to External File Storage for more information about configuring the system to connect to cloud object storage.

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- Customers may need the ability to authorize a customer service representative (CSR) to view the customer's account information in a customer facing portal. A signature key is required to support secure communication with the endpoint.

  Refer to User Redirection for more information about configuring the system to enable this type of redirection.

- Signature keys are used for outbound messages when using the OAuth JWT assertion grant type. The key is used to sign the assertion.

The product provides an RSA Signature Key Pair business object that supports the following functions:

- Generating a key pair, public and private. The private key is stored in an appropriate "secret store" and the public key is available to copy and share with a third party.
- Viewing the public key, allowing a user to copy it to register it with cloud object storage.
- Activating the new key pair (to be done after registering the new public key).
- Inactivating an expired key.
- Key rotation. For increased security, a new key pair should be generated periodically.
- Deactivating all keys for the key ring.
- Requesting a Certificate Signing Request
- Certificate Signing Request

Certificate Signing Request

If a certificate signing request is required for any use case, the following steps should be followed.

- Navigate to the signature key ring that requires a certificate.
- In the Keys zone, identify the pending or active key that requires a certificate. Click **Generate CSR**.
- You are prompted to provide appropriate distinguished name parameter values and set the duration.

> **Note**
>
> The distinguished name parameters are defined in the `F1-DistinguishedNameParameter` extendable lookup. The visible parameters are those that marked as 'default in grid'. Additional parameter names are available, if needed.

- Optionally check the Self Signed Certificate switch, for example in a development or test environment.
- Click Save

If you didn't check the self signed switch, copy the returned Certificate Signing Request text to a .pem file and use a certificate authority to provide the certificate. Otherwise, use the returned Self Signed Certificate.

Once you have the certificate, provide it to the relevant external party, according to the use case.

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File Encryption and Signing Keys

For security, files exchanged with third parties may be encrypted, digitally signed or both. This requires the sender and recipient to maintain public/private key pairs and share public keys. The product supports the maintenance and generation of public and private keys in a format suitable for encryption using PGP standards.

The following sections provide additional information about encryption keys.

Encryption Key Pairs

Internal encryption key pairs are used in the following cases:

- Creating a digital signature for an extract file. The signature is encrypted with the private key of the key pair and decrypted by the recipient using the shared public key .
- Decrypting an import file. The expectation is that the sender has encrypted the file data using a temporary key. The temporary key is encrypted using the shared public key and decrypted using the private key.

The product provides an Encryption Key Pair business object that supports the following functions:

- Generating a key pair, public and private. The private key is stored in an appropriate "secret store" and the public key is available to copy and share with a third party. Both keys are in formats suitable for PGP encryption.
- Viewing the public key, allowing a user to copy it to register it with third parties.
- Activating the new key pair (to be done after sharing the new public key).
- Inactivating an expired key.
- Key rotation. For increased security, a new key pair should be generated periodically.
- Deactivating all keys for the key ring.

Public Encryption Keys

External public encryption keys are used in the following cases:

- Verifying the signature of an imported file. The signature is decrypted using the public key provided by the sender.
- Encrypting an extract file. The batch file adapters create a temporary key which is used to encrypt the file data. The temporary key is encrypted using the public key provided by the recipient

The product provides a Public Encryption Key business object that supports the following functions:

- Defining the external system and reference ID related to the key ring.
- Adding a public key to the key ring. The product expects the public key to be in a format suitable for PGP encryption.
- Viewing the public key.
- Inactivating an expired key.
- Key rotation. When new public keys are provided by the external system, the previously active key is set to expiring status. It may be manually inactivated after all messages using that key have been processed.

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- Deactivating all keys for the key ring.

Defining Key Rings

Refer to Understanding Key Rings for an overview of key ring functionality.

To maintain the key rings applicable to your product or implementation, open **Admin**, and then **Security**, and then **Key Ring.**

This is an All-in-One portal and includes the standard List and display zones for a key ring.

The information captured on the key ring depends on the business objects supported by your product or implementation. Refer to the embedded help text for more information.

Key Zones

The key zones provide information about the keys that are associated with the key ring. The zones displayed and the available actions depend on the type of key. Refer to embedded help for more information.

Key Rotation

For internal keys, it is recommended to practice key rotation and generate new keys periodically. New key pairs are generated in the **Pending** state. The user should register the public key of the new key pair with the associated third party. Once that is done, the new key should be activated.

For external keys, new public keys are added in the **Active** state. The previously active key is set to **Expiring** and may be inactivated when no further processing needs to refer to it.

User Interface Tools

This section describes tools that impact many aspects of the user interface.

- Understanding Portals and Zones
- Setting Up Portals and Zones
- Defining Menu Options
- Defining Navigation Keys
- Defining Navigation Options
- Navigation to External Pages
- Understanding System Messages
- Understanding Unified Search
- Trees
- Contextual Insights
- Knowledge Articles
- Color Configuration
- Defining Display Icons
- Custom Look and Feel Options

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Understanding Portals and Zones

A portal is a page that is comprised of one or more information zones. The base product pages are built using either a fixed page metaphor or using portals and zones.

There are three broad classes of portals:

- **Standalone.** Standalone portals are separate pages where the main tab of the page is built using a portal. These pages are opened using any of the standard methods (e.g., by selecting a menu item, by selecting a favorite link, etc.). Additional tabs for a stand-alone portal may be included using tab page portals.
- **Tab Page.** These types of portals cannot be attached to a menu. They simply define the zones for a tab on a standalone portal.
- **Sidebar.** A sidebar portal is a special portal that dictates what may appear in the Sidebar Area. Its zones contain tools and information that exist on the user's desktop regardless of the transaction. Several sidebar portals and zones are delivered as part of the base-package. Your implementation can add additional zones to these portal.
- **Assistant.** This is a special portal that defines what may appear in the Assistant Area if configured by your specific product.

The contents of this section describe general information about portals and zones.

Portal Page Structure

A portal page has a main tab and may have additional tabs. The page is constructed by first creating a **Standalone** portal, which is also the main portal, followed by creating a **Tab Page** portal for each additional tab and linking it to the main portal. Content is organized on each tab using independent zones.

The entire page is secured by the single application service associated with the main portal.

Portal Roles

An optional attribute called a portal role may be assigned to a portal. The role is typically for information purposes, but in some cases, a role may support additional configuration.

Certain roles may support predefined **UI Template** layouts to choose from.

Portals Are Made Up of Zones

A portal is a page that contains one or more zones, and each zone contains data of some sort. All zones reference a **Zone Type**. The zone type controls the behavior of the zone and the parameters available to configure the zone.

A portal may also use zones to present additional information in a drawer. These zones are not part of the page layout and are only presented upon a user request.

Not All Zones Make Up Portals

Zones may or may not be associated with a portal. The following describes additional uses of zones:

- A data explorer type of zone may implement a search for an entity on an input user interface map. These zones may be referenced on a FK reference record or directly referenced on a UI map.

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- A data explorer type of zone may implement a Business Service. The latter may be used for an internal process or used to build a user interface dropdown.
- A zone may be defined as a **Context Sensitive Zone** that appears on the Sidebar when a specific page or portal is in context. This type of zone is not linked to the Sidebar portal but associated with the context page or portal's navigation key.
- A 'view detail' zone may be launched into a drawer without being configured as part of the portal it is launched from.

Configuring Zones for a Portal

The portal includes configuration of how the zones should appear on the portal by default. This includes the following options, all of which may be overridden by an implementation.

- The order in which the zone should appear. An implementation may configure an override sequence to change the order zones on a base delivered portal.
- Whether the zone is visible on the portal. Zones delivered in the base product should be configured to be visible. But an implementation may override this if desired.
- Whether the zone should display initially collapsed or not. A zone's data is only retrieved when it is expanded. As such, a zone may be configured to be initially collapsed when the data is not needed very often. A user can expand the zone when the information is required. Implementations may change the collapsed setting of a base product portal / zone. Refer to Zones May Appear Initially Collapsed When a Page Opens for more information.

Flexible Layout Control

By default a zone spans the full width of the portal's display area but can be configured in a number of ways using the layout control features on the portal.

These features allow portal designers to have finer-grained control over how zones are laid out, and enables them to achieve a better user experience and a more optimal layout that reduces unused space.

The following highlight key layout control options:

- In addition to the standard half and full width options, 1/4, 3/4, 1/3 and 2/3 width options are also available.
- Better handling of zones that are dynamically hidden by a visibility script. When a zone becomes invisible its space may be reclaimed by a next zone as long as it is of same width or smaller.
- A zone may define the beginning of a new row. This indication allows for a more fixed layout that is not impacted by hidden zones. The new row indication may establish a layout of one, two or three zones displayed vertically.
- Support the following zone height options:
  - **Content (Unlimited Height)** lets the height be determined by content.
  - **Content (Limited Height)** lets the height be determined by content up to a specified maximum limit. This option may be used to achieve a more consistent portal layout, especially when a zone is rendered on long or small devices.
  - **Fixed Height** sets the zone at a specific height regardless of content.

    This option too may be used to achieve a more consistent portal layout.
  - When a height option is not explicitly selected, zone height is unlimited and determined by content. However, for a data explorer zone, the results grid area itself (not the entire

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zone) is limited by the zone parameter "height of report" (which has a default value of 50%).

You may also control the visibility of the following page components:

- **Page Title.** Use the **Page Title Visibility** portal option on a standalone portal to indicate that the page title should not be visible for this portal and its related tab portals if any.

> **Note**
>
> The page actions displayed in the same row as the page title are also suppressed. As such, you should only use this option if the actions in that area are not needed, including Bookmark, Clear and Refresh.

- **Tab Menu.** Use the **Tab Menu/Tab Visibility** portal option to suppress one or more tabs on the page based on conditions. It also may be configured to suppress the tab area altogether.
- **Zone Header.** You may use the **Zone Header Visibility** general zone parameter to suppress an explicit map zone's header area to allow for more vertical space when the page only has one zone and the standard actions on the zone header are not relevant.

Portal Specific Page Actions

The system supports defining actions that appear in the Page Actions Toolbar that are specific to a portal. Portal specific actions are first defined using a menu with the menu type of **Page Action Menu**. Each menu line in a page action menu should define one item. The menu line's item may reference a navigation option or a sub-menu (which in turn defines one or more lines with menu items that define navigation options). Use the **Page Action Menu** portal option to associate the menu with the portal. More than one page action menu option may be defined. If the lines on the referenced menus define navigation options, they are shown as distinct buttons. If any line references a sub-menu, then an action menu is shown, using the description on the menu line.

> **Note**
>
> Standard menu security is checked. For any menu item in any of the page action menus defines an application service / access mode, you only see the action if you have security.

Advanced Configuration for Portal Title / Tabs

You may configure your portal to provide additional information to be displayed either in the portal's Page Title Area or in the tab area.

Information String. If the portal is configured to display a single record, you can configure the **Page Info FK Reference** portal option to include the FK reference for the related maintenance object. The system will automatically display the information string for the FK reference when viewing a record on this type of portal.

Advanced Title Configuration. You may provide a service script in the **Enhanced Page Title** portal option to override the page title or to add additional information to be displayed. The service script should include the data area F1PageTitleDetails. Refer to the detailed description of the data area for more information on what the service script can return. This option may only be configured on the standalone ("main") portal, but the information is visible on any of the portal tabs.

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Scorecard Configuration. For portals that are configured with the role of Dashboard, you may configure a scorecard for each tab in the portal. To do this, you provide a service script in the **Scorecard** portal option. The service script should include the data area F1ScorecardDetails. Refer to the detailed description of the data area for more information on what the service script can return. If the dashboard has multiple tabs, if any of the tabs configure a scorecard service script, all tabs must configure one.

Portal Banners

Important messages related to the context of a page may be displayed in the form of banners presented in the title area. For example, a customer dashboard may show a banner message alerting the agent of an existing outage along with the ability to view outage details in a drawer.

These messages are composed by a script referenced on a **Portal Banners** portal option. Banner messages may be associated with various severity levels and optionally support related actions. The option is defined for the main tab of the portal and applies to the entire page.

The product provides a generic 'Portal Banners by Insight Class' (F1BannesInst) script that composes messages based on insights for an insight class and a given context. Using this script allows banners for a portal to be configurable by the customer.

Portal Templates

When defining a portal with the portal role of **Dashboard**, you may optionally choose a **UI Template**. The UI templates define a predefined layout. You simply need to choose the zones that you wish to include and the template will render the zones based on the template's configuration.

User Preferences

A **Standalone** portal includes configuration to indicate whether or not the portal should appear on a user’s portal preferences. The portal will not appear on the user's portal preferences if the **Show on Portal Preferences** setting is set to No. Note that an implementation may change this value for a product delivered portal. This setting is typically enabled for a portal that provides disparate information where not all zones are applicable to all users or where users may wish to adjust the order of the zones. An example of a portal enabled for portal preferences is the Sidebar portal.

The user can override zone oriented configuration for the portal:

- Which zones appear on that portal
- The order in which the zones appear
- Whether the zones should be initially collapsed when the portal opens.
- The refresh seconds. This is applicable to zones displaying data that changes often.

An implementation can optionally configure the system to define portal preferences on one or more "template" users. When a template user is linked to a "real" user, the real user's preferences are inherited from the "template" user and the "real" user cannot change their preferences. Some implementations opt to work this way to enforce a standard look and feel for users in the same business area.

Refer to User — Portal Preferences for more information about how users configure their zones.

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View Detail Drawers

A zone may be designed to display related extended information in a drawer. This type of zone is designed and implemented like any other zone. It is recommended to associate it with the 'View Details Drawer' role for reporting purposes.

View detail zones can be configured as follows:

- **Portal panels.** An optional list of 'view detail' zones can be defined as part of a portal's zone configuration. These zones are not rendered as part of the portal's layout. Instead, they represent groups of zones to be presented in a drawer upon user request. A 'view detail' zone is associated with a **Panel Name** which represents a uniquely named drawer content. When the panel name is launched all zones that belong to that panel are presented in the drawer area in sequential order.
- **Not related to a portal.** A zone can be launched directly into a 'view detail' drawer, without being listed on any portal. This technique is used when the zone displays information that is not specific to the current portal. For example, the Knowledge Article drawer may be launched from any portal that supports a default knowledge article.

The product supports small, medium and large drawer sizes. When launched as a panel, the largest drawer size setting of all panel zones is used. When a zone is directly launched, not via an association to a panel, the width of the zone sets the drawer width.

A drawer may be launched from another drawer, forming a nested display of panels.

Support for launching a drawer is available from a display UI map, a data explorer column, and a chart. Refer to Launch a View Details Drawer for more information.

> **Note**
>
> Drawers may not be launched from the Sidebar and Assistant areas.

View Entity Drawer

In some pages, the product supports the ability to review an entity's information in a drawer without navigating to the entity's page.

The default drawer for viewing an entity's information may be dynamically determined using the **View Entity Drawer** maintenance object or business object option. If a business object option exists it overrides the maintenance object option if any. When applicable, you may use these options to override the 'view details' zone used by the product an entity. To do so, implement your custom 'view detail' zone and reference it as an option with a higher sequence number.

This feature is only available in select pages. By default, a link to an entity navigates to its portal, and does not launch the entity's view details drawer. To implement such functionality in a custom user interface, refer to product examples that use the 'Get Drawer Zone for an Entity' (F1GetDrwEnt) script.

Removing Zones From Portal

You cannot remove a base product zone from a base product portal. An implementation may override the **Display** setting to prevent a zone from displaying on the portal. In addition, you cannot remove a zone if a user has enabled it on their portal preferences. To remove a zone from the portal list, first make sure that no user has it enabled in their portal preferences.

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Granting Access to A Portal

An application service is associated with each portal. A user must be granted access rights to the respective application service in order to see a portal.

When you add a new **Standalone** portal, the system automatically creates its application service behind the scenes and displays it as part of the portal definition. You'll need to use this application service to grant access to the portal. **Tab Page** portals do not have separate security access. If a user has access to the main stand-alone portal, then the user will have security access to all its tabs.

Please note the following in respect of how application security impacts a user's portals:

- A user's Portal Preferences page only shows the portals configured to show on user preferences and where they have security access.
- The system's menus only show portals to which a user has security access.
- Users can set up favorite links to all portals, but they must have security rights to the portal's application service in order to invoke the favorite link.

Granting Access to Zones

An application service is associated with each zone. A user must be granted access rights to the respective application service in order to see a zone on a portal. Refer to The Big Picture Of Application Security for information about granting users access rights to an application service.

Please note the following with respect to zone application security:

- For most base product portals, all the zones for all the portals reference the same application service that is used to grant access to the portal. In other words, if the user has access to the page, then the user has access to all the zones on all portals for the page. There may be exceptions to this rule for certain portals.
- For a base product multi-query zones, typically the individual query zones and the multi-query zone reference the same application service that is used to grant access to the main (standalone) portal for the page. However, there may be individual query zones provided with a unique application service. This may occur when the query option is unusual and not applicable to all users or even to all implementations. If a user does not have security access to an individual query zone, that option will not be available in the dropdown.
- For base product portals that are configured to show on portal preferences, it is common that the portal contains different types of zones that may be applicable to different types of users. Typically these types of portals will deliver a unique application service for each zone so that an implementation may configure which user groups are allowed to view each zone. For these types of portals, please note the following:
  - A user's Portal Preferences page contains a row for a zone regardless of whether the user has access rights to the zone. Because of this, the system displays an indication of the user's access rights to each zone.
  - If a user's access rights to a zone are revoked, the zone will be suppressed when the user navigates to the respective portal.
  - Revoking a user's access rights does not change the user's portal preferences (i.e., a user can indicate they want to see a zone even if they don't have access to the zone - such a zone just won't appear when the respective portal appears).

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Putting Portals on Menus

When you add a new **Standalone** portal, the system automatically creates its navigation option behind the scenes and displays it as part of the portal definition. You'll need to use this navigation option to add the portal to a menu or to allow any other type of navigation method to the portal.

To add a portal to a menu, you must add a menu item to the desired menu and reference the portal's navigation option on the new menu item. A portal's navigation option can appear on any number of menu items (i.e., you can create several menu items that reference the same portal).

Your users can set up their preferences to include the portal's navigation option on their Favorite Links. This way, they can easily navigate to the portal without going through menus.

Portal Options

Portal options are used to enable various features available for each portal. Several are mentioned in previous sections in this topic. Review the detailed descriptions of each portal option to understand what other features are available.

> **Note**
>
> **You can add new option types.** Your implementation may want to add additional portal option types. To do that, add your new values to the customizable lookup field `PORTAL_OPT_FLG`.

Setting Up Portals and Zones

The topics in this section describe how to set up portals and zones. Please refer to The Big Picture of Portals and Zones for background information.

- Defining Zone Types
- Defining Zones
- Defining Context-Sensitive Zones
- Defining Portals

Defining Zone Types

A Zone Types represents a particular type of zone with a specific behavior. For example, a data explorer zone type is used to select data using a specific SQL statement and display the data based on parameter configuration. The zone type defines the Java Class that controls the behavior of the zone and defines the parameters that the Java Class supports. The base product supports many zone types used to build the portal / zone user interface. Implementations may introduce their own zone types.

> **Note**
>
> It is not very common for an implementation to introduce their own zone types.

Select **Admin**, and then **System**, and then **Zone Type** to maintain zone types.

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Description of Page

Specify an easily recognizable **Zone Type** code and **Description**. Use the **Detailed Description** to describe in detail what the zone type does.

> ⚠ **Caution**
>
> When adding new zone types, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

Owner indicates if this zone type is owned by the base product or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a zone type. This information is display-only.

Java Class Name is the Java class responsible for building the zone using the parameters defined below.

Two types of parameters are specified when defining a zone type:

- Parameter values that have a **Usage** of **Zone** are defined on the zones and control the functionality of each zone governed by the zone type. A **Usage** value of **Zone - Override Allowed** indicates that an implementation may override the parameter value for a base zone.
- Parameter values that have a **Usage** of **Zone Type** are defined directly on the zone type and control how the zone type operates (e.g., the name of the XSL template, the name of the application service). A **Usage** value of **Zone Type - Override Allowed** indicates that an implementation may override the parameter value for a base zone type.

The following points describe the fields that are defined for each parameter:

- **Sequence** defines the relative position of the parameter.
- **Parameter Name** is the name of the parameter.
- **Description** is a short description that allows you to easily identify the purpose of the parameter.
- **Comments** contain information that you must know about the parameter or its implementation. For parameters with a usage of **Zone** or **Zone - Override Allowed**, this information is visible to the user when viewing or defining this parameter for a zone of this type.
- **Usage** indicates whether the parameter value is defined in a **Zone** of this type or in the **Zone Type**. **Zone - Override Allowed** and **Zone Type - Override Allowed** indicate that override values for the parameters defined in a base zone or base zone type can be entered.
- **Required** is checked to indicate that a zone must define a value for the parameter. It is not checked if a value for the parameter is optional. This field is protected if the **Usage** is **Zone Type** or **Zone Type - Override Allowed**.
- **Parameter Value** is used to define the value of zone type parameters. This field is protected if the **Usage** is **Zone** or **Zone - Override Allowed**.
- **Owner** indicates if this parameter is owned by the base product or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a parameter. This information is display-only.

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Zone Type Parameter Comments

For the product owned zone type parameters, the parameter's detailed description provides the detail needed for properly configuring the parameter. For the Action parameters (IMPLEMENTOR_ACTION_n), the parameter description is abbreviated. Additional detail about configuring this parameter may be found in the Zone Action Parameter detailed information. The same details apply.

Defining Zones

This portal is used to view and maintain the configuration of a zone. Implementations may define custom zones or override the descriptions and some parameter values for base product zones.

You can access the portal from the**Admin Menu**, and then **System**, and then **Zone**. You are brought to a query portal with options for searching for a specific zone. Once a zone record has been selected you are brought to the maintenance portal to view and maintain the selected record.

> **Note**
>
> When introducing a new record, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

Refer to Understanding Portals and Zones for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Zone.** This zone provides general information about the selected zone.
- **Query Options.** This zone maintains the list of query options for a Multi-Query zone. The zone is only visible for Multi-Query zones.
- **Filters.** This zone maintains various zone parameters that handle filtering options for a data explorer zone. The zone is only visible for data explorer zones.
- **General Parameters.** This zone maintains various general purpose zone parameters for a data explorer zone.
- **SQLs.** This zone maintains individual SQLs and their related parameters. The zone is only visible for data explorer zones.
- **SQL Configuration.** This zone maintains all the zone parameters related to a specific data explorer SQL. The zone is only visible when a specific SQL is broadcast from the **SQLs** zone.

The following zones may appear as part of the portal's **References** tab page

- **Zone References.** This zone list various configuration entities referencing the current zone.
- Overriding Parameter Values
- Overriding Zone Parameters
- Zone Parameter Details
- Data Explorer Graph Configuration
- Pagination Configuration

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- Auto-filtering Configuration
- Use Data Explorer for Derived Data
- Configuring Timeline Zones

Overriding Parameter Values

Implementation teams may override the value of selected types of base provided zone parameters. The override parameter value field for base owned zone parameters is only enabled when the related zone type parameter usage is **Zone - Override Allowed**.

For multi-query zones, you may use the override parameter value to add custom query options to a base product owned zone.

Overriding Zone Parameters

Implementations may override the value of a base owned zone parameter only if the zone type definition allows such override. The override parameter value is enabled for a specific base owned parameter when the related zone type parameter usage is set to **Zone - Override Allowed**.

You may use the override parameter capability to provide alternative or additional custom query options for a base owned multi-query zone.

Zone Parameter Details

For most zone parameters, the embedded help for the parameter provides the detailed information needed for configuring the parameter values. For some parameters with very detailed descriptions, the embedded help is abbreviated and more detail is provided here.

- Zone Visibility Service Script
- SQL Statement
- Column Parameters
- Zone Action
- User Filters
- Hidden Filters
- Multi-Select Action

Zone Visibility Service Script

All zones support a visibility script that is used to determine if the zone should be displayed to the user or not based on conditions. The script may receive input parameters and is expected to return a Boolean value indicating if the zone should be displayed or not. The embedded help for the **Zone Visibility Service Script** parameter provides details related to the syntax.

The following table highlights some service scripts provided by the product that may be used if applicable to your zone's requirements. This is not an exhaustive list of visibility scripts. There may be others that are specific to a given zone.

Script Code	Description	Comments
`F1-ShldShwZn`	Zone Visibility - Display Zone in Portal	This script simply returns a value of 'true' and is used when the zone should always appear.

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Script Code	Description	Comments
F1-CondShwZn	Zone Visibility - Display Zone in Portal Conditionally	This is used when the condition for showing the zone is based on the population of a context value. This is commonly used when one zone in the portal should only appear after a broadcast of a record from another zone in the portal. For an example of a zone the uses this visibility script, refer to F1-BSFTYPE .
F1-RwCtShwZn	Zone Visibility - Based on Row Count	This is used when the condition for showing the zone is based on the existence of one or more rows that can be determined using SQL. This script accepts a zone code, user filters 1 through 25 and hidden filters 1 through 10. The script returns an indication of 'true' if at least one row count is returned by the zone. To use this visibility script, a specific data explorer zone must be developed for the specific use case. For an example of a zone the uses this visibility script, refer to F1-MIGRREQEL .

SQL Statement

Data explorer zones are used to select data to display using one or more SQL statements. The SQL parameters are applicable to the following zone types

- Info Data Explorer - Single SQL (F1–DE-SINGLE). The parameter has the description **SQL Statement**.
- Info Data Explorer - Multiple SQLs (F1–DE). The parameters follow the description pattern of **SQL Statement x**.
- Query Data Explorer - Multiple SQLs (F1–DE-QUERY). The parameters follow the description pattern of **SQL Statement x**.

> **Note**
>
> If your implementation has been configured to restrict the functions that may be used when defining an SQL then an error is issued at runtime if there are functions found that are not in the allowlist. The allowlist may be viewed using the **SQL function allowlist** link in the SQLs zone on the zone maintenance page.

> **Note**
>
> Zone SQL should take care not to use the following reserved keywords for the table alias. (For example, the table alias in this SQL is 'XX': SELECT 'X' FROM W1_ACTIVITY_TYPE **XX**.)

Keyword
AT

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The following table provides a list of SQL substituted keywords that may be used in the SQL Statement parameters in explorer zones. At execution time, the system determines the database and substitutes the keyword with the database specific syntax:

Keyword	Description	Examples
`@toCharacter()`	Converts the input to Character data type.	select **@toCharacter**(batch_cd) as batchCode from ci_batch_ctrl
`@toDate()`	Converts the input to Date data type.	select **@toDate**(last_update_dttm) as lastUpdateDate from ci_batch_ctrl
`@toNumber()`	Converts the input to Number data type.	select **@toNumber**(next_batch_nbr) from ci_batch_ctrl

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Keyword	Description	Examples
`@currentDate`	Fetches the current date.	select batch_cd, **@currentDate** as today from ci_batch_ctrl

> **⚠ Caution**
>
> The Oracle functions **SYSDATE** and `CURRENT_DATE` should not be used because they do not properly cater for adjusting dates from the database time zone to the installation time zone, if needed.

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Keyword	Description	Examples
`@currentTimestamp`	Fetches the current date / time. **⚠ Caution** The Oracle functions **SYSTIMESTAMP** and `CURRENT_TIMESTAMP` should not be used because they do not properly cater for adjusting the date / time from the database time zone to the installation time zone, if	select batch_cd from ci_batch_ctrl where last_update_dttm > **@currentTimestamp**

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Keyword	Description	Examples
	need ed.	
`@concat`	Combines the result list of two or more columns.	select batch_cd **@concat** next_batch_nbr concatNbr from ci_batch_ctrl
@substr(string, start)	**String** is the input String that you are trying to get a substring of. **Start** is the position of the character for the output results.	select batch_cd batchCode from ci_batch_ctrl Result: TESTCD select **@substr**(batch_cd,3) batchCode from ci_batch_ctrl Result: STCD
@substr(string, start, end)	**String** is the input String that you are trying to get a substring of. **Start** is the position of the character for the output results. **End** is the number of characters required in the output from starting position.	Select batch_cd batchCode from ci_batch_ctrl Result: TESTCD select **@substr**(batch_cd,3,2) batchCode from ci_batch_ctrl Result: ST
`@trim`	Trims the white spaces of the output on both sides.	select **@trim**(batch_cd) as batchCode from ci_batch_ctrl
The following syntax is related to 'fuzzy' searching. It is only applicable if Oracle DB Text is enabled and a context text index has been created. Refer to Advanced Search Options for more information.		
@fuzzy(string, score, numresult, 'weight')	**String** is the input value for the search. **Score** is the degree of 'fuzziness'. Valid values are between 1 - 80. The higher the number the more precise the search. Default is 60. **Numresults** is the number of variations to consider for the string. Valid values are between 1 and 5000. Default is 100. Indicate `'weight'` to signal that the results are returned in order of weight. Leave this setting off to indicate that the results are returned in order of score.	Set score to 70, number results to 6, and specify weight. select user_id, last_name from sc_user where contains(last_name, @fuzzy(:F1,70, 6, 'weight')) > 0
`@fuzzy(string)`	This returns a string result from the fuzzy expansion operation where the default value of 60 is assumed for the **score** and the default value of 100 is assumed for the **numresult**.	To use default values: select user_id, last_name from sc_user where contains(last_name, @fuzzy(:F1))> 0

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Keyword	Description	Examples
@fuzzy(string, score)	This returns a string result from the fuzzy expansion operation with the **score** specified and the default value of 100 for the **numresult**.	Set score to 70. select user_id, last_name from sc_user where contains(last_name, @fuzzy(:F1,70)) > 0
@fuzzy(string, score, numresult)	This returns a string resulted from the fuzzy expansion operation with the similarity score and the **numresults** specified.	Set score to 70, number results to 6. select user_id, last_name from sc_user where contains(last_name, @fuzzy(:F1,70, 6)) > 0

Column Parameters

Data explorer zones are used to select data to display using one or more SQL statements. For each SQL statement, the zone may configure up to 20 Columns that contain the formatting definition for displaying the output data.

These parameters are applicable to the zone types

- Info Data Explorer - Single SQL (`F1-DE-SINGLE`). The parameters follow the description pattern of **Column x**.
- Info Data Explorer - Multiple SQLs (`F1-DE`). For this zone type, all SQLs are executed and the zone displays a union of all the results. The parameters follow the description pattern of **Column x for SQL y**. There are some mnemonics that do not make sense to differ within rows of the same column. For example, the column label. For these mnemonics, only the value in SQL 1 is considered for that column. The table below indicates which mnemonics follow this rule.
- Query Data Explorer - Multiple SQLs (`F1-DE-QUERY`). For this zone type, only one SQL is executed. The **SQL y Condition** parameter may be used to control this. The system will execute the first SQL whose condition is satisfied (or with no condition populated). The parameters follow the description pattern of **Column x for SQL y**.

The following sections describe the various types of mnemonics.

Source Mnemonics

This table describe the mnemonics that control how the data in a column is derived.

Mnemonic	Description	Valid Values	Comments
`source=`	Defines how the column's value is derived.	`SQLCOL`	Indicates that the source of the column's value comes from a column in the SQL statement. This type of column must also reference the `sqlcol=` mnemonic.

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Mnemonic	Description	Valid Values	Comments
		BO	Indicates that the source of the column's value comes from a business object. This type of column must also reference the `bo=`, `input=` and `output=` mnemonics to define how to interact with the business object.
		BS	Indicates that the source of the column's value comes from a business service. This type of column must also reference the `bs=`, `input=` and `output=` mnemonics to define how to interact with the business service.
		SS	Indicates that the source of the column's value comes from a service script. This type of column must also reference the `ss=`, `input=` and `output=` mnemonics to define how to interact with the service script.
		FORMULA	Indicates that the source of this column's value is calculated using a formula. This type of column must also reference the `formula=` mnemonic.
		SETFUNC	Indicates that the source of this column's value is calculated using a superset of values from the rows in the SQL statement. This type of column must also reference the `setfunc=` mnemonic.

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Mnemonic	Description	Valid Values	Comments
		`ICON`	Indicates that the source of this column's value is a display icon reference (meaning that an icon will be displayed in the column). This type of column must also reference the `icon=` mnemonic to define the icon reference.

Note

When using this source mnemonic, the format

Mnemonic	Description	Valid Values	Comments
			ngmnemonic type = isnotapplicable.

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Mnemonic	Description	Valid Values	Comments
		FKREF	Indicates that the source of this column's value is an FK reference (meaning that the FK reference's context menu and information string will be displayed in the column and will be enabled for navigation). This type of column must also reference the `fkref=` and `input=` mnemonics to define how the FK reference is called.

> **Note**
>
> When using this source mnemonic, the

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Mnemonic	Description	Valid Values	Comments

formattingmnemonic type=isnotapplicable.

Note

Toshowaf

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Mnemonic	Description	Valid Values	Comments
			oreignkey's information button enable navigation, refer to Comm

Mnemonic	Description	Valid Values	Comments
			on Use Cases for the recommended technique.

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Mnemonic	Description	Valid Values	Comments
		SPECIFIED	Indicates that the source of this column's value is specified by concatenating literals and other column values. This type of column must also reference the spec= mnemonic. When constructing an HTML element for a web component or a function, the syntax may be slightly different for a data explorer column. Refer to UI Map Attributes and Functions for the appropriate syntax.
		MSG	Indicates that the source of this column is a message from the message table (along with any substitution variables). This type of column must also reference the msg= mnemonic.
sqlcol=	Defines the column in the SQL statement when source=SQLCOL.	COLUMN_NAME	Enter the name of a column that is retrieved in the SELECT statement. Note that if the select statement uses an alias for a column, then the alias should be referenced here.
		x	Where x is an integer value that references a column by its relative position in the SELECT statement. For example, sqlcol=3 would display the 3rd column in the SELECT statement).

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Mnemonic	Description	Valid Values	Comments
bo=	Defines the business object to invoke when source=BO. This mnemonic must be used in conjunction with the input= and output= mnemonics to define how information is sent to / received from the business object.	'Business Object Code'	
bs=	Defines the business service to invoke when source=BS. This mnemonic must be used in conjunction with the input= and output= mnemonics to define how information is sent to/received from the business service.	'Business Service Code'	
ss=	Defines the service script to invoke when source=SS. This mnemonic must be used in conjunction with the input= and output= mnemonics to define how information is sent to / received from the service script.	'Service Script Code'	

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Mnemonic	Description	Valid Values	Comments
`icon=`	Defines the icon to use when `source=ICON`.	Cx	This means the Display Icon code is defined in an earlier column. For example, define `C1` if column 1 defines the icon code value.
		COLUMN_NAME	This means the Display Icon code was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.
		'image'	This means the image file is defined directly. For example '/images/treeRootObject.gif'.
		'Display Icon Code'	This means the Display Icon code is defined directly. For example 'F1EDIT.
`fkref=`	Defines the FK reference used to retrieve the column's information when `source=FKREF`. This mnemonic must be used in conjunction with the `input=` mnemonic to define how information is sent to the FK reference to build the information.	Cx	This means FK reference code is defined in an earlier column. For example, define `C1` if column 1 defines the FK reference value.
		COLUMN_NAME	This means the FK reference was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.
		'FK Reference Code'	This means the FK Reference is defined directly. For example 'F1-ROLE'.
`formula=`	Defines the formula to use when `source=FORMULA`. Examples: • `formula=C1*.90/C2`	The formula can contain numeric constants, operators and column references.	For column references, use the format Cx where x represents the column number.

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Mnemonic	Description	Valid Values	Comments
	• `formula =(C1/ C2)*100`		Refer to Expression Parser for information about the functions supported.
`setfunc=`	Defines the function to apply to the rows of a given column when `source=SETFUNC`.	function(Cx)	Where Cx represents a column whose rows should have the function applied and the function is one of the following: • **MAX**. This derives the maximum value of all rows in the column. • **MIN**. This derives the minimum value of all rows in the column. • **TOT**. This derives the sum (total value) of all rows in the column. • **ACC**. This derives the cumulative total of all rows up to an including the current row.
`input=`	This is used to define one or more input fields and values passed to business objects, business services, service scripts, and FK references. The syntax is as follows: [ELEMENT_NAME=ELEMENT_REF ELEMENT_NAME=ELEMENT_REF ...] In other words, the list of input values is surrounded by square brackets separated by a space. Each passed value first defines the	Cx	Where Cx represents the value of a previous column. If the value to pass is in the first column, reference C1.
		COLUMN_NAME	This means the value to pass in was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.
		'literal value'	This means a literal value within the single quotes should be passed in.

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Mnemonic	Description	Valid Values	Comments
	ELEMENT_NAME, which is the name of the element / field in the target. ELEMENT_REF is the value passed in. The next column indicates the possible values for ELEMENT_REF.	`userTimeZone`	This means the current user's time zone should be passed in. This is typically used with the business service `F1-ShiftDateTime` to convert data in the storage time zone to the user's time zone for display.
		`installationTimeZone`	This means the installation time zone should be passed in. This is typically used with the business service `F1-ShiftDateTime` to convert data in the storage time zone to the installation time zone for display.
		Examples: • `input=[USER_ID=C1]` • `input=[USER_ID=USER_ID]` • `input=[input/targetTimeZone=userTimeZone]`	
`output=`	This is used to define the name of the element retrieved from the business object, business service or service script used to populate this column.	elementName	Example: `output=personInfo`
`pagingkey=`	This mnemonic is only applicable when the **Enable Paging** parameter has been configured. It indicates that this column is one of the keys used by the SQL statement to orchestrate paging through	`Y`	

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Mnemonic	Description	Valid Values	Comments
	results. This mnemonic can only be specified when the `source=SQLCOL`.	`N`	This is the default, meaning that you don't need to indicate `pagingkey=N` at all to indicate that the column is not one of the paging keys.

NOT_SUPPORTED

Refer to PaginationConfiguration f

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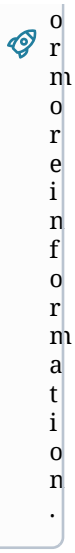
Mnemonic	Description	Valid Values	Comments
			

> **Note**
>
> If multiple columns are configured with the same source BO, BS or SS and the same input data, the system caches the output from the first call and reuses the results for subsequent columns.

Formatting Mnemonics

This table describe the mnemonics that control how a column is formatted.

> **Note**
>
> For the `F1-DE` zone type, zone displays the union of all the different SQLs.

Mnemonic	Description	Valid Values	Comments
`type=`	Defines how the column's value is formatted.	`STRING`	Columns of this type capture a string. This is the default value.
		`DATE`	Columns of this type capture a date and will be displayed using the user's display profile.
		`TIME`	Columns of this type capture a time (in database format) and will be displayed using the user's display profile.

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Mnemonic	Description	Valid Values	Comments
		`DATE/TIME`	Columns of this type capture a date and time (in database format) and will be displayed using the user's display profile.
		`MONEY`	Columns of this type capture a monetary field. This type of column may also reference the `cur=` mnemonic. If the cur mnemonic is not specified, the currency code on the installation record is used.

on and Foreign Key columns. The source= source mnemonic may be use

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Mnemonic	Description	Valid Values	Comments
		NUMBER ⓘ dtoindicateacolumnshouldbederivedfromanicon referenceoraf	Columns of this type capture a numeric field. This type of column may also reference the dec= mnemonic.

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Mnemonic	Description	Valid Values	Comments
		oreignkey(FK)referenceIfyouuseeitheroftheseresources,thet	

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Mnemonic	Description	Valid Values	Comments
		ype=mnemonicisnotrelevantaseitheranicononracontextmenu/in	

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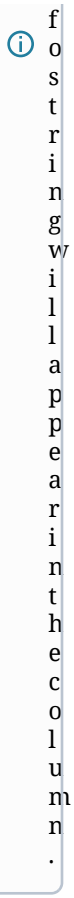
Mnemonic	Description	Valid Values	Comments
			
label=	Defines the column's override label. The label appears in the column's heading and in the zone's drag and drop area. If this mnemonic is not defined, the system uses the column's default label. The source of a column's default label differs depending on the column's source. Note that some sources don't have a default	FIELD_NAME	Enter a valid field name whose label should be used for the column label. This should always be the option used if multiple languages are needed.

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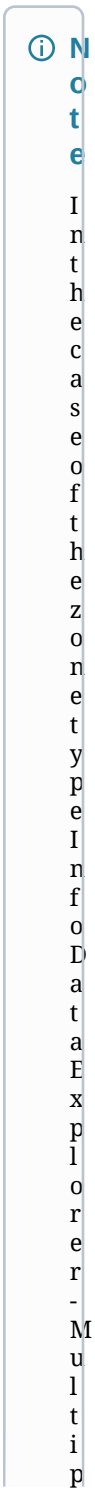
Mnemonic	Description	Valid Values	Comments
	value and omitting this mnemonic will result in a blank label.	'text'	Defines the text directly.



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Mnemonic	Description	Valid Values	Comments
		leSQLs(F1_DE), thesystemwillusethecolumndefinitionsinSQL1t	

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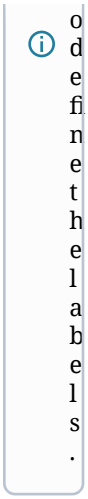
Mnemonic	Description	Valid Values	Comments
		 odefinethelabels.	
`cur=`	Defines the currency code applied when `type=MONEY` if the installation record's currency should not be used.	Cx	This means currency code value is defined in an earlier column. For example, define `C1` if column 1 defines the currency code.
		COLUMN_NAME	This means the currency code was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.
		'Currency Code'	This means the currency code is defined directly. For example 'USD'.

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Mnemonic	Description	Valid Values	Comments
`dec=`	Defines the number of decimal places when `type=NUMBER`. It is optional. If provided it should be an integer. If not provided, the number of decimals will default to the number of decimal places defined on the currency code specified on the installation record.	nR	Where n is the number of decimal places to show. Suffixing the number of decimal places with R means that the system should round up / down. Simply specifying n (without an R) means that decimal places should be truncated. For example, entering `dec=4` will display 4 decimal places and truncate the remainder.

Note

Formatting only. This mnemonic is only

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Mnemonic	Description	Valid Values	Comments
			used for formatting, it does not impact the precision used for subs

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Mnemonic	Description	Valid Values	Comments
			equentcalculations. For example, if a column retrieved from the

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Mnemonic	Description	Valid Values	Comments
			database contains 6 significant digits and dec=0, the column will be

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Mnemonic	Description	Valid Values	Comments
			show with decimal places (truncated), however any references

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Mnemonic	Description	Valid Values	Comments
			to the column in subsequent calculations will use 6 decimal places

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Mnemonic	Description	Valid Values	Comments
			. For example, if the column is referenced in a formula or set function

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Mnemonic	Description	Valid Values	Comments
			on, all 6 decimal places will be used.
`char=`	This mnemonic applies special character(s) to the column's value.	'x[]x'	Where x references the literal value to display and **[ ]** defines the relative position of the characters (before or after the value). You need only include the **[ ]** if you want to position characters in front of the value. For example, `char='%'` will place a percent sign after the value. If you want to position the word 'minutes' before a value, enter **char='minutes [ ]'**. If you want to output a value like **BUDGET $123.12 (YTD)**, enter **char='BUDGET [ ] (YTD)'**.

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Mnemonic	Description	Valid Values	Comments
`suppress=`	This is used to indicate a column should not be displayed. A column would be suppressed if it's only defined for use by subsequent columns, for example, if there is a formula that derives a column using two other columns. In this scenario, the columns referenced in the formula can be suppressed.	`true`	

Note

In the case of the zone type Inf

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Mnemonic	Description	Valid Values	Comments
		`false` Data Explorer-MultipleSQLs(F1_DE), the system will apply the s	This is the default, meaning that you don't need to indicate `suppress=false` at all to indicate that the field should be shown.

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Mnemonic	Description	Valid Values	Comments
		settingsforthecolumndefinitionsinSQL1toallsubsequentSQLs.	

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Mnemonic	Description	Valid Values	Comments
`suppressSearch=`	This is used to indicate a column should not be displayed when the zone is invoked in search mode only.	`true`	

Note

In the case of the zone type InfoDataExplorer-Mu

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Mnemonic	Description	Valid Values	Comments
		`false` ltipleSQLs(F1-DE), thesystemwillapplythesettingsforthecol	This is the default, meaning that you don't need to indicate `suppressSearch=false` at all to indicate that the field should be shown.

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Mnemonic	Description	Valid Values	Comments
		undefinitionsinSQL1toallsubsequentSQLs.	
`suppressExport=`	This is used to indicate a column should not be downloaded when exporting.	`true`	
		No	

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Mnemonic	Description	Valid Values	Comments
		`false` te In the case of the zone type InfoData Explorer-Multiple SQLs (F	This is the default, meaning that you don't need to indicate `suppressExport=false` at all to indicate that the field should be included in a download.

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Mnemonic	Description	Valid Values	Comments
		1 – DE), the system will apply the setting for the column definition	

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Mnemonic	Description	Valid Values	Comments
			sinSQL1toallsubsequentSQLs.

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Mnemonic	Description	Valid Values	Comments
`width=`	This is used to override the width of a column (number of pixels). The default value is the maximum width of any cell in the column.	n	Where n is a number between 0 and 999.

Note

If there is no available breaking point in the data, the co

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Mnemonic	Description	Valid Values	Comments
			lumn will be longer than the specified number of pixels. The length

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Mnemonic	Description	Valid Values	Comments
			f t h e c o l u m n ' s l a b e l (w h i c h a p p e a r s i n t h e c o l u m n ' s h e a d i n g) m a y a l

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Mnemonic	Description	Valid Values	Comments
			some the width wider than specified. In the case of the zone type In

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Mnemonic	Description	Valid Values	Comments
			for Data Explorer - Multiple SQLs (F1-DE), the system will set the wi

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Mnemonic	Description	Valid Values	Comments

dthbasedonthecolumndefinitionsinSQL1.

Mnemonic	Description	Valid Values	Comments
`color=`	This is used to override the column's text color.	A valid HTML "named" color	For example `color=yellow`.

Note

Refer to Color Contrast for information about the use of t

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Mnemonic	Description	Valid Values	Comments
			the HTML color 'red' and its impact on accessibility.
		A valid RGB color model combination	For example `color=#E0292F` or `color=#CCCCCC`. Note that the # is required.
`bgcolor=`	This is used to override the column's background color.	A valid HTML "named" color	Similar to the `color=` mnemonic.
		A valid RGB color model combination	Similar to the `color=` mnemonic.

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Mnemonic	Description	Valid Values	Comments
`order=`	Defines the column's default sort order.	ASC	Indicates that the order is ascending. This is the default meaning that it is not necessary to indicate `order=ASC`.
		DESC	Indicates that the order is descending.

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Mnemonic	Description	Valid Values	Comments
`rowHeader=`	Designates the column as a row header for accessibility purposes.	`true`	By default, the first data column of the data explorer results is identified as the row header, for accessibility tools. If the data in the first column does not uniquely identify the row, use this mnemonic to explicitly mark a different column or multiple columns as the row header.

Note

In the case of the zoneTypeInfo DataExplo

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Mnemonic	Description	Valid Values	Comments
			rer-MultipleSQLs(F1_DE),thesystemwilllookonlyatthecolumn

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Mnemonic	Description	Valid Values	Comments
			sinSQL1thathavethismnemonicdefinedandapplyittoallresultsf

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Mnemonic	Description	Valid Values	Comments
			orthosecolumns.

Click Mnemonics

This table describe the mnemonics that define whether a column value may be clicked and if so, what should happen.

Mnemonic	Description	Valid Values	Comments
`navopt=`	Defines the navigation option that references the target transaction or script when the user clicks a column. Note, this mnemonic should be used in conjunction with the `context=` mnemonic to define what information is sent to the navigation option's target transaction. This mnemonic is ignored if `source=FKREF` because the FK reference code defines the	Cx	This means navigation option code is defined in an earlier column. For example, define `C1` if column 1 defines the navigation option.
		COLUMN_NAME	This means the navigation option was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause. Example: `navopt=MAIN_PORTAL`

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Mnemonic	Description	Valid Values	Comments
	hyperlink's destination.	'Navigation Option Code'	This means the navigation option code is defined directly. For example `navopt='userMaint'`.
`context=`	This is used to define one or more context fields and values passed to the target navigation option to go along with the `navopt=` mnemonic. The syntax is as follows: [FIELD_NAME =FIELD_REF FIELD_NAME= FIELD_REF ...] In other words, the list of input values is surrounded by square brackets separated by a space. Each passed value first defines the FIELD_NAME, which is the name of the context field in the navigation option. FIELD_REF is the value passed in. The next column indicates the possible values for FIELD_REF.	Cx	Where Cx represents the value of a previous column. For example, if the value to pass is in the first column, reference `C1`.
		COLUMN_NAME	This means the value to pass in was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.
		'literal value'	This means a literal value within the single quotes should be passed in.
`bpa=`	Indicates that a BPA script should be executed with the user clicks the column	Cx	Indicates that the BPA script is defined in a previous column.

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Mnemonic	Description	Valid Values	Comments
	and indicates the BPA to execute. Note, this mnemonic should be used in conjunction with the `tempstorage=` mnemonic to define the temporary storage values that will be initiated when the script is executed. This mnemonic is ignored if `source=FKREF` because the FK reference code defines the hyperlink's destination.	COLUMN_NAME	This means the BPA script to execute was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.
		'BPA Script Code'	This means that the BPA script to execute is defined directly.
`tempstorage=`	This is used to define how temporary storage variables are initiated when the `bpa=` mnemonic is used. The syntax is as follows: [FIELD_NAME =FIELD_REF FIELD_NAME= FIELD_REF ...] In other words, the list of input values is surrounded by square brackets separated by a space. Each passed value first defines the FIELD_NAME,	Cx	Where Cx represents the value of a previous column. For example, if the value to pass is in the first column, reference `C1`.
		COLUMN_NAME	This means the value to pass in was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.

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Mnemonic	Description	Valid Values	Comments
	which is the name of the field in temporary storage. FIELD_REF is the value passed in. The next column indicates the possible values for FIELD_REF.	'literal value'	This means a literal value within the single quotes should be passed in.

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Mnemonic	Description	Valid Values	Comments
`list=`	This is used to enable work list capability for this column. You may optionally populate the `listdesc=` mnemonic to override the text that will be placed in the worklist zone.	`true`	Setting `list=true` will cause the work list icon to appear in the column's header. If a user clicks the column, it will populate all the rows in the output into the work list zone.

Note

In the case of the zone type InfoDataExplorer-M

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Mnemonic	Description	Valid Values	Comments
			multipleSQLs(F1-DE),theoutputmaybeshowingaunionoftheresul

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Mnemonic	Description	Valid Values	Comments
			tsoftmultipleSQLstatements.Inthiscase,ifsomeoftheSQLstate

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Mnemonic	Description	Valid Values	Comments
			ments configure a give column with list=true, but not all, only th

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Mnemonic	Description	Valid Values	Comments
			edata in the cells for the statements that configure this mnemonica

Mnemonic	Description	Valid Values	Comments

reputintotheworklistwhentheuserclickstheicon.Alsonotetha

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Mnemonic	Description	Valid Values	Comments
			t w h e n d e t e r m i n i n g w h i c h c o l u m n s s h o u l d h a v e t h e w o r k l i s t i c o n w h e

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Mnemonic	Description	Valid Values	Comments
			building the zone, the system only looks at the configuration for t

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Mnemonic	Description	Valid Values	Comments
			hecolumnsinSQL1.
`listdesc=`	This is an optional mnemonic when using the `list=` mnemonic. It can be used to override the text that is placed in the work list zone.	Cx	Where Cx represents the value of a previous column. For example, if the text to use is in the first column, reference `C1`.
`listbroadcast=`	Indicates that the broadcast information for the column is also to be made available in the work list zone. This means that the work list can be used to broadcast information to a portal in the same manner as a data explorer.	`true`	Use this setting to turn on the feature.

Common Use Cases

This section provides some common configuration that can be copied and pasted for newly created zones.

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Use Case	Code Snippet
Displaying the description of a lookup value that has been retrieved in the SQL statement. The business service checks for an override label.	**source=BS** **bs='F1-GetLookupDescription'** **label=FLD_NAME** **input=[fieldName='FLD_NAME' fieldValue=FLD_NAME]** **output=description**
Display a foreign key with its information but suppressing the navigation. (This is useful when you have a foreign key that is additional information in a zone but would cause confusion to enable navigation. To display foreign key reference with its information and enabled for navigation, use the source of FKREF as described above.) The first example assumes that you know the FK Reference. The second example uses a business service that receives the maintenance object as input.	**source=BS** **bs='F1-GetForeignKeyReference'** **input=[input/fkReference=FK_REF_CD input/fkValue1=BUS_OBJ_CD]** **output=output/infoDescription** **label=DESCR** **source=BS** **bs='F1-GetFKReferenceDetails'** **input=[input/maintenanceObject='F1-EXTLKUP' input/pkValue1=BUS_OBJ_CD input/pkValue2=C1]** **output=output/infoDescription** **label=DESCR**
Display a foreign key, including a corresponding navigation link, for generic objects that may or may not have a foreign key reference. If the FK reference exists, its information is shown, otherwise not. Standard foreign key services assume all rows have foreign key details. The service script **F1FKInfoOpt** provides the same foreign key details but does not error when foreign key details do not exist. To build the foreign key description and link, the script needs to be used twice; one column gets the navigation details and another gets the description. The latter references the navigation details column and invokes a BPA script to perform the dynamic navigation.	This column gets the navigation details: **source=SS** **ss='F1FKInfoOpt'** **input=[input/fkReference=C9 input/fkValue1=C6 input/fkValue2=C7]** **output=output/navigationOption** **suppress=true** This column constructs the foreign key description and link: **source=SS** **ss='F1FKInfoOpt'** **input=[input/fkReference=C9 input/fkValue1=C6 input/fkValue2=C7]** **output=output/infoDescription** **label=F1_APPSEC_COMP_DESCR** **bpa='F1ApsecNav'** **tempstorage=[navopt=C15 pkField1=C10 pkValue1=C6 pkField2=C11 pkValue2=C7]** **list=true**

Zone Action

Most zone types provided by the product allow for one or more Zone Actions to be defined to appear in the zone header. An action can appear as a hyperlink, icon or button. The action can also be provided as an HTML string.

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> **Note**
>
> Zone types also include parameters for actions defined at the zone type level using IMPLEMENTOR_ACTION_n (Action n) parameters. These are rarely used by the product zone types. The actions defined here override any actions defined on the zone type (if present). The details below apply to the zone type level actions as well.

A zone action is defined using the following mnemonics:

Mnemonic	Description	Valid Values	Comments
`type=`	This mnemonic defines the appearance of the action in the zone header.	**LINK**	Indicates that the action is shown as a textual hyperlink.
		ICON	Indicates that the action is shown as a graphical icon.
		BUTTON	Indicates that the action is shown as an HTML button.

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Mnemonic	Description	Valid Values	Comments
		ASIS	Indicates that the parameter will provide the HTML to be used for the action.
`action=`	This mnemonic defines the action to take when the link/icon/button is clicked. This is ignored when the type=ASIS.	**NAVIGATION**	Indicates that the action is navigation to a page.
		SCRIPT	Indicates that the action is to run a BPA script.
`navopt=`	Defines the navigation option to use when the `action=NAVIGATION`.	'NAV_OPT_CD'	Enter a reference to a valid navigation option in single quotes.

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Mnemonic	Description	Valid Values	Comments
`bpa=`	Defines the script to run when the `action=SCRIPT`.	'SCRIPT_CD'	Enter a reference to a valid BPA script in single quotes.
`icon=`	Indicates the icon to use when `type=ICON`.	DISP_ICON_CD	Enter a reference to a valid display icon.
		'path'	Enter an explicit path to the icon, for example 'images/gotoZone.gif'.
`asis=`	This is required when the `type=ASIS`. This provides the ability to precisely define the HTML you wish to have included in the header. All valid HTML is permitted including the use of "ora" css classes and JavaScript functions.	['HTML']	

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Mnemonic	Description	Valid Values	Comments
label=	By default, the label or tooltip will come from the navigation option or BPA script description. Use this mnemonic to override that label.	FIELD_NAME	Enter a valid field name whose label should be used. This should always be the option used if multiple languages are needed.
		'text'	Enter the text directly in single quotes.

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Mnemonic	Description	Valid Values	Comments
`context=`[target1=source1 target2=source2]	This is used to pass context data when navigating to a page or executing a BPA script. The mnemonic supports passing multiple values. In each case the target context field or BPA script variable is defined first followed by an equal sign, followed by source data defined using one of the valid values defined in the next column. One or more values may be defined. Each context value is defined separated by spaces. The whole set of context values should be surrounded by square brackets.	FIELD_NAME	Indicates that the value should be taken from the field with this name from portal context, global context or the page data model. The mnemonic sourceLoc is used for defining the source.

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Mnemonic	Description	Valid Values	Comments
		xpath	Indicates that the value should be taken from a schema field, represented by the Xpath, displayed in this zone. This is valid when the zone is displaying a UI Map.
		'constant'	Indicates that the value defined in single quotes should be passed.
sourceLoc=	This mnemonic defines the source of the FIELD_NAME's value in the context mnemonic. If this mnemonic is left blank, the default behavior is as follows: - The portal context is checked.	G	Indicates that the field's value is retrieved from the global context.

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Mnemonic	Description	Valid Values	Comments
	- If no portal context value is found, the global context is checked. - If neither value is available, the field is ignored.	P	Indicates that the field's value is retrieved from the portal context.
		D	Indicates that the field's value is retrieved from the page data model.
class=	Use this mnemonic to override the look and feel of the link / icon / button using a different CSS style.	'className1' 'className2'	Enter one or more classes in single quotes. Multiple class names may be provided.
style=	Use this mnemonic to override the look and feel of the action element using the indicated css style.	Standard style= format.	All allowed css style definitions may be used.

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Mnemonic	Description	Valid Values	Comments
vss=	This mnemonic, along with **vinput**= and **voutput**=, may be used to conditionally hide the action. Use this mnemonic to define the service script responsible for determining wherher the action should be visible or not.	'SCRIPT_CD'	Enter a reference to a valid service script in single quotes.
vinput=[target1=source1 target2=source2]	This is used to pass input data to the visibility script. The mnemonic supports passing multiple values. In each case the target field is defined first followed by an equal sign, followed by source data defined using one of the valid values defined in the next column.	FIELD_NAME	Indicates that the value should be taken from the field with this name from portal context.
	One or more input values may be defined. Each value is defined separated by spaces. The whole set of values should be surrounded by square brackets.	'constant'	Indicates that the value defined in single quotes should be passed.

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Mnemonic	Description	Valid Values	Comments
voutput=	Use this mnemonic to define the XPath name of a Boolean element set by the visibility script indicating whether to show the action or not.	xpath	If the visibility script sets the element to true the action is visible. If it is set to false the action is not visible.

Examples:

- **type=BUTTON action=SCRIPT bpa='F1-SET-USER' context=[USER_ID=USER_ID] label=UPDATE_LBL**
- **type=LINK action=NAVIGATION navopt='gotoUser' context=[USER_ID=path(schema/userdId)]**
- **type=LINK … vss='F1BtrActVis' vinput=[batchControl=BATCH_CD batchNumber=BATCH_NBR batchRerunNumber=BATCH_RERUN_NBR batchRunAction='CLOSE_PARMS'] voutput=showAction**
- **type=ASIS asis=['<A class="oraLink" href="www.google.com">Search']**

> **Note**
>
> If the zone type has actions defined and there is a desire to simply remove the zone type actions, the Zone Action can be set with the following configuration: **type=ASIS asis=[]**

User Filters

Data explorer zones include the ability to define User filters to allow a user to enter data to restrict the zone's rows and / or columns. The filters may be defined individually using User Filter parameters 1–25. Alternatively, a UI map may be defined for capturing filters. In this case, the map's input fields must be associated with the zone's filters by specifying the **xpath=** mnemonic on the respective User Filter parameters.

These parameters are applicable to the zone types

- Info Data Explorer - Multiple SQLs (F1-DE)

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- Query Data Explorer - Multiple SQLs (`F1-DE-QUERY`)
- Info Data Explorer - Single SQL (`F1-DE-SINGLE`)

A user filter is defined using the following mnemonics:

Mnemonic	Description	Valid Values	Comments
`name=`	This mnemonic is used if the zone's filter should be pre-populated with a value from global context, portal context or broadcast from another zone.	MD Field Name	
`datasource=`	This mnemonic defines the source of the filter's pre-populated value defined in the name mnemonic. If this mnemonic is left blank, the default behavior is as follows: - If the field has been broadcast from another zone, the broadcast value is used. - If no value is broadcast, the portal context is checked to determine if this field exists (if so, its value is taken). - If still no value, the global context is checked. - If still no value, no default value is shown.	`G`	Indicates that the zone should look for the filter value in global context.
		`P`	Indicates that the zone should look for the filter value in portal context.
		`D`	Indicates that the zone should look for the filter value in the page data model.
`type=`	Defines the visual metaphor used to capture the filter values.	`DATE`	Filters of this type capture a date.
		`DATE/TIME`	Filters of this type capture a date and time.

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Mnemonic	Description	Valid Values	Comments
		STRING	Filters of this type capture a string
		MONEY	Filters of this type capture a monetary field. This type of filter must also reference the cur mnemonic.
		NUMBER	Filters of this type capture a numeric field. This type of filter may also reference the decimals mnemonic.
		LOOKUP	Filters of this type capture a lookup value. This type of filter must also reference the lookup mnemonic.
		TABLE	Filters of this type capture an administrative table's value (code and description). This type of filter must also reference the table mnemonic.
		CHARTYPE	Filters of this type capture predefined characteristic values for a characteristic type (code and description). This type of filter must also reference the chartype mnemonic.
		ASIS	Filters of this type capture a list of values to be referenced within an 'IN' clause within the SQL statement.
label=	Defines the filter's label that appears in the zone's description bar and in the input area.	MD Field Name	Enter a valid field name whose label should be used for the filter label. This should always be the option used if multiple languages are needed.
		'text'	Defines the text directly.

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Mnemonic	Description	Valid Values	Comments
cur=	Defines the currency code applied when type=MONEY.	Currency Code	Enter a reference to a valid currency code.
dec=	Defines the number of decimal places when type=NUMBER.	Valid number	It is optional. If provided it should be an integer. If not provided, the number of decimals will default to the number of decimal places defined on the currency code specified on the installation record.
lookup=	Defines the lookup flag whose values appear when type=LOOKUP.	Lookup Field Name	Enter a reference to a valid lookup field name.
table=	Defines the admin table whose values appear when type=TABLE.	Table Name	Enter a reference to a valid control table name.
chartype=	Defines the characteristic type code whose values appear when type=CHARTYPE.	Char Type code	Enter a reference to a valid characteristic type code.
xpath=	This mnemonic is used in conjunction with a Filter Area UI Map. For each filter, you must specify the XPath to the corresponding UI map schema element.	XPath	The type= mnemonic must also be appropriate for the map's input field, otherwise the query's SQL could fail.
likeable=	This mnemonic defines if a likeable search is performed on the entered value when type=STRING.	S	The query will add % to the suffix of the filter value.
		P	The query will add % to the prefix of the filter value.

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Mnemonic	Description	Valid Values	Comments
		PS	The query will add % to the prefix and suffix of the filter value.
divide=	The mnemonic controls if a divider line appears above and/or below the filter. Note, you can specify this parameter twice if you want divider lines placed above and below a filter, e.g., **divide=above divide=below**.	above	This results in a divider line placed above the filter.
		below	This results in a divider line placed below the filter.
searchField=	This mnemonic controls the initial population of the filter when the zone is launched as a search from a UI map.	MD Field Name	Enter the field name that exactly matches the searchField name specified in the oraSearchField HTML element in the UI map.

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Mnemonic	Description	Valid Values	Comments
`oraSearchFilter`	This mnemonic is only applicable when the zone is used as a foreign key search. It indicates that this filter is the one that the user is prompted for in the auto-filtering functionality. No additional values are needed.		

Note

Be sure that filters that include this m

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Mnemonic	Description	Valid Values	Comments
		nemonicalsodefinea'label='mnemonicsothatttheautto-filteringp	

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Mnemonic	Description	Valid Values	Comments
		rompt shows the label. If no label is defined, the user sees the generer	

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Mnemonic	Description	Valid Values	Comments
		iterm'Filter'.	

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Mnemonic	Description	Valid Values	Comments

`encrypt=`	This mnemonic defines if the user filter is encrypted and needs to be searched by hashed value.	[TBL_NAME,FLD_NAME,WHERE_FLD,WHERE_VALUE]	A valid table name and field name are required.
			The WHERE_FLD and WHERE_VALUE are optional, but if entered, both are required. Use this to only encrypt the field if another field has a certain value. The following is an example.
			`encrypt=[CI_PERSON,PER_ID_NBR,ID_TYPE_NBR,'SSN']`
			. The WHERE_VALUE may also reference another filter. The following is an example.
			`encrypt=[CI_PERSON,PER_ID_NBR,ID_TYPE_NBR,F1].`
			Note: The field name referenced here should be the source value

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Mnemonic	Description	Valid Values	Comments
			eofthefield.However,theSQLshoulduse thehashedvalueinitsfilt

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Mnemonic	Description	Valid Values	Comments
			er.

Examples:

- `label=F1_NBR_DAYS type=NUMBER`
- `label=F1_SHOW_ALL_REQ_FLG type=LOOKUP lookup=F1_SHOW_ALL_REQ_FLG`
- Filter value where a Filter UI Map is defined and Description is one of the filters. `type=STRING xpath=description likeable=S`
  - `type=STRING label=DESCR likeable=S divide=below`
  - `label=REQ_TYPE_CD type=TABLE table=F1_REQ_TYPE`

Hidden Filters

Data explorer zones include the ability to define Hidden filters to restrict the rows and / or columns that appear in the zone. The following are the potential sources of a hidden filter's value:

- The global area contains the fields whose values are maintained in global context.
- The portal area contains the fields describing the object currently displayed in a portal.
- Other zones on a portal can broadcast information to the portal area, which can then in turn be used by the zone as a hidden filter.

These parameters are applicable to the zone types

- Info Data Explorer - Multiple SQLs (`F1-DE`)
- Query Data Explorer - Multiple SQLs (`F1-DE-QUERY`)
- Info Data Explorer - Single SQL (`F1-DE-SINGLE`)

A hidden filter is defined using the following mnemonics:

Mnemonic	Description	Valid Values	Comments
`name=`	This mnemonic defines the name of the field that needs to be broadcast from other zones or populated in the portal context	FIELD_NAME	

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Mnemonic	Description	Valid Values	Comments
datasource=	This mnemonic defines the source of the hidden filter's value. If this mnemonic is left blank, the default behavior is as follows: - If the field has been broadcast from another zone, the broadcast value is used. - If no value is broadcast, the portal context is checked to determine if this field exists (if so, its value is taken). - If still no value, the global context is checked. - If still no value, the zone appears as per the poprule mnemonic.	G	Indicates that the zone should look for the filter value in global context.
		P	Indicates that the zone should look for the filter value in portal context.
		D	Indicates that the zone should look for the filter value in the page data model.
poprule=	This mnemonic controls what happens if the hidden filter is not present.	R	Indicates that a value for the filter is required. The zone will be set to the "empty state" and the "please broadcast" message will appear in the zone. This is the default value.

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Mnemonic	Description	Valid Values	Comments
		0	Indicates that the value is optional. If no value is required, the zone is still built without that value.
type=	Defines the visual metaphor used to capture the filter values.	**DATE**	Filters of this type capture a date.
		DATE/TIME	Filters of this type capture a date and time.
		STRING	Filters of this type capture a string
		MONEY	Filters of this type capture a monetary field. This type of filter must also reference the cur mnemonic.
		NUMBER	Filters of this type capture a numeric field. This type of filter may also reference the decimals mnemonic.
		LOOKUP	Filters of this type capture a lookup value. This type of filter must also reference the lookup mnemonic.

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Mnemonic	Description	Valid Values	Comments
		TABLE	Filters of this type capture an administrative table's value (code and description). This type of filter must also reference the table mnemonic.
		CHARTYPE	Filters of this type capture predefined characteristic values for a characteristic type (code and description). This type of filter must also reference the chartype mnemonic.
		ASIS	Filters of this type capture a list of values to be referenced within an 'IN' clause within the SQL statement.
`label=`	Defines the filter's label that appears in the zone's description bar.	FIELD_NAME	Enter a valid field name whose label should be used. This should always be the option used if multiple languages are needed.
		'text'	Defines the text directly.

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Mnemonic	Description	Valid Values	Comments
cur=	Defines the currency code applied when type=MONEY.	CURRENCY_CD	Enter a reference to a valid currency code.
dec=	Defines the number of decimal places when type=NUMBER.	N	It is optional. If provided it should be an integer. If not provided, the number of decimals will default to the number of decimal places defined on the currency code specified on the installation record.
lookup=	Defines the lookup flag whose values appear when type=LOOKUP.	LOOKUP_FIELD_NAME	Enter a reference to a valid lookup field name.
table=	Defines the admin table whose values appear when type=TABLE.	TABLE_NAME	Enter a reference to a valid admin table name.
chartype=	Defines the characteristic type code whose values appear when type=CHARTYPE.	CHAR_TYPE_CD	Enter a reference to a valid characteristic type code.

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Mnemonic	Description	Valid Values	Comments
searchField=	This mnemonic controls the initial population of the filter when the zone is launched as a search from a UI map.	FIELD_NAME	Enter the field name that exactly matches the searchField name specified in the oraSearchField html element in the UI map.

Multi-Select Action

This parameter defines an action to be included in the action area for multi-selection processing. Note that a multi-selection action can only be used if the Multi Select parameter has been set to YES, which causes a checkbox to appear on each row displayed. The action defined here will trigger against all rows selected by the user via the checkbox.

These parameters are applicable to the zone types

- Info Data Explorer - Multiple SQLs (F1–DE)
- Query Data Explorer - Multiple SQLs (F1–DE-QUERY)
- Info Data Explorer - Single SQL (F1–DE-SINGLE)

A multi select action has the following mnemonics:

Mnemonic	Description	Valid Values	Comments
script=	This mnemonic defines the script to be invoked when the action is clicked. This is required.	SCR_CD	Enter a reference to a valid BPA script or Service Script.
type=	This mnemonic	**BUTTON**	The action is rendered as a button. This is the default.

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Mnemonic	Description	Valid Values	Comments
	defines how the action should be rendered.	**LINK**	The action is rendered as hypertext.
		ICON	The action is rendered as a graphic icon. For this option, the icon mnemonic is required.
`icon=`	This mnemonic defines the icon to display when `type=ICON`.	DISPLAY_ICON_CD	Enter a reference to a valid display icon code.
`refresh=`	This mnemonic indicates how and if a refresh should occur after the script completes.	**NO**	Indicates that no refresh is performed. This is the default.
		ZONE	Indicates that a refresh of the zone is performed.
		PORTAL	Indicates that a refresh of the entire portal is performed.
`label=`	By default, the button label, link text or icon toolti	FIELD_NAME	Enter a valid field name whose label should be used. This should always be the option used if multiple languages are needed.

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Mnemonic	Description	Valid Values	Comments
	p will come from the script description. Use this mnemonic to override that label.	'text'	Enter the text directly in single quotes.

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Mnemonic	Description	Valid Values	Comments
list=	When executing the script, the framework builds an XML list containing information from each row selected. This list must be defined in the script's schema and referenced in this mnemonic.	listElementName	Enter a valid list element name from the script schema.
context=[elementName1=rowData1 elementName2=rowData2]	This mnemonic is used to populate the list with the appr	Cx	Indicates that the element should be populated with a value in the referenced column parameter.

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Mnemonic	Description	Valid Values	Comments
	opriate information from each selected row. The mnemonic supports passing multiple values. In each case the element in the schema list is defined first followed by an equal sign, followed by information about the data used to populate the element defin	Px	Indicates that the element should be populated with a value in the referenced post processing parameter.
		COLUMN_NAME	Indicates that the element should be populated with a value from a column in the SQL statement.

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Mnemonic	Description	Valid Values	Comments
	ed using one of the valid values defined in the next column. One or more values may be defined. Each context value is defined separated by spaces. The whole set of context values should be surrounded by square brackets. Example of a	'constant'	Indicates that the value defined in single quotes should be passed.

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Mnemonic	Description	Valid Values	Comments
	schema: <schema> <accountInfo type="list"> <accountId/> <name/> <amount/> <process/> </accountInfo> </schema> Example of		

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Mnemonic	Description	Valid Values	Comments
	list and context mnemonics. `list=accountInfo` **context=[accountId=ACCT_ID name=C2 amount=P3 process='O']**		
`class=`	Use this mnemonic to override the look and feel of the action using a different CSS style.	'className1' 'className2'	Enter one or more classes in single quotes to be appended to the standard class(es). Multiple class names may be provided.

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Mnemonic	Description	Valid Values	Comments
`style=`	Use this mnemonic to override the look and feel of the action element using the indicated css style.	Standard style= format.	All allowed css style definitions may be used.

Data Explorer Graph Configuration

For some data explorer zones, it is more effective to display the results in a graphical form such as a pie or line chart. Visualization option parameters enable the graph configuration to be integrated with the data explorer zone that retrieves the data.

The visualization option parameters support three options:

- **Grid** - displays the data in a standard data explorer grid
- **Chart** - displays the data in the form of a chart
- **Map** - provides the ability to invoke a UI Map to display the data

Up to five visualization option parameters may be specified. One of the options must be the standard grid, allowing for a maximum of four graphical options. The zone will display icons corresponding to the visualization types to allow you to switch between the various views. These icons are presented in the same order are they are defined in the parameter list.

> **Note**
>
> If the only display option is a standard grid, it is not necessary to specify the grid as a visualization parameter.

Visualization option parameters are provided on the Info Data Explorer - Single SQL (`F1-DE-SINGLE`) and Info Data Explorer - Multiple SQLs (`F1-DE`) zone types.

Visualization Option Parameter Configuration

Mnemonics are used to define the attributes for an option type within the parameter value.

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For a **grid**, the mnemonic is ‘optiontype=GRID’. No other mnemonics are required.

For a **map**, the mnemonics are ‘optiontype=MAP map=MAP_CD schemaPath=xpath’, where ‘MAP_CD’ is the ID of the UI Map and ‘xpath’ is the schema path of the UI Map. In most use cases the schema elements will match the result set from the data explorer, in which case no schemaPath mnemonic is needed. If the UI Map schema has additional elements present, the schemaPath attribute will define the group node that the data explorer information will be copied into.

For a **chart**, the option type mnemonics is ‘optiontype=CHART’. This is followed by the appropriate chart configuration attributes, which are described in the section below.

Chart Configuration

The following attributes are used to configure a graphical representation of a set of data.

The ‘`oraChart:`’ attribute defines the type of graph to display and its general configuration. The set of configuration parameters available for this attribute are as follows:

Parameter	Values	Description

`type:`	`pie`
	`stacked`
	`cluster`
	`line`
	`area`
	`combo`
		Defines the type of chart to display.
		Required

`showLegend:`	`true` `false`	Defines if the chart should have a legend displayed. Optional (default is **true**)

`legendPosition:`	`left`
	`right`
	`bottom`
	`top`
		Defines where the legend should appear.
		Optional (default is **right**)
		Setting position to **left** or **right** will automatically render it vertically.
		Setting position to **top** or **bottom** will automatically render it horizontally.

`legendBorder:`	`true` `false`	Defines if the legend should display with a border around it. Optional (default is **false**)
`depth:`	`true` `false`	A value of **true** indicates a 3 dimensional depth for the chart. Optional (default **false**, which is a 2 dimensional chart)
`animate:`	`true` `false`	A value of **true** indicates that the graph should animate when displayed. Optional (default is **true**). When using large data sets, consider disabling animation.

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Parameter	Values	Description
`dataCursor:`	`on` `off`	A value of **on** enables hovering anywhere in the graph. Optional (default is **off**). It is not applicable to pie charts.
`orientation:`	`horizontal`	Defines the chart orientation. This only applies to bar, line, area, combo charts. E.g., `oraChart="type:cluster;orientation:horizontal"`, defines horizontal cluster chart. Optional (default is vertical).

The **oraChartSeries** attribute defines the source information for the graph. Most charts support 5 of these attributes, with the following mnemonics:

- `oraChartSeries1`
- `oraChartSeries2`
- `oraChartSeries3`
- `oraChartSeries4`
- `oraChartSeries5`

Stacked charts support an unlimited number of series by continuing to add attributes `oraChartSeries6` and above, but beware of performance implications and memory limits when using an excessively high number of series. All attributes are identical in format and accept the same parameters, as described below.

> **Note**
>
> All the charts require `oraChartSeries1`. Stacked, Cluster and Line charts may optionally include the additional series attributes (for multiple bars/lines).

If you define multiple series, then data must be provided for all series defined. The data amounts can be 0 (zero) but they have to be present in order for the chart to display correctly.

The set of configuration parameters available for the **oraChartSeriesN** attribute are:

Parameter	Values	Description
`list:`	XPath value	Defines the XPath to the list in the XML that contains the data to chart. Required only for HTML definitions in UI Maps. Data explorer values are derived from the columns for the zone.

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Parameter	Values	Description
`amount:`	Cn Pn XPath value	Defines the element containing the amount to chart. For data explorers, this will be a SQL or post-processing column identifier. For HTML definitions, the XPath of the element must be specified. Required
`xaxis:`	Cn Pn XPath value	Defines the element containing the x-axis data. For data explorers, this will be a SQL or post-processing column identifier. For HTML definitions, the XPath of the element is specified. Required for Stacked, Cluster, Line, Area and Combo charts.

`xaxisFormat:`	`date`
	`dateTime`
	`time`
	`localDate`
	`string`
		Defines the x-axis data format.
		If it is **date**, **dateTime** or **time** then the value is presented in the format as defined on the user's display profile.
		In case of **localDate** or **string** the data is displayed as is with no special formatting.
		Optional (Default is **date**).

`label:`	Text value	Defines the label for the amount being charted. Either this setting or `labelPath:` must be defined.
`labelPath:`	Cn Pn XPath value	Defines the element that provides the label for the amount being charted. For data explorers, this will be a SQL or post-processing column identifier. For HTML definitions, the XPath of the element must be specified. Either this setting or `label:` must be defined.
`currency:`	A valid Currency code	Defines the currency code for the amount being charted. Optional.
`currencyPath:`	Cn Pn XPath value	Defines the element that provides the currency code for the amount being charted. For data explorers, this will be a SQL or post-processing column identifier. For HTML definitions, the XPath of the element must be specified. Optional.

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Parameter	Values	Description
`hoverText:`	Text value	Defines the hover text for the chart element. Optional (A default hover text is always available.) Ignored if `hoverTextPath:` is defined. The following substitution variables are available. • `$label` This will be replaced with the label text as determined by the `label:` or `labelPath:` setting. • `$amount` This will be replaced with the amount text as specified by the `amount:` setting. • `$axis` This will be replaced with the x-axis text. • $% This will be replaced by the percentage "slice" of the pie or bar. • `$newline` This will force a line break. If the hover text defined contains any of the above values, they will be replaced by the equivalent text prior to being displayed. Example: `"hoverText:$label$newline$amount"`
`hoverTextPath:`	Cn Pn XPath value	Defines the element that provides the hover text for the chart element. For data explorers, this will be a SQL or post-processing column identifier. For HTML definitions, the XPath of the element must be specified. The hover text in the element can utilize all the substitution functionality described above in the `hoverText:` description. Optional.

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Parameter	Values	Description

`type:`	`bar`
	`line`
	`area`
		This attribute is used for the **combo** chart type only. It defines how each series on the **combo** chart should be presented.
		The following example defines a **combo** chart where one series is rendered as bars and another one as area.
		
		`oraChart="type:combo;" oraChartSeries1="xaxis:C3; label:C2; amount:C1;type:bar" oraChartSeries2="xaxis:C3; label:C2; amount:C1;type:area"`

`navOpt:`	A valid Navigation Option code.	Defines a navigation option to be activated when the chart element is clicked. Optional.
`navOptPath:`	Cn Pn XPath value	Defines the element that provides the navigation option to be activated when the chart element is clicked. For data explorers, this will be a SQL or post-processing column identifier. For HTML definitions, the XPath of the element must be specified. Optional Note that both `navOpt:` and `navOptPath:` may be configured. The `navOptPath:` navigation option is processed first. If a value is found it is used, otherwise the value in the `navOpt:` setting is used. This means that the chart definition can include a default navigation option and a navigation option present in the data will override it.

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Parameter	Values	Description
`key:`	Cn Pn XPath value	Defines the element that contains the key field data to be used in a navigation option. For data explorers, this will be a SQL or post-processing column identifier. For HTML definitions, the XPath of the element must be specified. This is required if either `navOpt:` or `navOptPath:` is defined. **Note** Only one key field can be configured for a navigation option.
`script:`	A BPA script name	Defines a BPA script to be activated when the chart element is clicked. Optional When a script is executed, all the elements from the chart data will be made available to the script as temporary variables.

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Parameter	Values	Description
`scriptPath:`	Cn Pn XPath value	Defines the element that provides the BPA script to be activated when the chart element is clicked. For data explorers, this will be a SQL or post-processing column identifier. For HTML definitions, the XPath of the element must be specified. Optional Note that both `script:` and `scriptPath:` can be configured. The `scriptPath:` script option is processed first. If a value is found it is used, otherwise the value in the `script:` setting is used. This means the chart definition can include a default script and a script present in the data will override it.

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Parameter	Values	Description
`color:`	HTML Color code / RGB value	Optional (default colors applied) Defines the color for the series. The format is a valid HTML color code, e.g. **green** or **blue**. All valid color names are defined in this link: http://www.w3schools.com/htmL/html_colornames.asp. Alternatively an RGB format may be used. (`00FF00` is green and `0000FF` is blue) **Note** Refer to Color Contrast for information about the use of the HTML color 'red' and its impact on accessibility.
`colorPath:`	Cn Pn XPath value	Defines the element containing a color for the series. For data explorers, this will be a SQL or post-processing column identifier. For HTML definitions, the XPath of the element must be specified. The valid formats as described in the `color:` setting apply. Optional (default colors applied)

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Parameter	Values	Description

`pieColors:`	HTML color code / RGB values	Defines the colors for the pie series. Any number of HTML color codes or RGB color values can be specified, separated by spaces. Examples:
		
		`pieColors: green blue`
		
		`pieColors: 00FF00 0000FF`
		
		Optional (default colors are applied if the series exceeds the values specified)

The `oraChartBroadcast=`attribute provides the ability to broadcast a value from a chart to the portal context. An unlimited number of fields can be broadcast, configured as name/value pairs; Broadcast is triggered by clicking on a corresponding section of the chart.

The syntax is as follows where FIELD_NAMEn is the name of the portal context field to be broadcast and Cn (or Pn) is the element that contains the data value to be broadcast.

```
oraChartBroadcast="FIELD_NAME1:C1;FIELD_NAME2:C2;"
```

For HTML definitions in UI Maps, ‘xpathn’ is the element in the list schema that contains the data value to be broadcast.

```
oraChartBroadcast="FIELD_NAME1:xpath1;FIELD_NAME2:xpath2;"
```

The `oraChartViewDetails=`attribute provides the ability to launch a view details drawer for an entry in a chart. The syntax is similar to launching a drawer from a UI map or a data explorer column but without rendering an icon. Refer to Launch a View Details Drawer for more information.

UI map examples:

```
oraChartViewDetails="detailPanelName:VIEWDET; USERID:x[user];"
oraChartViewDetails="detailPanelName:x[panelName]; USERID:x[user];"
```

Data explorer examples:

```
oraChartViewDetails="detailPanelName:VIEWDET; USERID:C1;"
oraChartViewDetails="detailPanelName:C2; USERID:C1;"
```

Zone Configuration Examples

Zone with a simple pie chart

In this example, the zone SQL summarizes To Do entries by Role. The column definitions are:

- C1 - role description

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- C2 - count of To Do entries by role
- C3 - role ID

Visualization Option 1

This option shows To Do entries by Role as a pie chart. The role ID will be broadcast to the portal when the corresponding section of the pie chart is clicked.

```
optiontype=CHART
oraChart="type:pie;"
oraChartSeries1="labelPath:C1; amount:C2;hoverText:$label$newline$amount;"
oraChartBroadcast="ROLE_ID:C3"
```

Zone with two chart types

In this example, the zone SQL summarizes To Do entries by Priority and also calculates separate counts by To Do status within priority. The column definitions are:

- C1 - priority description
- C2 - count of To Do entries by priority
- C3 - priority flag value
- C4 - count of Open To Dos by priority
- C5 - count of Assigned To Dos by priority
- C6 - Label for the Open To Dos bar in the cluster chart
- C7 - Label for the Assigned To Dos bar in the cluster chart

Visualization Option 1

This option shows To Do entries by Priority as a pie chart. The priority value will be broadcast to the portal when the corresponding section of the pie chart is clicked.

```
optiontype=CHART
oraChart="type:pie; legendBorder:true;"
oraChartSeries1="labelPath:C1; amount:C2;hoverText:$label$newline$amount;"
oraChartBroadcast="TD_PRIORITY_FLG:C3"
```

Visualization Option 2

This option shows To Do entries by Priority as a cluster chart with two data series, one for Open To Dos and another for Assigned To Dos . The corresponding priority value will be broadcast to the portal when clicking either the Open or Assigned bar of the cluster chart.

```
optiontype=CHART oraChart="type:cluster;  showLegend:true;"
oraChartSeries1="xaxis:C1; xaxisFormat:string; labelPath:C6;
amount:C4;hoverText:$label$newline$amount;"
oraChartSeries2="xaxis:C1; xaxisFormat:string; labelPath:C7;
amount:C5;hoverText:$label$newline$amount;"
oraChartBroadcast="TD_PRIORITY_FLG:C3"
```

Pagination Configuration

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The various data explorer zones in the product support the ability to configure pagination so that a user can 'page through' a large set of results using "previous" and "next" buttons or links.

There are several zone parameters that are impacted when attempting to configure this functionality. The following steps highlight the configuration.

- The **Enable Pagination** parameter must be configured to define the basic setup for pagination for the zone. This parameter defines whether the "previous" and "next" actions are defined as buttons, links or icons and indicates the location of the actions. It also allows an indication as to whether the additional rows are simply appended, rather than shown in a new "page". Refer to the parameter's embedded help for information about the specific syntax.
- It is recommended that the zone is configured with record count and page information by properly configuring the **Record Count Display** parameter. Refer to the parameter's embedded help for information about the specific syntax.
- Configure the **Number of Rows to Retrieve for SQL**. parameter to define the number of records displayed per page. If this parameter is not specified the value in the **Number of Rows to Display** parameter is used.
- Configure the key that will be used for paging so that the system can keep track of the 'page break'. The data must be sorted by the paging key; as a result, the decision for identifying the paging key must take into account the design for the zone and the data being displayed. In addition, the paging key must be unique to ensure that the page breaks occur correctly. See below for configuration examples.
  - The **SQL Statement** must includes additional clauses **PAGENEXT** and **PAGEPREV** based on the paging key. In addition, as mentioned above, the paging key must be used in the ORDER BY clause.
  - The SQL **Column** parameters must define the paging key mnemonic to be used in conjunction with the SQL statement paging clauses.
  - It is recommended to configure the **SQL Display Column** parameter to show the data in the same order as the ORDER BY clause.

The following zone types support this capability:

- Info Data Explorer - Single SQL (`F1-DE-SINGLE`).
- Info Data Explorer - Multiple SQLs (`F1-DE`). Note that zones of this type support a union of the results of all the SQL statements. As a result, pagination may only be enabled for zones of this type if a single SQL is used. The system is not able to keep track of the pagination across disparate SQL statements.
- Query Data Explorer - Multiple SQLs (`F1-DE-QUERY`).
- Multi Query Data Explorer (`F1-DE-MULQRY`). Zones of this type do not include configuration for SQL statements or column display. However, they do include configuration for the **Enable Pagination**. This parameter must be configured in order for pagination on the individual zones to work.

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> **Note**
>
> **Zones used for a Business Service.** Note that pagination is ignored when invoking a data explorer zone via a business service. In this scenario, the zone will return the first "chunk" of rows as defined by the Number of Rows parameters.
>
> **Zones with data visualization options.** Pagination is not supported for zones that define visualization options to show data in a graphical form.

Examples

Simple Paging Key

In this example, the Extendable Lookup Value is defined as Column 1 (C1) and is marked as the paging key. This field is unique for the table and works well as a simple paging key.

```
SELECT A.F1_EXT_LOOKUP_VALUE,A.BUS_OBJ_CD
FROM
  F1_EXT_LOOKUP_VAL A,
  F1_EXT_LOOKUP_VAL_L B
WHERE
A.BUS_OBJ_CD = :H1
AND A.BUS_OBJ_CD = B.BUS_OBJ_CD
AND A.F1_EXT_LOOKUP_VALUE = B.F1_EXT_LOOKUP_VALUE
AND B.LANGUAGE_CD = :LANGUAGE
[(F1) AND UPPER(A.F1_EXT_LOOKUP_VALUE) like UPPER(:F1)]
[(F2) AND ((UPPER(B.DESCR_OVRD) like UPPER(:F2))
OR (B.DESCR_OVRD = ' ' AND UPPER(B.DESCR) like UPPER(:F2)))]
[(PAGENEXT) AND A.F1_EXT_LOOKUP_VALUE > :C1]
[(PAGEPREV) AND A.F1_EXT_LOOKUP_VALUE < :C1]
ORDER BY A.F1_EXT_LOOKUP_VALUE
```

Complex Paging Key

Most queries however do not sort by a unique value. In this case, the paging key needs to be set based on the sorting of the query and should include a unique field, such as the primary key, as the last paging key. In this example, the query is showing results sorted by To Do Type, Role and User. All fields, including the To Do Entry ID (the primary key) are marked as paging keys.

```
SELECT TD_TYPE_CD, ROLE_ID, ASSIGNED_TO, ASSIGNED_DTTM, TD_PRIORITY_FLG,
TD_ENTRY_ID
FROM  CI_TD_ENTRY
WHERE
ENTRY_STATUS_FLG IN ('O', 'W')
[(F1) and TD_TYPE_CD = :F1]
[(F2) AND ASSIGNED_TO = :F2]
[(F3) AND ROLE_ID = :F3]
[(PAGENEXT) and ((TD_TYPE_CD>:C1) or (TD_TYPE_CD=:C1 and ROLE_ID>:C2) or
(TD_TYPE_CD=:C1 and ROLE_ID=:C2
and ASSIGNED_TO>:C3) or (TD_TYPE_CD=:C1 and ROLE_ID=:C2 and ASSIGNED_TO=:C3
AND TD_ENTRY_ID>:C4))]
[(PAGEPREV) and ((TD_TYPE_CD<:C1) or (TD_TYPE_CD=:C1 and ROLE_ID<:C2) or
(TD_TYPE_CD=:C1 and ROLE_ID=:C2
```


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```
and ASSIGNED_TO<:C3) or (TD_TYPE_CD=:C1 and ROLE_ID=:C2 and ASSIGNED_TO=:C3
AND TD_ENTRY_ID<:C4))]
ORDER BY TD_TYPE_CD, ROLE_ID, ASSIGNED_TO, TD_ENTRY_ID
```

Auto-filtering Configuration

Auto-filtering is the term used to describe functionality available in search fields where a user can type search text without having to open the search. Refer to Input Field with Search for examples of this feature. This section describes how to enable this feature and how to configure a search zone to enable this functionality.

The feature is opt-in. To turn on the feature, navigate to Feature Configuration. Search for an existing feature configuration with the Feature Type `Custom Look and Feel`. If one does not exist, create a feature configuration of this type. Select the `Enable Auto-Filtering` option and set the value to 'Y'.

The feature supports designating a single user filter in the zone as the one to expose to the user for auto-filtering. For example, when searching for a control table record, like To Do Type, the system configures the Description filter as the one that supports auto-filtering. For an object like Person, the person name filter may be the one that is configured for this feature.

To indicate the filter to support auto-filtering, add the mnemonic `oraSearchFilter` to the filter definition. For example, here is the configuration for the description user filter in the To Do Type search zone.

```
type=STRING label=DESCR likeable=S xpath=descr oraSearchFilter
```

In addition, when turning on this feature, the system supports displaying up to 3 columns of content for each record to help the user choose the correct value. The best practice is ensure that at least one of the columns configured to display matches the filter the user is typing. For example, the system has configured that all control table searches show both the code and the description. This configuration goes into the `Initial Display Columns` parameter, or for Query data explorers, if individual SQLs have different display columns, add the configuration to the appropriate `SQL n Display Column` parameter. The syntax is the mnemonic `oraSearchDisplay=` followed by a comma delimited list of up to 3 column references in the order to display. Note that the columns in the search display mnemonic are limited to those referenced in the display parameter. Example:

```
C1 C2 C3 C4 C5 oraSearchDisplay='C2,C1'
```

Use Data Explorer for Derived Data

There are times when a design warrants displaying data in a data explorer zone that is not accessible via SQL. For example, perhaps the data is from another system and it requires a web service call. The JMS Message Browser is another example.

The product provides functionality in the data explorer that allows you to call a script after the user filters are populated but before the SQL is executed. The script can retrieve the data as appropriate, store the data in table format so that the SQL can retrieve the data from the table.

The following points provide more detail:

- Create a service script that retrieves the data as needed. This script should store the retrieved data in a temporary table.

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  - The product provides a table that may be used. It is called F1_GENERIC_GTT (Generic Global Temporary Table). There is a business service — Create Global Temporary Table Records (`F1-InsertGTTRecords`) that the service script may call to insert the records.
  - Note that if the data is accessed via a web service call, it may be appropriate to execute the web service in a separate session using the business service F1-ExecuteScriptInNewSession to trap errors that may be issued by the web service call and provide a better error.
- In the data explorer zone use this service script in the zone's pre-processing script parameter. If any user or hidden filters should be passed into the script, the parameter supports mnemonics for this purpose. Refer to the parameter's embedded help for the supported syntax.
- The SQL for the data explorer should access the temporary table that was populated by the service script.

Configuring Timeline Zones

This topic highlights information related to configuring a timeline zone. The zone type is `F1-TIMELINE`. A timeline zone contains one or more "lines" where each line shows when significant events have occurred. The output of each line is driven by an algorithm configured on a timeline zone. Each algorithm is responsible for retrieving a single type of data. For example, one algorithm may retrieve bills for an account in a given time period whereas another algorithm may retrieve payments for that account for the same time period.

The algorithms to configure for a timeline zone use the **Zone - Timeline** plug-in spot. Please note the following details about the behavior for algorithms for this plug-in spot.

- The timeline algorithm receives all the global context values currently populated. In addition, it receives a start and end date from the zone, based on the time period chosen by the user, along with the maximum number of events that can be reasonably displayed for the chosen time period. The algorithm should use this information to retrieve data for a given type of transaction related to one or more of the input context values for the provided time period.
- For each event found, the algorithm returns information about the event along with many options that assist the user in getting more detail about each event or acting on an event.
  - Event date
  - Primary key of the record (key / value pairs)
  - FK Reference. With this information, the timeline zone will display the appropriate info string to display in the zone's info area when clicking on the event. In addition, the FK reference identifies the appropriate navigation option to use when a user clicks the info string hypertext to view the record on its maintenance page.
  - Background Color and Text Color to use for the event. (Obsolete). This information is no longer used by the timeline zone and will be ignored.
  - Icon use for the event. (Obsolete). This information is no longer used by the timeline zone and will be ignored.
  - BPA script to launch when a user clicks on an event. (Optional). The algorithm may return one or more BPA scripts that a user may launch to act on an event. For example, for an event that has a status of **Error**, perhaps a BPA is provided to walk a user through resolving the error.

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When a script is initiated from a timeline, the system puts the prime key of the event into a field in the page data model. The name of the field is the column name(s) of the event's prime key. For example, when a script associated with a payment event is kicked off, the system populates a field called PAY_ID with the prime-key of the selected payment.

Note that your specific edge application may supply algorithm types for a timeline zone as part of the base product. Although algorithm types may be provided, typically the product does not deliver algorithms because the parameters for the algorithms are driven by a particular implementation's business rules and preferences. As a result, the product will also not deliver pre-configured timeline zones. Please refer to your edge application's documentation for more information about what timeline algorithm types are delivered, if any and recommendations for configuration.

Defining Context-Sensitive Zones

A context-sensitive zone allows you to associate a zone with a specific user-interface transaction. A context-sensitive zone appears at the top of the Sidebar when a user accesses a page for which the zone is specified as the context.

> ⚠ **Caution**
>
> Make sure that the zone is appropriate for the transaction on which you are specifying it.

Select **Admin**, and then **Context Sensitive Zone** to maintain context-sensitive zones.

Description of Page

The **Navigation Key** is a unique identifier of a tab page within the system. **Owner** indicates if this navigation key is owned by the base product or by your implementation (**Customer Modification**).

> ⚠ **Caution**
>
> Important! When introducing a new context sensitive zone, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The grid contains the list of context-sensitive zones and the sequence in which they appear in the sidebar for the selected navigation key. The grid contains the following fields:

- **Zone** is the name of the zone to display in the Sidebar.
- **Sequence** is the sequence in which the zone is displayed (if multiple context-sensitive zones are defined).
- **Owner** indicates if this context sensitive zone is owned by the base product or by your implementation (**Customer Modification**).

Where Used

A context-sensitive zone displays at the top of the Sidebar whenever a user accesses the transaction for with the zone is specified.

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Defining Portals

This portal is used to view and maintain the configuration of portals. An implementation may define their own portals or may override some of the settings for base product provided portals.

You can access the portal from the **Admin Menu**, and then **System**, and then **Portal**. You are brought to a query portal with options for searching for a specific record. Once a portal record has been selected you are brought to the maintenance portal to view and maintain the selected record.

> **Note**
>
> When introducing a new record, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

Refer to Understanding Portals and Zones for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Portal.** This zone provides information about the selected portal definition.
- **Tabs.** This zone lists other tab portals if any are configured for a standalone portal. This zone is only visible when such tabs exist for the current standalone portal.
- **Context Sensitive Zones.** This zone lists context sensitive zones that appear on the sidebar when this portal is displayed . This zone is only visible when such zones exist for the current standalone portal.

The following zones may appear as part of the portal's **Options** tab page

- **Options.** This zone lists various configuration options for the selected portal record.

Some portals may be associated with configurable settings that are maintained on a **Configuration** tab. These settings are defined using a master configuration business object referenced as portal option. The tab is visible when such option exists for the portal.

Defining Menu Options

This portal is used to define / change any menu in the system. You can access the portal from the **Admin Menu**, and then **System**, and then **Menu**. You are brought to a query portal with options for searching for a specific menu. Once a menu has been selected you are brought to the maintenance portal to view and maintain the selected record.

> **Caution**
>
> Updating menus requires technical knowledge of the system. This is an implementation and delivery issue and should not be attempted if you do not have previous experience with menus.

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> **Note**
>
> **Security and menus.** Refer to Secured Objects and Application Services for a discussion of how application security can prevent menu items (or an entire menu) from appearing.

> **Note**
>
> **Module configuration and menus.** Your module configuration can prevent menu items (or an entire menu) from appearing.

The following zones may appear as part of the portal's **Main** tab page:

- **Menu.** This zone provides information about the selected menu.
- **Menu Lines.** This zone lists the menu's lines and supports actions to add, edit and delete lines. You may also broadcast a line to review more information about its items configuration.
- **Menu Line Items.** This zone lists item information for a selected menu line.

Application security information for the menu can be reviewed and managed from the **Application Security** tab. The following zones may appear as part of this tab page:

- **Menu Lines.** This zone lists the menu's lines. Broadcast a line to review its application security information.
- **Menu Line Security.** This zone lists application services related to the selected menu line. You may use this zone to review and configure security access for the selected menu line and a specific user group.
- **Menu Line Security Details.** This zone lists the entities secured by a selected application service.

The following zone may appear as part of the portal's **References** tab page:

- **Menu References.** This zone lists entities that reference the selected menu.

The following sections provides more information.

Menu Types

The following types of menus are supported:

- **Main** menu type defines the menu items under the Main Menu entry visible when the menu is initially expanded.
- **Admin** menu type defines the menu items under the Admin Menu entry visible when the menu is intially expanded.
- **Submenu** defines a menu group that appears when the main menu or admin menu is selected. For the Admin menu, this is only visible when it's organized functionally. Refer to Admin Menu for more information about options for organizing the admin menu.
- **Context** refers to a context menu.
- **Page Action Menu** defines buttons that appear in the Page Title Area.
- **User Menu** refers to the menu items that appear on the user menu; for example, User Preferences.

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Extending Product Owned Menus

An implementation may choose to add custom menu lines along with its menu item (or items) to a base product owned menu.

Overriding Menu Lines Sequence

An implementation may override the sequence of a base product owned menu line. Also note that the sequence is defined on the menu line language table, allowing for different orders to be used for different languages (or to let the menu be sorted alphabetically in one language and in a specified order in a different one).

Menu Information is Cached

Use the **Flush Menu** button to flush the cached menu items so you can see any modified or newly created menus. Refer to Caching Overview for more information.

Defining Navigation Keys

Each location to which a user can navigate (e.g., transactions, tab pages, tab menus, online help links, etc.) is identified by a navigation key. A navigation key is a logical identifier for a URL.

- Navigation Key Types
- Navigation Key vs Navigation Option
- The Flexibility of Navigation Keys
- Linking to External Locations
- Overriding Navigation Keys
- Maintaining Navigation Keys

Navigation Key Types

There are three types of navigation keys:

- **System navigation keys** define locations where the target for the navigation is a transaction or portal within the system. The navigation keys define the program component that identifies the page to navigate to.
- **External navigation keys** define a URL that identifies the target location. External URLs can be specified as relative to the product web server or fully qualified. External navigation keys always launch in a new instance of a browser window. Examples of external navigation keys include URLs to external systems.
- **Help navigation keys** define a online help topic that identifies the specific page within the online help to launch. Help navigation keys may be related to a program component when the help is related to a specific page in system.

Navigation Key vs Navigation Option

The system has two entities that work in conjunction with each other to specify how navigation works:

- Navigation Key defines a unique location to which a user can navigate. For example, each page in the system has a unique navigation key. Navigation keys can also define locations

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that are "outside" of the system. For example, you can create a navigation key that references an external URL. Think of a navigation key as defining "where to go".

- Navigation Option defines how a page is opened when a user wants to navigate someplace. For example, you might have a navigation key that identifies a specific page. This navigation key can then be referenced on two navigation options; the first navigation option may allow users to navigate to the page with no context included, while the second navigates to the page with context data provided to automatically display information related to that context.
- Please note that a wide variety of options can be defined on a navigation option. In addition to defining if data is passed to the page, it could also define search options. In addition, there are some navigation options that do not reference a navigation key but rather refer to a BPA script that should be launched.

The Flexibility of Navigation Keys

Navigation keys provide a great deal of functionality to your users. Use navigation keys to:

- Allow users to navigate to new pages or search programs
- Allow users to transfer to an external system or web page. After setting up this data, your users may be able to access this external URL from a menu, a context menu, their favorite links, etc. Refer to Linking to External Locations for more information.

Refer to the Tool Suite Guide for more information on developing program components.

> **Note**
>
> **Replacing Base-Package Pages or Searches**. If your new page or search has been designed to replace a module in the base-package, the navigation key must indicate that it is overriding an existing navigation key.

Linking to External Locations

If you want to include links to external systems or locations from within the system, you need to:

- Define a navigation key that specifies the URL of the location. For example, define an external navigation key that as a URL of **http://www.oracle.com/**.
- Define a navigation option that specifies from where in the system a user can go to your external location. For example, define a navigation option with a usage of **Favorites** or with a usage of **Menu**. Your navigation option points to the navigation key you defined above.
- Add your navigation option to the appropriate location within the system. For example, have users add the navigation option to their Favorite Links or add the navigation option as an item on a menu.

Overriding Navigation Keys

Your implementation may choose to design a program component (e.g., a maintenance transaction or search page) to replace a component provided by the system. When doing this, the new navigation key must indicate that it is overriding the system navigation key. As a result, any menu entry or navigation options that reference this overridden navigation key automatically navigates to the custom component.

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For example, if you have a custom On-line Batch Submission page and would like users to use this page rather than the one provided by the system, setting up an override navigation key ensures that if a user chooses to navigate to the On-line Batch Submission from Menu or a context menu, the user is brought to the custom On-line Batch Submission page.

To create an override navigation key, you need to:

- Define a navigation key using an appropriate naming convention.
- If the Navigation Key Type of the navigation key being overridden is **External**, specify a Navigation Key Type of **Override (Other)** and define the appropriate URL Component.
- If the Navigation Key Type of navigation key being overridden is **System**, specify a Navigation Key Type of **Override (System)** and populate the Program Component ID with your custom program component ID.
- Specify the navigation key that you are overriding in the **Overridden Navigation Key** field.

Refer to the Tool Suite Guide for more information about developing your own program components.

Maintaining Navigation Keys

Select **Admin**, and then **System**, and then **Navigation Key** to maintain navigation keys.

Use the **Navigation Key Query** portal to search for an existing navigation key. Once a navigation key is selected, you are brought to the maintenance portal to view and maintain the selected record.

> ⚠ **Caution**
>
> Important! When introducing a new navigation key, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

Description of Page

The **Navigation Key** is a unique name of the navigation key for internal use.

Owner indicates if this navigation key is owned by the base product or by your implementation (**Customer Modification**). This information is display-only.

Navigation Key Type includes the following possible values:

- **External** indicates that the location is specified in the **URL Component** field.
- **Help** indicates that the navigation key is used to launch online help where the specific help topic is defined in the **URL Component** field.
- **Override (Other)** indicates that the navigation key overrides another navigation key of type **External** or **Help**. For this option, the name of the navigation key being overridden is populated in the **Overridden Navigation Key** field.
- **Override (System)** indicates that the navigation key overrides a system navigation key. For this option, the name of the navigation key being overridden is populated in the **Overridden Navigation Key** field.
- **System** indicates that the navigation key refers to a transaction in the system identified by its program component.

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NOT_SUPPORTED

Refer to Navigation Key Types for more information about navigation key types.

NOT_SUPPORTED

Refer to Overriding Navigation Keys for more information about settings required to override a system navigation key.

Program Component ID is the name of the program component identified by the key (for system navigation keys). The program component ID can also be used to specify the transaction with which an online help link is associated.

Overridden Navigation Key is the name of the navigation key that the current navigation key is overriding (if **Override (Other)** or **Override (System)** is selected for the **Navigation Key Type**). Refer to Overriding Navigation Keys for more information.

URL Component is the specific URL or portion of the URL for the navigation key (external and help navigation keys only). The URL can be relative to the product web server or fully qualified.

Open Window Options allows you to specify options (e.g., width and height) for opening a browser window for an external navigation key. (External navigation keys always launch in a new browser window.) You can use any valid features available in the Window.open( ) JavaScript method. The string should be formatted the same way that it would be for the features argument (e.g., `height=600,width=800,resizeable=yes,scrollbars=yes,toolbar=no`). Refer to a JavaScript reference book for a complete list of available features.

Application Service is the application service that is used to secure access to transactions associated with **External** navigation keys. If a user has access to the specified application service, the user can navigate to the URL defined on the navigation key. Refer to The Big Picture of Application Security for more information.

The grid displays menu items that reference the navigation key (actually, it shows menu items that reference navigations options that, in turn, reference the navigation key).

Defining Navigation Options

Every time a user navigates to a transaction, the system retrieves a navigation option to determine which transaction should open. For example:

- A navigation option is associated with every menu item. When a user selects a menu item, the system retrieves the related navigation option to determine which transaction to open.
- A navigation option is associated with every favorite link. When a user selects a favorite link, the system retrieves the related navigation option to determine which transaction to open.
- A navigation option is associated with every node in the various trees. When a user clicks a node in a tree, the system retrieves the related navigation option to determine which transaction to open.
- Etc.

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Many navigation options are shipped with the base product and cannot be modified as these options support core functionality. As part of your implementation, you may add additional navigation options to support your specific business processes.

Navigation options may also be used to launch a BPA script.

The topics in this section describe how to maintain navigation options.

> ⚠ **Caution**
>
> In order to improve response times, navigation options are cached the first time they are used after a web server is started. If you change a navigation option and you don't want to wait for the cache to rebuild, you must clear the cached information so it will be immediately rebuilt using current information. A special button has been provided on the Main tab of the navigation option transaction that performs this function. Please refer to Caching Overview for information on the various caches.

- Navigation Option - Main
- Navigation Option - Tree

Navigation Option - Main

Select **Admin**, and then **System**, and then **Navigation Option** to maintain a navigation option.

Use the **Navigation Option Query** portal to search for an existing navigation option. Once a navigation option is selected, you are brought to the maintenance portal to view and maintain the selected record.

Description of Page

Enter a unique **Navigation Option** code and **Description**.

> ⚠ **Caution**
>
> When introducing a new navigation option, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The **Flush System Login Info** button is used to flush the cached navigation options so you can use any modified navigation options. Refer to Caching Overview for more information.

Owner indicates if this navigation option is owned by the base product or by your implementation (**Customer Modification**). This field is display-only. The system sets the owner to **Customer Modification** when you add a navigation option.

> ⓘ **Note**
>
> You may not change navigation options that are owned by the base product.

Use **Navigation Option Type** to define if the navigation option navigates to a **Transaction**, launches a BPA **Script** or opens an **Attachment**.

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> **Note**
>
> The **Attachment** option type is only applicable to navigation options that are used to launch a file attached to a record in the Attachment maintenance object.

For navigation option types of **script**, indicate the **Script** to launch. You can use the **Context Fields** at the bottom of the page if you want to transfer the contents of specific fields to temporary storage variables available to the script. The script engine creates temporary storage variables with names that match the Context Field names.

For navigation option types of **transaction**, define the **Target Transaction** (navigation key) and optionally a specific **Tab Page** (also a navigation key) if a specific tab on the transaction (other than the Main tab) should be opened when navigating to that transaction.

> **Note**
>
> **Finding transaction navigation keys**. When populating the **Target Transaction** and **Tab Page** you are populating an appropriate navigation key. Because the system has a large number of transactions, we recommend using the "%" metaphor when you search for the transaction identifier. For example, if you want to find the currency maintenance transaction, enter "%currency" in the search criteria.

The additional information depends on whether the target transaction is a fixed page or a portal-based page:

- For portal-based pages:
  - **Navigation Mode** is not applicable and should just be set to **Add Mode**.
  - If navigating to a query portal, by default the query portal will open with the default search option defined. If the navigation should open a different search option, define the **Multi-Query Zone** for that query portal and indicate the **Sub-Query Zone** to open by default. Note that for this configuration, it is common to define **Context Fields** to pre-populate search criteria in the target query zone. When using this configuration, be sure that the target query zone's user filters are defined to populate data from context.
- For fixed pages:
  - **Navigation Mode** indicates if the **Target Transaction** should be opened in **Add Mode** or **Change Mode**.
  - **Add Mode** should be used if the option is used to navigate to a transaction ready to add a new object. You can use the **Context Fields** at the bottom of the page if you want to transfer the contents of specific fields to the transaction when it opens.
  - **Change Mode** is only applicable for fixed pages and should be used if the option is used to navigate to a transaction ready to update an object. You have two ways to define the object to be changed:
    - Define the name of the fields that make up the unique identifier of the object in the **Context Fields** (and make sure to turn on **Key Field** for each such field).
    - Define the **Search Transaction** (navigation key) if you want to open a search window to retrieve an object before the target transaction opens. Select the appropriate **Search Type** to define which search method should be used. The options in the drop down correspond with the sections in the search (where **Main** is the first section, **Alternate** is the 2nd section, **Alternate 2** is the 3rd section, etc.).

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You should execute the search window in order to determine what each section does.

When you select a **Search Type**, define appropriate **Context Fields** so that the system will try to pre-populate the search transaction with these field values when the search first opens. Keep in mind that if a search is populated with field values the search is automatically triggered and, if only one object is found that matches the search criteria, it is selected and the search window closes.

- **Search Group** is only visible if the **Development Tools** module is not turned off. It is used to define the correlation between fields on the search page and the tab page. You can view a tab page's **Search Groups** by viewing the HTML source and scanning for **allFieldPairs**.

The **Go To Tooltip** is used to specify the label associated with the tool tip that appears when hovering over a **Go To** object. Refer to the **Usage** grid below.

The **Usage** grid defines the objects on which this navigation option is used:

- Choose **Favorites** if the navigation option can be used as a favorite link.
- Choose **Menus** if the navigation option can be used as a user's home page or as a menu or context menu item.
- Choose **Script** if the navigation option can be used in a script.
- Choose **Foreign Key** if the navigation option can be used as a foreign key reference.
- Choose **Go To** if the navigation option can be used as a "go to" destination ("go to" destinations are used on Go To buttons, tree nodes, and hyperlinks).
- If your product supports marketing campaigns, you can choose **Campaign** if the navigation option can be used as a "post completion" transaction on a campaign. For more information refer to that product's documentation for campaigns.

The **Context Fields** grid contains the names of the fields whose contents will be passed to the **Target Transaction** or **Script** or used to launch an **Attachment**. The system retrieves the values of these fields from the "current" page and transfers them to the target transaction or to the script's temporary storage. Turn on **Key Field** for each context field that makes up the unique identifier when navigating to a transaction in **Change Mode**.

> **Note**
>
> For an **Attachment**, the grid should contain the Attachment ID.

> **Note**
>
> **Navigating from a Menu**. The standard followed for many base main **menu** navigation options for fixed transactions is that navigation options launched from the Menu dropdown are configured with no context.

Navigation Option - Tree

This page contains a tree that shows how a navigation option is used. Select **Admin**, and then **System**, and then **Navigation Option** and navigate to the **Tree** tab to view this page.

Description of Page

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The tree shows every menu item, favorite link, and tree node that references the navigation option. This information is provided to make you aware of the ramifications of changing a navigation option.

Navigation to External Pages

The URL Navigation (F1-URLNavigation) extendable lookup defines named external pages to which a user may navigate to from the application. For example, a named code for the Service Request page in Oracle Fusion.

The actual URL for the page is specific to your implementation and as such is not delivered on the extendable lookup record. When applicable, update the entry to reference the URL for the corresponding page. The UI location that references the name external page shows the corresponding URL only when a URL is provided.

Understanding System Messages

All error, warning and informational messages that are displayed in the system are maintained on the message table. Every message is identified by a combination of two fields:

- **Message category number.** Think of a message category as a library of messages related to a given functional area. For example, there is a message category for billing messages and another one for payment messages.
- **Message number**. A unique number identifies each message within a category.

Every message has two components: a brief text message and a long description.

The brief message text supports the %n notation within the message text to cause field values to be substituted into a message. For example, the message text "Unable to assign To Do Entry (%1). It is already assigned to another User (%2)" will have the values of 2 fields merged into it before it is displayed to the user (%1 is the To Do Entry ID, %2 is the current assigned user).

> **Note**
>
> **You cannot change the text provided with the product.** If the message is "owned" by the product, you cannot change the product's message or detailed description. If you want your users to see a different message or detailed description other than that supplied by the product, enter your desired verbiage in the corresponding override fields (and flush the cache).

- Defining System Messages

Defining System Messages

This portal is used to search for message categories and messages that appear throughout the system. An implementation may introduce messages used in custom processes or may choose to override the text for messages delivered by the product.

You can access the portal from the **Admin Menu**, and then **System**, and then **Message**. You are brought to a query portal with options for searching for a specific message category or a message. Once a record has been selected you are brought to the maintenance portal to view and maintain the selected record.

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Refer to Understanding System Messages for more information.

- Defining Message Categories
- Defining Messages

Defining Message Categories

This portal is used to view and maintain a message category and its messages.

> **⚠ Caution**
>
> Message category 80000 or greater must be used to define new messages introduced for a specific implementation of the system. Changes to other Message Text will be overwritten when you next upgrade. If you want to make a change to a Message, drill down on the message and populate the Override Message Text. Note that even for message categories 80000 and higher, message numbers lower than 1000 are reserved for common base product messages.

You can access the portal from the **Admin Menu**, and then **System**, and then **Message**. You are brought to a query portal with options for searching for a specific message category or a specific message. Once a message category has been selected you are brought to the maintenance portal to view and maintain the selected record.

Refer to Understanding System Messages for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Message Category.** This zone provides information about the selected message category.
- **Messages.** This zone lists and maintains messages for the selected category.

Defining Messages

This portal is used to view and maintain a specific message. An implementation may introduce messages used in custom processes or may choose to override the text for messages delivered by the product.

> **⚠ Caution**
>
> Message category 80000 or greater must be used to define new messages introduced for a specific implementation of the system. Changes to other Message Text will be overwritten when you next upgrade. If you want to make a change to a Message, drill down on the message and populate the Override Message Text. Note that even for message categories 80000 and higher, message numbers lower than 1000 are reserved for common base product messages.

You can access the portal from the **Admin Menu**, and then **System**, and then **Message**. You are brought to a query portal with options for searching for a specific message category or a specific message. Once a message has been selected you are brought to the maintenance portal to view and maintain the selected record.

Refer to Understanding System Messages for more information.

The following zones may appear as part of the portal's **Main** tab page

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- **Message.** This zone provides information about the selected message.

Understanding Unified Search

Depending on your product, the toolbar search box may support a product specific search for business entities in addition to the standard search for menu items. For example, the search may support a query of business entities by their name, address, contact details etc. The unified search feature is a simplified version of your product's main search, that allows the user to lookup up records using free form search text or hint codes. For more complex queries, the user may navigate to the corresponding advanced search portal.

The configuration of a unified search option includes the following items:

- A **search service script** that implements the data query and defines the supported **filters**. The application service associated with this script is used to secure the unified search option.
- **Search filter rules** and **hints** for the supported filters. These rules are used to parse the text entered by the user to determine whether it qualifies as a valid filter value.
- The **advanced search** portal to use for more complex queries.

The unified search box interacts with a unified search option implementation as follows:

- As the user types free form text in the search box, the application uses the **search filter rules** and **hints** to parse the entered text and translate it to corresponding query filters.
- The **search service script** is then called to query for entities that match these filters and present the results.
- Selecting a result record navigates to the corresponding portal.
- Selecting the **Advanced Search** link in the search box navigates to the general query portal associated with the unified search option.

If a unified search option is not enabled for your product or the user does not have security access to it then the search box may only be used for searching the menu.

The following sections describe various aspects related to the configuration of a unified search option.

The Search Script Controls Everything

A unified search is implemented as a single service script that controls the following:

- **Filters.** The script determines which filters are supported and how they are applied to return results efficiently. Each filter name must be a valid **Field** record.
- **Results.** The script returns a list of business entities that matches the query filters provided by the user, along with the navigation information needed to drill in to a selected record in the list.
- **Application security.** Only users that have access to the script's application service may use the unified search associated with the search script.
- **Override Advance Search.** The script may override the advanced search portal configured for the search option.

When the search box component initializes, the script is called once in **Prepare Search Details** mode to return the list of supported filter names. In this mode the script does not perform any query.

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As the user types in text in the search box, the search box component analyzes the entered text to derive query filters and calls the search script in **Perform Search** mode to return matching results.

The search box component is designed to support any type of unified search implementation and as such, the interaction between the user interface component and the search script is generic. Filters are defined as name / value pairs and results for each matched entity includes details like primary, secondary and tertiary description lines, along with a line that describes the matching text for entry.

> **Note**
>
> If your organization needs to implement a custom unified search script, it is strongly recommended that you follow the base product's implementation of such scripts as a reference.

Filter Rules and Hints

A unified search is designed to support a predefined set of filters for querying data. For example, searching customers by their address, name, identifiers; or searching locations by address or name etc. Each filter is uniquely identified by a **Field** name as declared by the search service script.

As the user types in free text in the search box, the application applies parsing rules to determine whether the text may be used as the value of one or more filters supported by the unified search. For example, if the user types in the text "ave", parsing rules may determine that it can be used to filter results by a person's name or address but not their email address.

Each parsing rule, defined in the **Search Filter Rule** extendable lookup, associates a filter's field name with a regular expression. Multiple filter rules defined for the same filter name are processed in execution order sequence and it is enough for one rule to return a match for the search text to be used as the value for the specific filter.

Alternatively, the user may use an explicit hint code to identify the filter they would like to use followed by the filter value. For example, an address filter may be associated with the hint "ad:" allowing the user to enter "ad: main" to look up records by address.

Each hint, defined in the **Search Filter Hint** extendable lookup, associates a filter's field name with a hint code. When applicable, a hint may be associated with a value expression rule that is used to qualify the entered value as eligible for use as a filter value. For example, requiring the value to be of a minimum length before a search is performed. If the entered value does not match the hint's value expression the corresponding search is not performed.

Note that filter rules and hints are defined for a specific filter name and not a specific unified search option. The same parsing rules may be shared across searches using the same filter names. For example the parsing rule to identify an "email" filter or the "ad:" hint for an address filter are the same regardless of how these are used by a search query. These rules are automatically associated with any unified search option that uses the same filter names.

> **Note**
>
> You may customize the parsing rules and hints associated with a filter by inactivating the base product's extendable lookup records and introducing custom rules that match your business requirements.

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Which Unified Search Option is Used?

Each unified search option is defined in the **Unified Search** extendable lookup, referencing the option's search service script and its corresponding advanced search portal. The unified search option is only enabled to users that have access to the search script's application service. When more than one unified search option is configured and enabled for a user, the application chooses the option with the highest sequence as the default option, allowing users to switch to other options they have access to.

Customizing Unified Search

You may customize the parsing rules and hints associated with base product search filters by inactivating the base product's extendable lookup records and introducing custom rules that match your business requirements.

There is no need to duplicate a product hint to override its Value Expression rule. You may do so by populating the Override Value Expression element on the hint definition record.

If you need to support a search for different business entities and filters, you need to implement a custom unified search. The configuration of a unified search option involves the following high level steps:

- Design and implement a search script that supports a predefined set of filters and returns the topmost set of matching results while taking into account performance considerations.
- Design hints and filter rules as needed for each of the supported filters. Review existing hints and filter rules associated with same filter names when applicable.
- Register each hint, if any in the **Search Filter Hint** extendable lookup.
- Register each filter rule, if any in the **Search Filter Rule** extendable lookup.
- Register the search script in the **Unified Search** extendable lookup.

Trees

Many edge products and implementations make extensive use of UI tree structures to display hierarchical relationships between records in the system. The framework provides an objects to define a tree structure and the rules on how to populate the nodes in the tree, and processes to interpret the configuration and dynamically render the tree display.

The topics in this section provide information about what is supplied in the framework. Your product may supply UI components with ready built trees for common use cases. Refer to your product documentation for more information.

Common Attributes of Trees

Your organization may have many portals and zones showing data in a hierarchical tree. Most trees in the system follow a similar pattern:

- Trees have a number of levels. There may be different types of tree nodes present in any given level; for instance a list of algorithm types for a script, followed by a list of script steps. Icons may be displayed to further identify the node’s object type.
- The most common node types reference an entity within the system such as a schema, script, data area and so on. These nodes usually display the information string from the entity's FK reference and provide the ability to navigate to the entity. They may also allow the node context to be broadcast to other zones in the portal.

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- In addition to the ability to navigate to the associated entity, many node types provide a context menu with further navigation paths.
- Some nodes are simply informational and are used to group a set of child nodes below a type or category. For example, the business object Options tree groups the option value nodes below summary nodes that describe the option type.

Each tree defines the nodes that make up the tree and the parent/child relationship between those nodes. A tree node defines which of the common attributes are applicable to the node and the algorithms responsible for retrieving the node data and, optionally, determining the node information to be displayed.

Populate Node Algorithm

A tree node displays a combination of the attributes listed above, typically for an object in context. For a root node, the object will normally be derived from a global or portal context value, such as the current script. For each lower level node, the context is derived from the context fields of its parent row; for instance, algorithms for a specific algorithm type.

The key responsibility of the populate node algorithm is to receive the tree code, node name and the parent context value (or values), determine if there is data that should be shown for this node, and return the a list of the context fields and values applicable to each row in the node. The following highlights additional optional information that may be returned by the algorithm:

- Entity information. If the node is related to a specific entity, the maintenance object code and primary key values may be returned. These are used for determining default information for the node, including navigation details.
- A display icon value. This is used to override the icon defined on the tree node and/or the default icon for the entity as defined on the maintenance object or business object.
- An information string. This may be used to override the default information string for an entity or to display stand-alone text such as a summary or description of the child nodes to follow.
- Override broadcast details if needed for a specific node. For example, set specific broadcast field names and values when they differ from the related entity's primary keys or indicate that broadcasting is not applicable for a node instance even though broadcasting is enabled by the node's definition.

> **Note**
>
> The populate node algorithm is responsible for returning all the context values required to populate its child nodes. For an informational or summary node, this may require including the node’s parent context fields in its own context. For example, in the script tree, the summary node describing the number of steps is followed by a list of steps for the script. The summary node populate node algorithm needs to include the script code passed in as parent context in its output context list, in order for the steps to be correctly retrieved.

Information Override Algorithm

The information override algorithm has two main purposes:

- Providing alternative information text for a tree node when the information provided isn’t suitable for your implementation.

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- Retrieving contextual insights related to the tree node entity, to be included in the node's information text. Only badge insight types are currently supported.
- Override broadcast details if needed for a specific node. For example, set specific broadcast field names and values when they differ from the related entity's primary keys or indicate that broadcasting is not applicable for a node instance even though broadcasting is enabled by the node's definition.

The override information algorithm receives the tree code, node name, maintenance object and prime key values for the node. The following highlights the information that may be returned by the algorithm:

- A display icon value.
- An information string. This will be used to override the default information string in the node's formatted string.
- Full node text. This will be used as the full text for the display, overriding the formatting defined on the node.
- A list of badge insight types and their context.

> **Note**
>
> If the information override algorithm returns insight types for the entity, it is also responsible for returning all the context values required for those insight types. Refer to Contextual Insights for more information.

Preparing a Node for Display

The following section highlights key steps in fetching a node's data and formatting it for display.

Determining Node Content

The following steps are performed to retrieve the components making up the tree node display:

- The Populate Node algorithm is called to determine all instance nodes for the tree node along with their related details.
- The Information Override algorithm is called for each node instance to allow for optional override of presentation related details.

The node display contents are determined as follows:

- The icon is determined from the following sources, in order: tree node definition, override information algorithm value, populate node algorithm value, maintenance object / business object default value.
- Broadcast usage is determined by the setting on the tree node definition.
  - This setting can be overriden by either the Populate Node algorithm or the Override Information algoirthm (which takes precedence) to indicate that broadcasting is not applicable for a specific node instance.
  - By default the broadcast fields for a node are the primary key names of its related entity. Broadcast field names can be overriden by either the Populate Node algorithm or an Override Information algorithm where the latter takes precedence.
- The information string is determined from the following sources, in order: override information algorithm value, populate node value, maintenance object / business object information algorithm. If the string is derived from the MO/BO algorithm, the short information text is used when available else the standard information is used.

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- Context menu usage is determined by the settings on the tree node definition.
- The system supports a different style for header rows, including a larger font. Header style usage is determined by the setting on the tree definition and is only applicable if the node is a root node with only one instance.

Node Text Format

The text for nodes referencing a system entity commonly includes some combination of a label, the entity key and an information string. The node configuration provides a label field and a substitution format string field which may be used to define the node text format. The format string defines which of the components should be included in the text, the order of those components and any surrounding text and HTML markups. For example, a format string of '`%label` - `%key` - `%info`' will result in a node text like the example below:

If the format string is blank, the default text will include '`%info`' only. If an override information algorithm is configured that returns the full node text, the text is presented without further formatting.

Auto Expansion

If the tree node definition indicates that the node should be expanded, the system will automatically fetch and display the data for its child node. This processing continues until there are no further child nodes marked for expansion.

There are cases where a tree node should be conditionally expanded based on business rules. For example, prevent the initial expansion when the number of child nodes exceeds a certain threshold. You may design the "Populate Node" algorithm to indicate whether a tree node should be initially expanded or not. When populated, the indication overrides the setting on the tree node definition.

Base Delivered Trees

Trees are system data and your product may already deliver several trees out of the box. You may choose to customize a base delivered tree in the following ways:

- You may add your own nodes to an existing tree definition.
- You may override the information string for a node by supplying your own **Information Override** algorithm. If a base override algorithm is configured on the node, your custom algorithm should be plugged in at a higher sequence number, to take precedence over the base algorithm.

Rendering a Tree

To render a tree on the UI, you would include the ou-tree web component in a UI map that references the tree definition.

> **Note**
>
> Refer to Include a Web Component for more information.

- Defining Trees

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Defining Trees

This portal is used to view and maintain information about a tree definition. Trees are commonly used to display hierarchical relationships between objects in the system. Refer to Trees for background information about defining trees.

You can access the portal from **Admin**, and then **System**, and then **Tree**. You are brought to a query portal with options for searching for a specific tree definition. Once a tree has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones will appear as part of the portal's **Main** tab page

- **Tree.** This zone provides information about the selected tree.
- **Tree Nodes.** This zone lists the nodes for this tree in hierarchical order. Use the zone actions to add or maintain a node in the tree.
- **Tree Node.** This zone displays the details for a tree node. It is only visible if a tree node name has been broadcast from the Tree Nodes zone.

Contextual Insights

Contextual Insights provide a powerful way to surface focused intelligence and alerts to users in the context of the core screens for any applications built on Oracle Utilities Application Framework. There are multiple options for the visual patterns when surfacing Contextual Insights and the actions that can be performed by users are easily configurable as well. The subsequent topics provide detail about the Insight Type and Insight Group objects that are used to configure the information that may then be displayed in appropriate screens.

- Insight Types
- Insight Groups

Insight Types

The insight type object contains all the detailed configuration for displaying one or more alerts, or important information for a record in context. The following sections provide more information about all the configuration managed by the insight type.

Insight Algorithm

Each insight type is used to display some information, typically related to an object in context. It is the responsibility of the insight type algorithm to receive the context value (or values), determine if there is information that should be shown for this context, return the text to display.

The following highlights additional optional information that may be returned by the algorithm:

- A secondary message. This is only applicable to some visual structures where more than one line of information may be displayed.
- A severity value. This is used to override the visual display configuration if different emphasis should be used for different severity values. Refer to Override Configuration for more information.
- Entity information. If the insight is related to a specific entity, the maintenance object code and primary key values may be returned. This is useful if the insight type configures a BPA or user action algorithms that may perform logic for this entity.

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- Navigation and User Action information. This is only applicable to visual structures that support user actions. The algorithm must return the list of all the actions that should be made visible on the insight. If the action includes navigation, the algorithm should return the navigation option and navigation context key and value pairs. Additionally, there is configuration for each action that must be defined. Refer to User Actions for more information.

Each algorithm can return multiple insights, if applicable. For example, if the insight is about To Do entries related to the object being displayed, you could design your insight algorithm to return a single insight summarizing all the To Do related information. Or you could choose to return separate insights based on To Do information so that you provide more granular information and customize actions or navigation based on the different conditions. For example, if there are To Do Entries that the current user may perform actions on and others that current user cannot update, the algorithm could return two separate insights: one with actions and one without.

> **Note**
>
> **Preview mode**. The insight type maintenance page includes an Insight Preview section that shows the output from the insight algorithm when invoked with an insight mode of "Preview". Every algorithm should include logic that returns appropriate text when called in this mode so that something is displayed in that section.

Visual Structures

Each insight type defines a visual structure which dictates what kind of information may be shown. The system has some fixed layout expectations for each visual structure type. The insight type configuration is used to provide the source for the possible layout.

> **Note**
>
> All the insights use color options as part of their configuration. Refer to Color Option for more information.

Badge Insight

The simplest visual structure is the badge. It is used to display a single line of quick text with a solid background (for visibility) that is meant to alert the user to important summary information or attributes.

Inline Insight

The inline insight defines an icon and a single message. This is meant to be more descriptive than a badge. For this type of insight, a default light background is used so the recommendation is to select a color option for both the text and the icon that has only a foreground color defined or has a light background color.

List Insight

The list insight are intended to exist in a list of insights for the object. It defines an icon and can support two lines of text. In addition, this type of insight supports buttons or user actions. Refer to User Actions for more information. Note that for a list insight, if there is one valid action or 2

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valid actions, the action buttons are shown. If there are three or more valid actions, one action is shown and then an 'Other Actions' button is visible. Clicking this shows the other available actions.

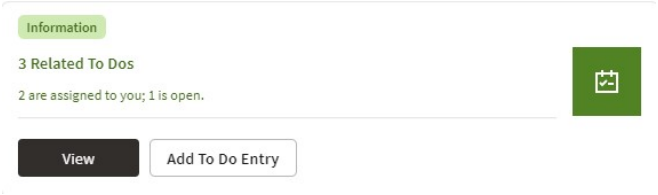
Note that the background color for the insight is used as the color for the full insight snippet. The text and the icon are shown on this background. The icon's background color is ignored.

Card

The card insight is the most information rich, with up to two lines of text, user actions, a large icon to call attention and header text. The header text is chosen from a dropdown list of valid options. The product provides out of the box header text of "Information", "Warning" and "Error". Implementations may add additional values to this using the lookup field HEADER_CAT_FLG.

Please note the following about the treatment of the various components of the card insight:

- The header text is rendered like a badge insight.
- For the message text displayed in the card, the background color is ignored so a color option with no background color or a light background color should be chosen.
- For the icon, the background color is used to create a square area for display and the icon is rendered in the foreground color.



Override Configuration

Each insight supports default visual setting for the various components of the insight. This includes the color option for the applicable components along with icons and header text, where applicable. In each case, override visual settings may be defined for a given severity number.

For example imagine the algorithm for a badge insight that returns a message with the count of related To Do entries uses a different color option if there are more than 10 related records. To do this, the algorithm can return a severity number and then the configuration user can define the override color option for this severity number.

User Actions

The list and card insights support the definition of user actions that may be presented as buttons when displaying the insight. The actions may do one or more of the following:

- Perform algorithm logic. One or more user action algorithms may be associated with an action button. This should be used to perform server logic that does not require any user interaction. For example, you can provide an action to update the status of a record related to the insight. These algorithms are configured on the Insight Type.

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- Navigate to another page. For this type of action, the insight algorithm must provide the navigation context and the navigation option to launch when clicking the button. It's possible to configure navigation and configure user action algorithms. In that case the algorithms are run first and then the navigation occurs.
- Launch a BPA. This is used if there is user interaction needed to perform additional logic and / or if there is conditional navigation such that the logic is needed before navigating. It's possible to configure a BPA and configure user action algorithms. In that case the algorithms are run first and then the BPA is launched. If the insight algorithm also provides navigation for this action, it is ignored in favor of the BPA. The BPA is configured on the Insight Type.

The list of valid actions to display at run time must be returned by the insight algorithm. This allows for the algorithm to have control over which actions to display, in case there are some actions that are conditional. In addition, each possible button requires configuration related to what text should display and the style of the button.

Button Text

The button text to display is chosen from a button text lookup. The lookup name is `INSIGHT_ACT_FLD_FLG`. Implementations may add additional values to this lookup to include new button text. In addition, if you would like to change button text on any product delivered button, you can override the lookup value description.

Action Class

Each action button defines an action class. Any action configured with the action class value of **Positive** value is shown first and is styled differently for emphasis. Other action class values are for information purposes.

Securing Actions

If the action navigates or launches a BPA, the system automatically checks the underlying security for the target page or the BPA and only shows the action if the user has security rights. Other types of actions, such as ones that should launch an algorithm, do not have security configuration that can be automatically detected by the system. For these types of actions, you can define an explicit application service and access mode on the Buttons collection. It's also possible for the algorithm to check security before returning applicable buttons.

Base Delivered Insight Types

Insight types are system data and your product may already deliver several insight types out of the box. You may choose to include one or more insight types in an Insight Group.

Rendering an Insight

To render an insight for an insight type, you would include the ou-insights web component in a UI map that references this insight type. This is how the Insight Preview section of the insight type maintenance page renders the preview.

> **Note**
>
> Refer to Include a Web Component for more information.

- Defining Insight Types

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Defining Insight Types

The insight type entity is used to define the configuration of a specific type of alert to display extra information related to one or more records in context. Refer to Insight Types for a detailed description of the supported functionality.

To view or maintain insight types, open **Admin**, and then **General**, and then **Insight Type.**

This is a standard All-in-One portal.

The information captured on the insight type depends on the record's business object. Refer to the embedded help text for more information.

Related Insight Groups

If there are any insight groups that reference this insight type, the **Related Insight Groups** zone displays the linked insight groups.

Insight Groups

An insight group may be used to include several insight types together onto a single map. When defining an insight group, you configure the visual structures that the insight group should include. Only insight types for the configured visual structure are available.

Insight Class

Each insight group must reference a unique insight class. The insight class is defined using a lookup. The lookup field is `INSIGHT_CLASS_FLG`. Your product may already deliver base values for insight class. To display insights in a user interface your UI map would include the ou-insights web component. This component includes syntax to reference an insight class and the logic will find the insight group for that class and render all the insight types linked to that group.

Because the insight class is used as the reference in the web component rather than the insight group, it allows your product to supply base logic to show insight group information in a base delivered user interface. The base logic defines an insight class in base and references it on a base UI map. Your implementation can then define the insight group for this insight class and choose the insight types that should be rendered in that map. Refer to your specific product documentation to find out if there are any base delivered insight classes.

If your implementation identifies a new use case where one ore more insight types should be displayed, once the insight types are configured, do the following:

- Define a new Insight Class lookup value.
- Define an Insight Group that references this insight class and configure the appropriate insight types.
- Include the appropriate web component in the map for your user interface where you wish to display this information.

Multiple Insight Groups for an Insight Class

Typically there should exist a single insight group for an insight class. In cases where the list of insight types for the class needs to vary based on context, a separate insight group needs to be defined for each list.

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When more than one insight group is associated with an insight class **Action Method** rules may be applied to determine which group to use based on the context provided to insight processing. Refer to Action Method for an overview of action method functionality.

- Defining Insight Groups

Defining Insight Groups

The insight group entity allows implementations to define multiple related insight types that should be displayed together in a given user interface map or zone. Refer to Insight Groups for an overview of insight group configuration and functionality.

To view or maintain insight groups, open **Admin**, and then **General**, and then **Insight Group.**

This is a standard All-in-One portal.

The information captured on the insight group depends on the record's business object. Refer to the embedded help text for more information.

Related Insight Types

The **Related Insight Types** zone displays all the insight types that are currently linked to the group. The Edit link in the zone header allows you to add or remove insight types. Only insight types that reference one of the **Valid Visual Structures** may be selected.

Knowledge Articles

When applicable, a knowledge article icon may be configured to appear in a specific location on a page. Clicking the icon launches a drawer presenting an article on the topic and allows the user to further search and review other articles.

> **Note**
>
> The product supports only knowledge articles defined in Oracle Fusion.

The association between a user interface location and a related knowledge article is registered in the **Knowledge Management Articles** extendable lookup. The user interface location references an extendable lookup knowledge code and the article ID is referenced on the extendable lookup record. The knowledge article icon appears on the page only when the corresponding extendable lookup entry is active and references an article ID.

Some product pages are released with embedded references to knowledge codes. By default, these knowledge codes are not associated with any article. To enable these locations for knowledge functionality update their respective extendable lookup entries with references to your articles.

You may also introduce knowledge functionality to custom pages as follows:

- Add a knowledge code entry to the extendable lookup along with a reference to an article ID.
- Reference the knowledge code on your custom page using the Knowledge Article web component.

Access to knowledge articles requires an integration with Oracle Fusion. Once the integration is established, follow these instructions to complete the configuration:

- Update the context details for the **Get Fusion Article** Message Sender.

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Table Get Fusion Article - Message Sender (F1-KMGET)

Context Type	Context Value
HTTP Method	GET
HTTP Timeout	60
HTTP Transfer Method	SendReceive
HTTP URL 1	@EXT_PUB@<hostname>:<portnumber>/api/knowledge-management/v2/articles/answers/${pathParms}?${queryParms}
OAuth Grant Type	jwt_user_assertion
OAuth Access Token URL OAuth Client Credentials Key Ring Oauth Signature Key Ring OAuth REST API Scope	Refer to OAuth Configuration for more information.

- Update the context details for the **Search Fusion Articles** Message Sender.

Table Search Fusion Articles - Message Sender (F1-KMSCH)

Context Type	Context Value
HTTP Method	GET
HTTP Timeout	60
HTTP Transfer Method	SendReceive
HTTP URL 1	@EXT_PUB@<hostname>:<portnumber>/api/knowledge-management/v2/search?${queryParms}
OAuth Grant Type	jwt_user_assertion
OAuth Access Token URL OAuth Client Credentials Key Ring Oauth Signature Key Ring OAuth REST API Scope	Refer to OAuth Configuration for more information.

Color Configuration

The topics in this section describe some options for configuring colors to be used in displaying information in the user interface.

- Defining Colors
- Color Options

Defining Colors

The system provides the extendable lookup Color (F1-Color) to define valid colors to be used in the system. The base colors provided are ones related to the standard color palette used in Oracle products.

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At this time, zones and UI maps that define specific colors do not support any syntax to reference a color extendable lookup. In the meantime, colors applied at the zone or map level can still reference HTML colors or reference hex codes directly.

Color Options

The color option entity is used to define a combination of colors to be used in user interface components. The system provides a standard set of color options used for contextual insights.

To view or maintain color options, open **Admin**, and then **System**, and then **Color Option.**

This is a standard All-in-One portal.

The information captured on the color option depends on the record's business object. Refer to the embedded help text for more information.

Defining Display Icons

Icons are used to assist users in identifying different types of objects or instructions. A limited number of control tables allow administrative users to select an icon when they are configuring the system. Select **Admin**, and then **System**, and then **Display Icon** to maintain the population of icons available for selection. You are brought to a query portal with options for searching for a specific display icon. Once a display icon has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The latest standard is to use Scalable Vector Graphic (SVG) icons. For these types of icons, the Icon Type is **Variable (SVG)**. The product also supports icons in the .gif or .png format. For these types of icons, the Icon Type defines a pixel size.

URL describes where the icon is located (folder) and the icon name (file name).

Note that there is a standard folder structure for delivered assets such as images. The structure is `{DefaultWebApp}/{owner}/assets/images|svgs/`

- {Owner} - this is the owner of the icon. The `/cm` folder is used for custom icons.
- svgs - all images that are of type svg are in this folder.
- images - all files that have a file suffix of jpg, gif, png or other types of image formats are in this folder.

When using the above folder structure, then the URL only needs to contain the icon name (file name). The correct full URL is determined automatically at runtime. Images can optionally be placed in other folders under the DefaultWebApp. However, this is not recommended but if used, the URL must contain the full path to the icon (e.g. /cm/assets/newImages/myIcon.gif)

Custom Look and Feel Options

The default look and feel of the application can be customized via feature configuration. The base product is provided with a **Custom Look And Feel** Feature Configuration type. If you define a feature configuration of this type, you can adjust the look and feel in the following ways.

- You may adjust the look and feel of the application using cascading style sheets. Refer to User Interface Style Customization for more information.
- You may adjust configuration related to the display of the UI Map Help icon.

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- You may choose to change the UI View Settings for all users in the system. To do this, define an entry for the **UI View** option type and enter the desired value. Note that individual users may override this setting on their user preferences.
- Redwood Enablement
- User Interface Style Customization
- UI Map Help

Redwood Enablement

The Redwood User Experience is opt-in functionality. To enable this in your implementation, navigate to Feature Configuration. Search for an existing feature configuration with the Feature Type `Custom Look and Feel`. If one does not exist, create a feature configuration of this type. Select the `User Interface Style` option and set the value to 'Oracle Redwood'.

User Interface Style Customization

The base product allows for the conditional inclusion of custom style sheets into the system style set. Custom styles may override any style provided by the base product. The style sheet may also include new styles for use in customer zone definitions. Use the **Style Sheet** option on the **Custom Look And Feel** Feature Configuration to define your custom style sheet. The option supports either referencing a *.css file or referencing a Managed Content record (with the content type **CSS Definitions**.)

> **Note**
>
> The Managed Content option is recommended as this makes the Custom CSS available to be easily transferred to other environments if desired using Content Migration Assistant (CMA).

> **Note**
>
> Some styles cannot change if they are part of the HTML code.

> **Caution**
>
> Implementers must ensure that the customized user interface is stable and scalable. Changing font, alignment padding, border size, and other user interface parameters may cause presentation problems, like scrollbars appearing or disappearing, cursors not working as expected, and unanticipated look and feel alterations of some layouts.

The structure of the CSS extension follows the standard CSS file format regardless of using the File option or the Managed Content option. This means that the "<style>" tag is not needed and the file will contain a list of CSS selectors with their declarations (properties and values).

To find the necessary CSS Selector, navigate the application to an appropriate screen, then "right click" on the element you wish to re-style and select **inspect** from the menu (normally at the bottom). This opens a view of the HTML document. From this view you will be able to see any "id" and "class" attributes that are available on the element. These are generally the most suitable attributes for CSS selectors. In order to make the styling more specific, it is also

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appropriate to scan up the HTML DOM tree to view parent "id" and "class" attributes. Making the CSS selector as precisely targeted as possible will reduce the possibility of custom stylings affecting elements outside your desired area.

All standard CSS is supported. However, when looking at the most up-to-date CSS standards, be aware that not all browsers support all options without some specific browser settings.

UI Map Help

A tool tip can be used to display additional help information to the user. This applies to section elements as well as individual elements on a map zone or UI Map. Refer to the tips context sensitive zone associated with the UI Map page for more information. The **Custom Look And Feel** Feature Configuration provides options to control the following:

- Whether UI Map Help functionality is turned on or off. By default it is turned on.
- Override the default help image with a custom image
- The location of the help image, either before or after the element.

> **NOT_SUPPORTED**
>
> Refer to the feature configuration for a detailed description of each option.

Database Options

This section describes a variety of database tools that are supplied with the your product.

- Understanding The Data Model
- Defining Tables
- Defining Fields
- Defining Maintenance Objects
- Maintenance Object Configuration
- Defining Lookups
- Defining Extendable Lookups
- Defining Characteristic Types
- Defining Foreign Key References
- Audit Trails
- Bundling
- Revision Control
- Information Lifecycle Management

Understanding The Data Model

The application uses meta-data to describe its data model, from plain description of its tables and fields to more complex hierarchies of maintenance objects.

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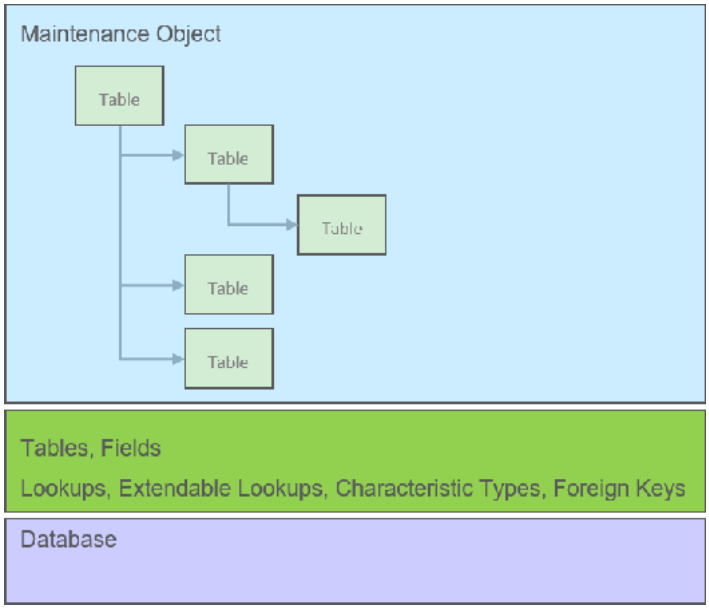

The following points briefly outline key aspects of application's data model as illustrated in this diagram:

- Table and Field records describe all the tables maintained by the application.
- Valid values for certain fields are defined using corresponding Lookup and Extendable Lookup records.
- Characteristic types may be defined to support an extension of a maintenance object via its characteristics table.
- Maintenance Objects define the physical structure of an entity. Business objects further refine maintenance objects to describe business entities. Refer to The Big Picture of Business Objects for more information.
- Foreign Key References define ways for searching and navigating to the maintenance portal of an entity.

The following sections further discusses concepts and guidelines related to the data model.

- Fields
- Tables
- Maintenance Objects
- Defining Valid Values
- Characteristic Types
- Foreign Key References

Fields

A Field definition describes the metadata needed by the application to support the capture and display of a piece of information. Fields may correspond to physical columns on database tables or represent any type of element used for calculation or presentation purposes.

The definition includes the following key details:

- Whether the field refers to a physical column on a database table or used as a work field.
- The type of data the field holds.

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- The label to use when the field is presented.
- The help text to display when the user clicks on the help icon seeking additional information about this field.
- and more

The following sections further discusses concepts and guidelines related to defining fields.

Physical vs. Work Fields

A Field definition record exists for every physical column on a database table that is used by the application. Refer to Understanding Tables for more information.

A Field that does not represent a physical column on a database table is considered as work field and needs to be marked as such. Work fields are typically used as labels as well as describe internal elements used in business rules.

Data Type Information

The type of data captured by a field is defined using the following attributes:

- **Data Type** indicates the basic type of value the field holds. Valid values are **Character, Character Large Object, Date, DateTime, Number, Time, Varchar2** and **XML Type**.
- **Extended Data Type** is used to further define the type of data for certain data types. Valid values are **Currency Source, Day of Month, Duration, Money, Month of Year, Flag, Switch** and **URI**.
- **Precision** defines the length of the field. In the case of variable length fields, it is the maximum length possible. For number fields that include decimal values, the precision includes the decimal values.
- **Scale** is only applicable for number fields. It indicates the number of decimal places supported by the field.
- **Sign** is only applicable for numbers. It indicates if the data may contain positive or negative numbers.

Data Type Inheritance

A Field can be defined to inherit its data type attributes from the definition of another field. The field to inherit the attributes from is referenced as the **Base Field**. When using a base field reference, the data type attributes are defined once, on the base field, and all the fields inheriting their data type information from it are kept consistent with that definition as it may change over time. Any change of a field's data type attributes is automatically reflected on all the fields that reference it as their base field.

Data type information may either be specified directly on the field itself or by referencing a base field. The system does not support a way to partially override the base field's data type information.

It is recommended to leverage data type inheritance whenever possible, especially when the reason for creating a new field is to provide an alternate label for the original field in a certain context. In that situation the new field should reference the original field as its base field and provide the new labels and help text as needed.

Labels and Help Text

For fields that appear on a user interface, the description acts as a label to be used for presentation purposes. As per the product's multi-language support, a field is associated with a label for each of the languages enabled in the system.

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A field's help text may be used to provide the user with additional information on how the field is used. When populated for a field that is visible on a user interface that supports display of embedded help, a help icon appears for the field, presenting the help text to the user when clicked.

Overriding Labels and Help Text

The label and help text provided for a product owned field may be overridden by your organization using the corresponding override fields.

The field's label and help text can be overridden for a specific table by populating the corresponding override information as part of the table / field definition. However, this override is not used in portal based user interfaces. It is only applicable if the field is displayed on fixed page user interfaces. For fixed pages, if the override label at the table / field level takes precedence over the override at the field level.

Alternate Labels

There are contexts where a separate label may be needed for the "date" and "time" parts of a date/time field. Such an example is when the field is used by the operational analytics product. For example, for a "Completion Date/Time" field you may provide the context label "Creation Date" for the **Date** context and "Creation Time" for the **Time** context. These context labels are optional.

In the same way, date fields, time fields and date/time fields may be associated with a **Date and Time Base** context label, which is a label without a reference to the word "Date", "Time" or "Date / Time". For example, for a "Completion Date/Time" field, the date and time base label may be "Completion". This label that can be used in combination with date or time attributes such as day, month, year, hours, minutes etc.

Overrides labels are available for these additional context labels.

Tables

A Table definition describes the metadata needed by the application to work with and access a database table or view.

The definition includes the following key details:

- The table's description in the application.
- The list of fields defined on the table and any foreign key constraints they establish with other tables.
- The table's prime key and how it is generated.
- Whether the table holds administrative, master or transactional data.
- Whether the table is released with product owned system data rows or not.
- The table's role in the conversion process.
- How should table content be upgraded.
- and more

The following sections further discusses concepts and guidelines related to defining tables.

System Tables

Tables released with rows that are owned by the base product are referred to as system tables. These tables include the **Owner** (OWNER_FLG) field to capture the owner of each row.

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Refer to System Data for more information about naming conventions and standards around row record ownership.

The **Upgrade** setting on the table definition record controls what happens to the rows in a table when the system is upgraded to a new release. The most common setting allows customer owned rows to be merged with rows owned by the base product. Other settings may keep the content of the table as is, i.e. rows are not touched by the upgrade, or fully refresh the content of the table with base product rows.

Some fields on certain system owned tables are explicitly marked to allow customization. This means implementation are allowed to change these specific fields for a base owned record. Changes to the field value of one of these types of fields by an implementation are maintained when upgrading to a new version of the product.

Designated Table Roles

Some tables are designed to support the following application roles:

- **Key Tables**
  - A key table holds a copy of a table's prime key only and is only applicable to tables with system generated keys.
  - Tables with a system generated keys reference their Key Table as part of their Table definition record.
  - Records in the key table remain in the system even when the related entity is archived, preventing the same key from being allocated to a new record. Retaining the key allows the system to keep the integrity of any references that may still exist to the archived entity.
- **Language Tables**
  - To support multi-language implementations, all labels and descriptions that are presented to a user are kept in a designated language table where a row exists for each enabled language.
  - The product is released with the English content provided in the various language tables. An additional row is added to these tables for each enabled language along with the translated content for that language. Refer to Support For Different Languages for more information.
  - Tables associated with language sensitive fields reference their corresponding Language Table as part of their Table definition record.
- **Characteristics Tables**
  - Many entities in the system support one or more Characteristics tables, which are used to capture additional fields for the object that are not already supported by the entity's provided attributes.
  - A Characteristics table is designed to capture characteristics applicable to its specific entity only. The entity associated with a Characteristics table is referenced on the Table's definition record.
  - Refer to Setting Up Characteristic Types & Values for more information.
- **Entity Log Tables**
  - Many entities in the system support the ability to capture lifecycle and other important business events on a designated log table.
  - A log table captures the event details in the form of an application message and stores any parameters for the message in a child log parameters table. All log and log

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parameters tables follow a predefined structure allowing them to be consistently and efficiently implemented.

  - Typically log tables do not participate in the conversion process.

Table Constraints

Foreign key relationships between tables are not enforced at the database level but rather at the application level, providing the application more flexibility around data manipulation and referential integrity.

The following types of constraints may be defined on the Table's definition record:

- **Primary Key** represents the field or set of fields that represent the unique identifier of a record stored in a table.
- **Logical Key** represents an alternate unique identifier of a record based on a different set of fields than the Primary key.
- **Foreign Key** represents a field or set of fields that specifies identifying and non-identifying relationships to other tables in the application. A foreign key constraint references the primary key constraint of another table.
- **Conditional Foreign Key** represents rare relationships between tables where a single field (or set of fields) may reference multiple primary key constraints of other tables within the application as a foreign key.

The system leverages a table's foreign key constraints information to performs referential integrity validation when rows in this table are deleted. These validations can be disabled by checking off the **Enable Referential Integrity** field on the Table definition record.

Table Indexes

The indexes delivered by the base product for a given table are visible in the index metadata. In addition, table index information may be defined as part of the cloud services support for generation of custom tables in certain use cases. Refer to the section Generating Custom Tables below for more information.

Primary Key Type

A table's primary key may be of the following types:

- **User-defined** means the user specifies the key when a record is added. This type of key is typically used for configuration and administrative tables.
- **System-generated** means a program generates a random numeric key for the record when it is added.
  - This type of table is typically associated with a key table. Refer to the **Designated Table Roles** section for more information.
  - System generated keys may be fully random or partially inherited from a parent table's key for performance reasons. Refer to the **System Generated Keys** for more information.
- **Sequential** means a sequence number is incremented whenever a record is added to the table. The next number in the sequence determines the key value.
- **Database Native Sequential Key** means a unique number is assigned using a database sequence object.
- **Other** means some other business rule allocates the table's prime-key or the prime key is made of multiple parts.

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System Generated Keys

In general, randomly generated numeric system keys are used to attempt to evenly distribute records across a full range of possible IDs. Batch programs that use multiple threads will typically divide the threads using ID ranges and evenly distributed keys will help spread out the work across these threads.

If a table using a system generated key is a child of another table, the child table's key may **inherit** a portion of the random number from its parent table's key. Key inheritance for child records further extends the performance benefit. When considering partitioning, the recommendation for DBAs is to range partition data based on the primary key so that different batch threads operate on different partitions which reduces contention for hot blocks. Ideally the number of batch threads will be an exact multiple of the number of partitions. Batch programs that insert child data (for example batch Billing creation) also benefit from this design especially when the child tables are partitioned in the same way. The parent is often the driver of the batch process. If this is multi-threaded, then each thread is processing a set of parent records in a given ID range and all child records are being inserted into the same ID range.

While most entities with system generated keys either use fully random keys or partially inherited keys from a single parent, entities may be designed to implement more specific key generation rules.

When key inheritance is used, the table definition of the child table defines the following information:

- The number of most significant digits from the parent record's primary key to use as the **prefix** for the child record's key value.
- The **parent key field name** to inherit the key from. This information is provided for display and documentation purposes only and is only provided when the inheritance rule implemented by the entity may be documented this way. Typically the child key value is inherited from a single parent key but in some cases the inheritance rule may be more complex. For example, different types of records in the same child table may inherit their key from different parent key fields. In this case, multiple parent field names may be listed to describe the various inheritance options. When the rule is too complex, this information may not be provided on the table definition record.

Conversion Options

The conversion process manages the process by which master and transaction legacy data, loaded into a staging schema, is validated and assigned new system generated keys before it is copied to the production schema. Refer to Understanding The Conversion Process for more information.

The tool classifies tables into the following roles:

- Administrative tables. These only exist in the production schema. Instead of a table, a view to the production table exists in the staging schema. These views are necessary to enforce foreign key references when data is validated in the staging schema
- Convertible tables that retain their prime keys. Data conversion is supported for these tables and their prime key values remain unchanged.
- Convertible tables that require a new system generated key to be assigned. Data conversion is supported for these tables and their prime key is reassigned by the system during conversion.
- Not convertible tables. Assigning new system generated keys for a record and replacing all foreign key references it might have with the new key is a complicated process that may not be supported for all tables.

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. The **Data Conversion Role** setting on the table definition record controls if / how the table is used by conversion processing.

Date/Time Configuration

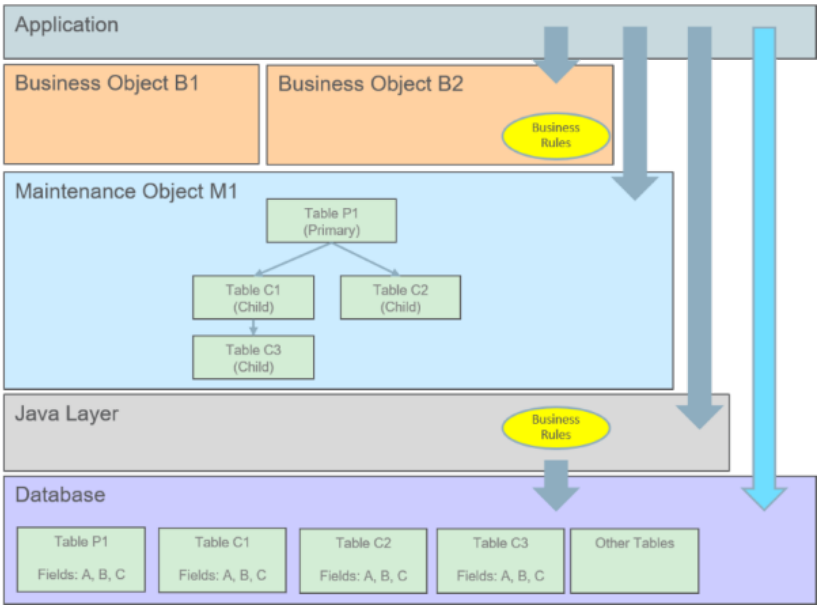
Fields capturing date/time information may be designed to store data in either local legal time or local standard time. Local legal time is captured as entered and displayed as captured in the database. It also assumes the date/time information refers to the time zone defined on the installation options. Refer to Standard vs. Legal for more information.

Generating Custom Tables

For cloud customers and for certain use cases, the product supports defining table metadata for custom tables and generating the related DDLs for that metadata in the database. For these custom tables, there is a Generation Status visible on the Table metadata that identifies where the Table is in the lifecycle for this supported feature. In addition, the index tab on the table portal is used to define custom indexes that are included in the DDL as part of this feature. If you are a cloud customer and would like more information, refer to the Cloud Services Implementation Guide.

Maintenance Objects

A maintenance object defines the configuration of a given “entity” in the system. It includes a primary table and any additional child tables that together capture the physical data for the entity. The application reads, adds, updates and deletes an entity as a single object by invoking its maintenance object service.



The following points briefly outline key aspects of application’s interaction with maintenance objects as illustrated in this diagram:

- Database tables are maintained solely via the application’s Java layer. Direct updates to a table via its Java class is not common and typically reserved to special processes.
- A maintenance object orchestrates the update to an entity’s primary table and its child tables as a single object.
- A business object defines a logical representation of an entity, including all or a subset of the maintenance object’s tables and fields.

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- The more common way to maintain an entity is via its maintenance object, either directly or via one of its business objects. Most entities support the use of business objects and as such their maintenance is typically made via their business objects.
- Direct access to database tables is supported for query purposes only.

The following sections further discusses concepts and guidelines related to defining tables.

Maintaining An Entire Object

A maintenance object includes a single primary table and one or more child tables where each child table can further have nested child tables. The table structure of a maintenance object represents the scope of data that should be maintained together as a single object:

- When an object is added, data in added to each corresponding table.
- When an object is updated, data in updated in each corresponding table.
- When an object is read, data in retrieved from all the tables.
- When an object is deleted, data in deleted from all the tables.

Algorithms

Several algorithm plug-in spots are also defined on the maintenance object, allowing for business rules that govern all records for this maintenance object.

Options

The maintenance object includes options that define important information related to the maintenance object that may be accessed for logic throughout the system.

Maintenance Objects vs. Business Objects

A maintenance object defines the physical structure of an entity as stored in the database. Different business objects may be defined on top of a maintenance object to represent different types of such entity. A business object includes only the relevant information applicable to the specific type of entity as well as enforces business rules applicable only to that type.

When a maintenance object supports business object configuration, the system uses the **Determine Business Object** maintenance object algorithm to determine the identifying business object that controls a given entity's data structure and rules.

Refer to The Big Picture of Business Objects for more information.

Defining Valid Values

The product provides several options for defining valid values for a column on a table:

- Lookup
- Extendable Lookup
- Control Table

The following provides more information about the functionality of each of the options available for defining valid values for a column.

Lookup

The simplest mechanism for defining valid values for a column on a table is via the Lookup table. This is sometimes referred to as a "simple" lookup to distinguish it from an extendable lookup (described below). Using the lookup table, you can define valid values and their

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descriptions. When choosing a valid value that is defined by a lookup, a dropdown UI metaphor is used.

The following highlights functionality related to lookups:

- Lookups are associated with a Field. The field is defined as a character data type with an extended data type of **Flag**. The field's label serves as the description for the prompt to select the valid value.
- The lookup code is limited to four characters and must be all uppercase. If there is any functionality where a valid value in the application must match valid values in an external system, the lookup table may not be the appropriate choice.
- The lookup table does not support additional attributes to be defined for each value. This option is only appropriate when a simple code and description pair is needed.
- The product may also use Lookups to define valid values for functionality unrelated to a column on a table. For example, an algorithm plug-in spot may define an input parameter that supports one or more valid values. The plug-in spot may define the valid values using a lookup, allowing for a simple way to validate the value supplied when invoking the algorithm and to document the valid values.

> **NOT_SUPPORTED**
>
> For more information, refer to Defining Lookup Options.

Extendable Lookup

The extendable lookup provides a way of defining valid values for a column with additional capabilities that are not supported using the Lookup table. When choosing a valid value that is defined by an extendable lookup, a dropdown UI metaphor is used.

The following highlights functionality related to extendable lookups:

- Each Extendable Lookups is defined using a business object.
- A field should be defined for the extendable lookup code. The field defines the label for the lookup code and defines the size of the lookup code. The size is determined based on the business use case. In addition, there are standard fields included in all extendable lookups, including a description, detailed description and an override description (so that implementations can override the description of base delivered values).
- The extendable lookup may define additional information for each value if warranted by the business requirement. See Additional Attributes for technical information about additional attributes.

> **NOT_SUPPORTED**
>
> For more information, refer to Defining Extendable Lookups.

Control Table

There may be scenarios where a list of valid values warrants a standalone maintenance object, which is considered an administrative or control table object. When choosing a valid value that is defined by a control, either a dropdown UI metaphor or a search metaphor is used, depending on how it has been designed.

The following points highlight some reasons why this option may be chosen:

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- The records require a lifecycle such that BO status is warranted.
- The additional attributes are sophisticated enough that they warrant their own column definition rather than relying on using CLOB or flattened characteristic. For example, if a list of information needs to be captured with several attributes in the list and the information in the list needs to be searchable.

In this situation, if a product has provided a control table for this type of functionality, it will be documented fully in the appropriate functional area. If an implementation determines that a custom control table is warranted, all the standard functionality for a maintenance object is required: database tables, maintenance object metadata, appropriate Java maintenance classes, portals, zones, etc. Refer to the Software Development Kit for more information. No further information is provided in this section for this option.

Characteristic Types

Many maintenance objects in the system support characteristics tables, which are used to capture additional fields for the object that are not already supported by the object's provided attributes. Each characteristic is associated with a characteristic type, which defines attributes of the field you wish to capture.

While each characteristic is stored in a separate row in the characteristic table, the user interface metaphor used to capture and display them differ based on the type of page that is used to maintain the object.

- For portal based pages, the business object drives the display and maintenance of the object. The display and maintenance of each characteristic is determined by the business object's user interface design. For these types of pages, it is recommended that characteristics are defined as flattened elements allowing the user interface to display the characteristic as if it is another field. Refer to The Flattening Nodes and Attributes for more information about flattening characteristics on a business object schema.
- There are some fixed pages in the system that do not support customization of the user interface. For these objects, the characteristics are displayed / maintained as a generic list.

The topics in this section describe various aspects of a characteristic type definition and usage.

Characteristic Value Types

Every characteristic referenced on an object references a characteristic type. The characteristic type controls the validity of the information entered by a user when they enter the characteristic's values. For example, if you have a characteristic type on user called "skill", the information you setup on this characteristic type controls the valid values that may be specified by a user when defining another user's skill.

When you setup a characteristic type, you must classify it as one of the following categories:

- **Predefined Value.** When you setup a characteristic of this type, you define the individual valid values that may be entered by a user. A good example of such a characteristic type would be one on User to define one or more predefined skills for that user. The valid values for this characteristic type would be defined in a discreet list.
- **Adhoc Value.** Characteristics of this type do not have their valid values defined in a discreet list because the possible values are infinite. Good examples of such a characteristic type would be ones used to define a user's birth date or their mother's maiden name. Optionally, you can plug-in an algorithm on such a characteristic type to validate the value entered by the user. For example, you can plug-in an algorithm on a characteristic type to ensure the value entered is a date.

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- **Foreign Key Value.** Characteristics of this type have their valid values defined in another table. For example perhaps you want to link a user to a table where User is not already a foreign key. Valid values for this type of characteristic would be defined on the user table. Before you can create a characteristic of this type, information about the table that contains the valid values must be defined on the foreign key reference table.

  > **Note**
  >
  > When you are searching for a foreign key characteristic value, there are some limitations of when a search is available depending on the search metaphore. Refer to Search Options for more information.

- **File Location.** Characteristics of this type contain a URL. The URL can point to a file or any web site. Characteristics of this type might be useful to hold references to documentation / images associated with a given entity. For example, the image of a letter sent to you by one of your customers could be referenced as a file location characteristic on a customer contact entry. When such a characteristic is defined on an entity, a button can be used to open the URL in a separate browser window.

  File location characteristic values must be entered in a "non-relative" format. For example, if you want to define a characteristic value of *www.msn.com*, enter the characteristic value as `http://www.msn.com`. If you omit the `http://` prefix, the system will suffix the characteristic value to the current URL in your browser and attempt to navigate to this location when the launch button is pressed. This may or may not be the desired result.

  > **Note**
  >
  > Due to browser security restrictions, opening URLs using the file protocol ("file://") from pages retrieved using http does not work. If the file protocol is used, the browser either does not return properly or an error is thrown (e.g., "Access Denied", which usually results from cross site scripting features added for security reasons). This issue has no known workaround. To comply with browser security standards, the recommendation is to move the target files to an FTP or HTTP server location to avoid protocols that are subject to browser security restrictions.
  >
  > Also note that the functionality described in the topics for Referencing URIs do not apply to this value given that the browser is responsible for connecting to the URI and does not go via server logic.

  For references to a file, the recommendation is to use the Attachment functionality to link a file to an object rather than a characteristic type of File Location. Refer to Attachment Overview for more information. The documentation related to file location remains for upgrade purposes.

Searching By Characteristic Values

For certain entities in the system that have characteristics, you may search for a record linked to a given characteristic value. The search may be done in one of the following ways:

- Some base searches provide an option to search for an object by entering Characteristic Type and Characteristic Value.
- Your implementation may define a customized search for an entity by a characteristic value for a specific characteristic type using a query data explorer.

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- Your implementation may require a business service to find a record via a given characteristic value. For example, maybe an upload of user information attempts to find the user via an Employee ID, defined as a characteristic.

Not all entities that support characteristics support searching by characteristics. To confirm if a given characteristic table supports searching, verify that it includes the field SRCH_CHAR_VAL.

> ⚠ **Caution**
>
> For ad hoc characteristics, only the first 50 bytes are searchable. For foreign key characteristics, the search value is populated by concatenating the values of each foreign key column to a maximum of 50 bytes.

For the base searches that provide a generic option to search by characteristic type and value, you can restrict the characteristic types that can be used to search for an entity. For example, imagine you use a characteristic to define a "jurisdiction" associated with a To Do for reporting purposes. If your company operates within a very small number of jurisdictions, you wouldn't want to allow searching for a To Do by jurisdiction, as a large number of To Do entries would be returned.

A flag on the characteristic type allows an administrator to indicate if searching by this characteristic type is **allowed** or **not allowed**.

Data Typing an Ad hoc Characteristic Value

An **Adhoc Value** characteristic type may further restrict the data type of the captured value by referencing a Field. When populated, the system validates that the captured characteristic value complies with the data type definition of the referenced field.

Valid Characteristic Entities

Characteristics are stored in designated tables, each associated with a unique characteristic entity value referenced on the table definition record. A characteristic type record lists all the valid characteristic entities it is allowed to be captured on.

Customizing Base Owned Characteristic Types

Implementations may customize the following aspects of a base owned characteristic type:

- Extend the list of valid values for a base owned **Predefined Value** characteristic type to include additional custom values. Such extension is only supported if the characteristic type is defined with the **Custom** option turned on.
- Provide a custom algorithm to validate an **Adhoc Value** characteristic type.
- Indicate whether characteristics of this type may be used in searches.
- Extend the list of entities associated with the characteristic type.

Foreign Key References

A Foreign Key Reference defines the necessary information needed to reference an entity in a certain table.

You need to set up this control table if you need to validate a foreign key value against a corresponding table. For example, if a schema element is associated with an FK Reference the system validates the element's value against the corresponding table. Refer to Configuration Tools to learn more about schema-based objects. Another example is characteristics whose

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valid values are defined in another table (i.e., you use "foreign key reference" characteristic types). Refer to Characteristic Types for a description of characteristics of this type.

A FK Reference is used not just for validation purposes. It also used to display the standard information description of the reference entity as well as provide navigation information to its maintenance transaction. Info descriptions appear throughout the UI, for example, whenever an account is displayed on a page, a description of the account appears. The product provides base product FK references for many of its entities as they are used for validation and display of elements in both fixed page user interfaces as well as portal based user interfaces.

An implementation may also see the need to define a foreign key reference. The following points describe what you should know before you can setup a foreign key reference for a table.

- The physical name of the table. Typically this is the primary table of a maintenance object.
- The program used by default to construct the referenced entity's info description.
- The transaction used to maintain the referenced entity. This is where the user navigates to when using the "go to" button or hyperlink associated with the entity.
- The name of the search page or zone used to look for a valid entity.

The topics in this section describe various aspects of a foreign key reference definition and usage.

Information Description Is Dynamically Derived

Typically a FK Reference is defined for a maintenance object's primary table. In this case the system dynamically derives the standard information associated with a specific referenced entity as follows:

- Attempt to determine the business object associated with the referenced entity. Refer to the Determine BO maintenance object algorithm system event for more information. If a business object has been determined, the system lets the business object's Information plug-in, if any, format the description.
- If a business object has not been determined or the business object has no such plug-in, the system lets the maintenance object's information plug-in, if any, format the description.
- If the maintenance object has no such plug-in, the system uses the info program specified on the FK Reference to format the information.

> **Note**
>
> **Technical note.** The class that returns the information displayed adjacent to the referenced entity is generated specifically for use as an info routine. Please speak to your support group if you need to generate such a class.

> **Note**
>
> **Generic routine.** The system provides a generic information routine that returns the description of control table objects from its associated language table. By "control table" we mean a table with an associated language table that contains a **DESCR** field. Refer to Defining Table Options for more information on tables and fields. The java class is `com.splwg.base.domain.common.foreignKeyReference.DescriptionRetriever`.

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Navigation Information Is Dynamically Derived

Typically a FK Reference is defined for a maintenance object's primary table. In this case the system dynamically derives the actual transaction to navigate to for a given referenced entity as follows:

- Attempt to determine the business object associated with the referenced entity. Refer to the Determine BO maintenance object algorithm system event for more information. If a business object has been determined, use the maintenance portal defined as its **Portal Navigation Option** business object option.
- If a business object has not been determined or the business object defines no such option, the system uses the transaction specified on the FK Reference.

Search Options

The product provides two main metaphors for implementing a user interface. For input fields that are foreign keys, search options are dependent on the metaphor used by the page in question.

- A portal based user interface is a more flexible user interface where an implementation has more options for customizing the look and feel. The base product uses UI maps or automatic UI rendering to display input fields. Elements that are foreign keys may display a search icon if the FK reference defines a Search Zone.

  > **Note**
  >
  > **Defining search zones directly.** It's possible for elements on a UI map to define a specific search zone directly in the HTML, rather than using the search zone defined on an FK reference. Refer to the UI map tips for more information on implementing searches using zones.

- A fixed maintenance page user interface is a page supplied by the base product where only minor enhancements, if any, can be introduced by implementations. The foreign key reference may be used in one of two ways.
  - The based product may use an FK reference to define a base element on one of these pages. If a search is available for such elements, the FK reference's Search Navigation Key is used to implement the search.
  - Entities that support characteristics typically include a generic characteristic collection UI metaphor on these types of pages. In this metaphor, a foreign key characteristic displays a search icon if the FK Reference has configured a Search Navigation Key.

> **Note**
>
> Not every FK reference provided with the product is configured with a search option. This may be the case if the base delivered pages use a dropdown for this foreign key rather than a search. In addition, base provided FK references that do provide a search may not be configured with both search options. It means that if linking this type of object as a characteristic, the search may not be available if the appropriate search is not configured.

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Defining Tables

This portal is used to view and maintain information about an application table.

You can access the portal from the**Admin Menu**, and then **Database**, and then **Table**. You are brought to a query portal with options for searching for a specific table. Once a table has been selected you are brought to the maintenance portal to view and maintain the selected record.

Refer to Tables for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Table.** This zone provides information about the selected table.
- **Fields.** This zone lists all fields of the selected table and provides various actions to maintain this information.

The following zones may appear as part of the portal's **Relationship** tab page

- **Entity Relationship Diagram.** This zone provides a visual representation of the table's relationship to other tables in the application's data model.

The following zones may appear as part of the portal's **Constraints** tab page

- **Table Constraints.** This zone lists the various key constraints defined for the selected table and provides various actions to maintain this information.
- **Referred By Constraints.** This zone lists all tables referring to the selected table via foreign key constraints.

Refer to Tables for more information.

The following zones may appear as part of the portal's **Indexes** tab page

- **Table Indexes.** This zone lists the indexes defined for the selected table and provides various actions to maintain this information.

Refer to Tables for more information.

Defining Fields

This portal is used to view and maintain information about a field. For product owned fields, you may use this portal to override the label of a field on the various pages in the system.

You can access the portal from the **Admin Menu**, and then **Database**, and then **Field**. You are brought to a query portal with options for searching for a specific field. Once a field has been selected you are brought to the maintenance portal to view and maintain the selected record.

> **Note**
>
> When introducing a new record, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

Refer to Fields for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Field.** This zone provides information about the selected field.

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- **Tables Using Field.** This zone lists tables referencing the field. It is not visible for work fields.
- **Lookup Values.** This zone lists and maintains valid values for the selected lookup field. The zone is only visible when the selected field is a lookup field.

The following zone may appear as part of the portal's **References** tab page

- **Field References.** This zone list various configuration entities referencing the current field.

Defining Maintenance Objects

A maintenance object defines the configuration of a given “entity” in the system. It includes the definition of the tables that together capture the physical data for the entity. In addition, the maintenance object includes options that define important information related to the maintenance object that may be accessed for logic throughout the system. Several algorithm plug-in spots are also defined on the maintenance object, allowing for business rules that govern all records for this maintenance object.

Most maintenance objects are provided with the base package. An implementation can introduce custom maintenance objects when needed. Most fields may not be changed if owned by the base package.

Many maintenance objects in the system support the use of business objects to further define configuration and business rules for a given record. Refer to Maintenance Objects for more information.

You can access the portal from the **Admin Menu**, and then **Database**, and then **Maintenance Object**. You are brought to a query portal with options for searching for a specific maintenance object. Once a maintenance object has been selected you are brought to the maintenance portal to view and maintain the selected record.

> **Note**
>
> When introducing a new record, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Maintenance Object.** This zone provides information about the selected maintenance object.
- **Tables Information.** This zone displays information about the tables included in the maintenance object.

The following zone may appear as part of the portal's **Relationship** tab page

- **Entity Relationship Diagram.** This zone describes the relatiomship of this entity to other entities in the data model.

The following zone may appear as part of the portal's **Options** tab page

- **Options.** This zone is used to maintain various configuration options associated with the current maintenance object.

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> **Note**
>
> **You can add new option types.** Your implementation may want to add additional maintenance option types. For example, your implementation may have plug-in driven logic that would benefit from a new type of option. To do that, add your new values to the customizable lookup field `MAINT_OBJ_OPT_FLG`.

The following zone may appear as part of the portal's **Algorithms** tab page

- **Algorithms.** This zone is used to maintain the algorithms associated with the current maintenance object. Refer to the table that follows for a description of all possible system events. If the algorithm is implemented as a script, a link to the **Script** is provided. Refer to Plug-in Scripts for more information.

The following zone may appear as part of the portal's **Business Objects** tab page

- **Business Objects.** This zone displays business objects associated with the current maintenance object.

The following zone may appear as part of the portal's **References** tab page

- **Maintenance Object References.** This zone list various configuration entities referencing the current maintenance object.

Actions

The page supports the following special actions:

- **Create an Algorithm.** Use this action, on the Algorithm tab to create a script based algorithm related to this maintenance object. You are prompted for information regarding the plug-in spot and the system event, the name, description, etc. Once all the information is provided, the system creates an algorithm type, a script, an algorithm and links the algorithm to the maintenance object. You may then navigate to the script to adjust it as needed.
- **Inactivate / Activate Base Algorithms.** You can inactivate algorithms on Maintenance Objects. Your implementation may want to use a maintenance object provided by the base product, but may want to inactivate one or more algorithms provided by the base maintenance object. To do that, use the "Inactivate" action on the appropriate algorithm entry on the Algorithm tab. Use use the "Activate" action to mark an inactive algorithm as active.
  Note that these actions add and remove the "Inactive Algorithm" maintenance option as needed.
- Maintenance Object Algorithms

Maintenance Object Algorithms

The following table describes all the system events supported for maintenance objects.

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System Event	Optional / Required	Description
Audit	Optional	Algorithms of this type are called to notify of any changes to the maintenance object's set of tables. These algorithms are invoked just before the commit at the end of a logical transaction. The system keeps track of what records are added or changed in the course of a transaction and all MO audit algorithms are executed in order of when each record was first added or updated.
Determine BO	Optional	Algorithm of this type is used to determine the Business Object associated with an instance of the maintenance object. It is necessary to plug in such an algorithm on a Maintenance Object to enable the business object rules functionality. The system invokes a single algorithm of this type. If more than one algorithm is plugged-in the system invokes the one with the greatest sequence number.
ILM Eligibility	Optional	Algorithms of this type are used for maintenance objects that are enabled for object erasure for Information Lifecycle Management. They are used to review records that have reached the maximum retention days and evaluate if they are ready to be archived. The system invokes a single algorithm of this type. If more than one algorithm is plugged-in the system invokes the one with the greatest sequence number.

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System Event	Optional / Required	Description
Information	Optional	We use the term "Maintenance Object Information" to describe the basic information that appears throughout the system to describe an instance of the maintenance object. The data that appears in this information description is constructed using this algorithm. The system invokes a single algorithm of this type. If more than one algorithm is plugged-in the system invokes the one with the greatest sequence number.
Manage Erasure Schedule	Optional	Algorithms of this type are used for maintenance objects that are enabled for object erasure, which is a measure to protect Data Privacy. They are triggered when certain system events occur for those objects. The algorithms are used to determine if the record needs to be scheduled for erasure and, if so, create or maintain an entry for the record in the Object Erasure Schedule.
Revision Control	Optional	An algorithm of this type is used to enforce revision control rules when an object is added, changed, or deleted. The maintenance object service calls the plug-in once before the object is processed and once more after applying all business object rules. This allows revision rules to take place in proper revision timings.

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System Event	Optional / Required	Description
Transition	Optional	The system calls algorithms of this type upon each successful state transition of a business object as well as when it is first created. These are typically used to record the transition on the maintenance object's log. Note that most base maintenance objects are already shipped with an automatic logging of state transitions. In this case you may use these algorithms to override the base logging functionality with your own. Refer to State Transitions are Audited for more information.
Transition Error	Optional	The system calls this type of algorithm when a state transition fails and the business object should be saved in its latest successful state. The algorithm is responsible for logging the transition error somewhere, typically on the maintenance object's log. Notice that in this case, the caller does NOT get an error back but rather the call ends successfully and the exception is recorded somewhere, as per the plug-in logic. The system invokes a single algorithm of this type. If more than one algorithm is plugged-in the system invokes the one with the greatest sequence number.

Maintenance Object Configuration

The Maintenance Object Configuration portal provides several zones to help implementations manage configuration across several maintenance objects. It is a standard All-in-One portal.

Navigate using**Admin**, and then **Implementation Tools**, and then **Maintenance Object Configuration.**

The following zones appear on the portal.

- **Object Erasure Configuation.** This zone displays a list of maintenance objects that support object erasure. Press the edit icon to open a window in which the configuration values for that maintenance object can be changed.

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- **Generalized Initial Export Batch Controls.** This zone displays a list of maintenance objects that are eligible for generalize data export, but where appropriate batch controls have not been created. Note that base delivered maintenance objects are delivered with the appropriate batch controls. This zone may not show any data unless you have custom maintenance objects that should be configured for Generalized Data Export.
- **Conversion Batch Controls.** This zone displays a list of maintenance objects whose primary table is eligible for conversion, but where appropriate batch controls have not been created. Note that base delivered maintenance objects are delivered with the appropriate batch controls. This zone may not show any data unless you have custom maintenance objects that should be configured for conversion.

Defining Lookups

Lookup fields may be used to define valid values for a column in a table or for other types of values like parameters to an algorithm. This portal is used to view and maintain information about a lookup field and its values. Note that all lookup information is also maintained as part of the corresponding Field portal.

You can access the portal from the **Admin Menu**, and then **Database**, and then **Lookup**. You are brought to a query portal with options for searching for a specific lookup field. Once a field has been selected you are brought to the maintenance portal to view and maintain the selected record.

> **NOT_SUPPORTED**
>
> Refer to Defining Valid Values for some background information.

> **Note**
>
> When introducing a new record, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Lookup.** This zone provides information about the selected lookup field.
- **Lookup Values.** This zone lists and maintains valid values for the selected lookup field.

The base product provides many different lookup fields and their values as part of the product. The following points highlight some functionality related to base-package lookups.

- Fields that are owned by the product will typically provide base lookup values. Implementations are not permitted to remove base delivered lookup values. Implementations may be able to add custom values to base owned lookups. This is controlled with the Custom switch on lookup.
  - When the custom switch is unchecked, it means that there is functionality controlled by the base values and an implementation may not extend or customize this functionality. An example of this type of lookup is the Data Type field on the Field table. The system supports a distinct list of data types and an implementation may not add additional values.
  - When the custom switch is checked, it means that there is base functionality supplied for the base values but that an implementation can extend the functionality by supplying their own values. An example of this type of lookup is the Access Mode on

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Application Service. The product provides many values for the access mode lookup, representing various actions a user may perform. Implementations may add their own values to this lookup. Documentation should indicate when functionality may be extended and should highlight the lookup value that can be extended.

> ⚠ **Caution**
>
> Important! If you introduce new lookup values, you must prefix the lookup value code with X or Y. If you do not do this, there is a possibility that a future release of the application could introduce a new lookup value with the name you allocated.

- There may be some scenarios where the product supplies a base field and base lookup field with no base lookup values supplied. This occurs when the product doesn't have any base functionality driven by the lookup values. Typically this type of lookup is for information or categorization purposes. The configuration guide for the functional area associated with the lookup should include a configuration step regarding defining values for this type of lookup.
- The description of base delivered values may be overridden by an implementation.

An implementation may also identify the need for defining a new lookup field with its values.

Defining Extendable Lookups

Extendable lookups are a way of defining valid values that are more sophisticated than simple lookups.

> **NOT_SUPPORTED**
>
> Refer to Defining Valid Values for some background information.

The base product provides extendable lookups as part of the product. The following points highlight some functionality related to base-package extendable lookups.

- The base product may supply base extendable lookup values. Implementations are not permitted to remove base delivered extendable lookup values. It is also possible that implementations may be able to add custom values to base owned lookups. If an implementation is not permitted to add lookup values to the base extendable lookup, the extendable lookup business object will include validation to prevent this. There is no equivalent of the Custom switch that is on the lookup field.
- There may be some scenarios where the product supplies a base extendable lookup with no base lookup values supplied. This occurs when the product doesn't have any base functionality driven by the extendable lookup values. The configuration guide for the functional area associated with the extendable lookup should include a configuration step regarding defining values for this type of extendable lookup.
- The description of base delivered values may be overridden by an implementation.

Open this page using **Admin**, and then **General**, and then **Extendable Lookup.**

You are brought to the **Extendable Lookup Query** where you need to search for the extendable lookup object (in other words, its business object).

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Once you have found the appropriate extendable lookup, select the value and you are brought to a standard All-in-One portal that lists the existing lookup values for the extendable lookup. The standard actions for an All-in-One portal are available here.

- Extendable Lookup Advanced Topics

Extendable Lookup Advanced Topics

This section provides some addition technical information about extendable lookup attributes

Defining Additional Attributes

The product provides a few different ways to define additional values for an extendable lookup. Some of the methods are only relevant for base delivered lookup values as they may impact whether or not an implementation can update the values.

The following table highlights the options available and some summary information about what the option provides.

Option	Brief Description	Extendable Lookup Value Searchable by this Attribute?	Base Delivered Value Modifiable?
Element mapped to BO_DATA_AREA	The element is mapped to a CLOB field that allows for base delivered values to be modified.	No	Yes
Element mapped to BASE_BO_DATA_AREA	The element is mapped to a CLOB field that does not allow for base delivered values to be modified.	No	No
Flattened characteristic	The element is defined using the flattened characteristic mechanism.	Yes	No

The following points highlight information from the table above:

- The decision of defining an additional attribute using a CLOB mapping or a flattened characteristic will depend on whether the functionality expects that the lookup value is known when the attribute is needed (in which case a CLOB mapping is appropriate) or if the functionality expects to determine the lookup value based on the attribute (in which case, a flattened characteristic is appropriate).
- When the base product defines an extendable lookup with additional attributes and intends to provide base extendable lookup values, it needs to determine whether or not implementations may update the additional attribute or not.
  - If no and the value is mapped to a CLOB, it will map the value to the BASE_BO_DATA_AREA column. This means that implementations will receive an owner mismatch error when attempting to change the value. In addition, upgrading to a new release will replace the value with the base value.
  - If yes and the value is mapped to a CLOB, it will map the value to the BO_DATA_AREA column. This means that implementations will be able to change the value for a base owned record. In addition, upgrading to a new release will not make any changes to the value.

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- For values mapped to a characteristic, the product does not support an implementation changing the value of a base delivered record. If the product would like to support an implementation overriding this type of value, the business object will need to be designed with a corresponding "override" element (also a flattened characteristic), similar to how the product supplies an Override Description field to support an implementation overriding the base product delivered description for a base value. This element will not be delivered with any value and will allow an implementation to populate that value.

  > **Note**
  >
  > Note that in this situation, the product functionality that uses this value must cater for the override value.

- All of this detail is only relevant for base provided extendable lookup values. If an implementation adds custom values for a base supplied extendable lookup, all the additional attributes may be populated as appropriate.
- If an implementation defines a custom extendable lookup business object and wants to define an additional attribute using a CLOB, it doesn't matter which CLOB column is used. Both BO_DATA_AREA and BASE_BO_DATA_AREA provide the same functionality for custom business objects.

Capturing a Password

If an extendable lookup includes configuration of a password for some functionality, the system supports automatic encryption of the password value if the schema maps the password to a characteristic using the characteristic type `F1-PWD`.

Defining Characteristic Types

This portal is used to view and maintain characteristic types. An implementation may define their own characteristic types or override some of the settings for base product provided characteristic types.

You can access the portal from the **Admin Menu**, and then **General**, and then **Characteristic Type**. You are brought to a query portal with options for searching for a specific record. Once a characteristic type record has been selected you are brought to the maintenance portal to view and maintain the selected record.

> **Note**
>
> When introducing a new record, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

Refer to Characteristic Types for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Characteristic Type.** This zone provides information about the selected characteristic type.
- **Characteristic Values.** This zone is visible for pre-defined characteristic types and shows the existing values (if applicable) with action buttons. It also allows you to add new values.

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Note that you may only add values to a product owned characteristic type if the Custom switch is checked.

Defining Foreign Key References

The topics in this section describe the transaction that allows you to define foreign key references.

Refer to Foreign Key References for more information.

You can access the portal from the **Admin Menu**, and then **Database**, and then **FK Reference**. You are brought to a query portal with options for searching for a specific foreign key reference. Once a foreign key reference has been selected you are brought to the maintenance portal to view and maintain the selected record.

> ⚠ **Caution**
>
> Important! If you introduce a new foreign key reference, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page.

- **Foreign Key Reference.** This zone provides information about the selected foreign key reference.
  - Navigation to the referenced entity may be dynamic. The page associated with the specified Navigation Option is used when a dynamic option is not available. Refer to Navigation Information Is Dynamically Derived for more information.
  - The information description of the referenced entity may be composed dynamically depending on the specified Info Program Name. Refer to Information Description Is Dynamically Derived for more information.
  - Certain restrictions apply when displaying the context menu for a referenced entity.

    > ⓘ **Note**
    >
    > Context Menu Name is not applicable to user interface elements displaying a generic collection using a foreign key characteristic type. It is only applicable for pages utilizing the foreign key compound element type for fixed page user interface and for data displayed in a portal based user interface where the foreign key reference is defined as an attribute for an element. Report parameters that reference foreign key characteristics are an example of a user interface where a context menu is not displayed even if the foreign key reference defines one.

  - Certain restrictions apply to search features on fixed page user interfaces.

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> **Note**
>
> Search Type and Search Tooltip attributes are only applicable to user interface elements utilizing the foreign key compound element type on fixed page user interfaces. Report parameters that reference foreign key characteristics are an example of a user interface where this information is not used even if the foreign key reference defines them.

The following zones may appear as part of the portal's **References** tab page.

- **Foreign Key References.** This zone list various configuration entities referencing the current foreign key reference.

Actions

The page supports the following special actions:

- **View the source.** If the foreign key information program is shipped with the base package, you can use the adjacent button to display the source code of this program in the Javadocs viewer.

Audit Trails

The topics in this section describe one way of auditing changes in the system. Note that this technique has limitations and may not be the best option for all situations.

- This functionality is configured at the table and field level. Many base maintenance objects use an XML or CLOB field to capture one or more elements using XML format, configured using a BO schema. This auditing technique is not able to capture changes to individual elements. It can only capture overall changes to the single field. The BO Audit plug-in is a better option for auditing changes to individual elements with the CLOB / XML field.
- The base table provided for supporting audits limits the field size of the before and after values to 254 bytes.
- Auditing is captured for each field. In some cases it is prefered to capture a before and after image for several fields at once. For example, if an address is changed, it's more user friendly to capture the before and after for the full address rather than the individual address components. The BO Audit plug-in allows for capturing a single audit record for multiple elements rather than granular changes for each element.

The subsequent topics highlight how to enable auditing for fields, and describe the auditing queries that you can use to view audit records.

- Captured Information
- How Auditing Works
- The Audit Trail File
- How To Enable Auditing
- Audit Queries

Captured Information

When auditing is enabled for a field, the following information is recorded when the field is changed, added and/or deleted (depending on the actions that you are auditing for that field):

- User ID

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- Date and time
- Table name
- Row's prime key value
- Field name
- Before image (blank when a row is added)
- After image (blank when a row is deleted)
- Row action (add, change, delete)

How Auditing Works

You enable auditing on a table in the table's meta-data by specifying the name of the table in which to insert the audit information (the audit table) and the name of the program responsible for inserting the data (the audit trail insert program). Then you define the fields you want to audit by turning on each field's audit switch in the table's field meta-data. You can audit fields for delete, insert and update actions.

Once auditing is enabled for fields in a table, the respective row maintenance program for the table assembles the list of changed fields and calls the audit trail insert program. If any of the changed fields are marked for audit, the audit program inserts audit rows into the audit table.

> **Note**
>
> **Customizing Audit Information.** You may want to maintain audit information other than what is described in Captured Information or you may want to maintain it in a different format. For example, you may want to maintain audit information for an entire row instead of a field. If so, your implementation team can use the base audit program and base audit tables as examples when creating your own audit trail insert program and audit table structures.

The Audit Trail File

Audit log records are inserted in the audit tables you define. The base product contains a single such table (called `CI_AUDIT`). However, the base audit insert program is designed to allow you to use multiple audit tables.

If you want to segregate audit information into multiple tables, you must create these tables. Use the following guidelines when creating new audit tables (that use the base delivered audit insert program):

- The new audit tables must look identical to the base table (`CI_AUDIT`).
- The new tables must be prefixed with **CM** (e.g., `CM_AUDIT_A`, `CM_AUDIT_B`, etc.). An appropriate java table name must be defined and an *_impl.java program for that java table name must be defined.
- The name of the new table must be referenced on the various tables whose changes should be logged in the new table.

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> **Note**
>
> It's important to note if you use your own tables (as opposed to using the base package table called `CI_AUDIT`), the SQL used to insert and access audit trail records in the base delivered audit program is dynamic. Otherwise, if the base package's table is used, the SQL is static.

How To Enable Auditing

Enabling audits is a two-step process:

- First, you must turn on auditing for a table by specifying an audit table and an audit trail insert program.
- Second, you must specify the fields and actions to be audited for the table.

The following topics describe this process.

- Turn On Auditing For a Table
- Specify The Fields and Actions To Be Audited

Turn On Auditing For a Table

In order to tell the system which fields to audit, you must know the name of the table on which the field is located. You must specify the audit table and the audit trail insert program for a table in the table's meta-data.

> **Note**
>
> Most of the system's table names are fairly intuitive. For example, the user table is called SC_USER, the navigation option table is called CI_NAV_OPT, etc. If you cannot find the table using the search facility on the Table portal, please contact customer support.

To enable auditing for a table:

- Navigate to the Table portal and find the table associated with the field(s) for which you want to capture audit information.
- Specify the name of the **Audit Table**.

> **Note**
>
> **Specifying the Audit Table.** You can use the audit table that comes supplied with the base package (`CI_AUDIT`) to audit multiple tables and fields. All the audit logs are combined in a single table (`CI_AUDIT`). However, you can also have a separate audit table for each audited table. Refer to The Audit Trail File for more information.

- Specify the name of the **Audit Program** . The product provides two programs. `com.splwg.base.domain.common.audit.DefaultTableAuditor` is a standard table audit program. In addition

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`com.splwg.base.domain.common.audit.ModifiedTableAuditor`is supplied as an alternative. This program does not audit inserts or deletes of empty string data.

> **⚠ Caution**
>
> By default, none of a table's fields are marked for audit. Even though you have enabled auditing for a table, you must still specify the fields and actions on those fields to be audited (see below).

Specify The Fields and Actions To Be Audited

The system only audits actions (insert, update and delete) made to fields that you want audited.

To specify the fields and actions to be audited:

- Navigate to the Table portal for a table on which you have enabled auditing.
- For each field you want to audit, specify the actions you want to audit by turning on the **Audit Delete**, **Audit Insert** and **Audit Update** switches as appropriate.

> **ⓘ Note**
>
> You can also turn on the audit switches using the Field zone at the bottom of the Table portal.

> **⚠ Caution**
>
> Audit Program Caching! The audit program from the table meta-data is read into a program cache on the application server whenever the date changes or when the server starts. If you implement new auditing on a table, your audit trail does not become effective until this program cache is reloaded. In other words, new audits on tables where the audit program was not previously specified do not become effective until the next day (or the next restart of the application server). However, if you change the fields to be audited for a table where the audit program is already in the cache, your changes are effective immediately.

Audit Queries

There are two queries that can be used to access the audit information.

- Audit Query by User
- Audit Query by Table / Field / Key

Audit Query by User

This transaction is used to view changes made by a user that are stored on a given Audit Trail File.

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> **⚠ Caution**
>
> The system only audits changes that you've told it to audit. Refer to The Big Picture Of Audit Trails for more information.

Navigate to this page by selecting **Admin**, and then **Database**, and then **Audit Query By User**.

Description of Page

To use this transaction:

- Enter the **User ID** of the user whose changes you wish to view.
- Enter the name of the table on which the audit trail information is stored in **Audit Table**. Refer to The Audit Trail File for more information about this field.

> **ⓘ Note**
>
> **Default Note**. If only one audit table is used to store audit trail information, that table is defaulted.

- Specify a date and time range in **Created between** to restrict the records that result from the query.

> **ⓘ Note**
>
> **Default Note**. The current date is defaulted.

- Click the search button to display all changes recorded on a specific audit table associated with a given user.

Information on this query is initially displayed in reverse chronological order.

The following information is displayed in the grid:

- **Row Creation Date** is the date and time that the change was made.
- **Audited Table Name** contains the name of the table whose contents were changed.
- **Primary Key** is the prime key of the row in the **Audited Table** whose contents where changed.
- **Audited Field Name** is the name of the field that was changed.
- **Audit Action** indicates whether the row action was **Add**, **Change** or **Delete**.
- **Field Value Before Update** contains the content of the field before the change. This column is blank if information was **Added**.
- **Field Value After Update** contains the content of the field after the change. This column is blank if information was **Deleted**.

Audit Query by Table / Field / Key

This transaction is used to view audited changes made to a given table.

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> **⚠ Caution**
>
> The system only audits changes that you've told it to audit. Refer to The Big Picture Of Audit Trails for more information.

This transaction can be used in several different ways:

- You can view all audited changes to a table. To do this, enter the **Audited Table Name** and leave the other input fields blank.
- You can view all audited changes to a given row in a table (e.g., all changes made to a given user). To do this, enter the **Audited Table Name** and row's prime key (the row's prime key is entered in the field(s) beneath **Audited Field Name**).
- You can view all audited changes to a given field in a table (e.g., all changes made to all customers' rates). To do this, enter the **Audited Table Name** and the **Audited Field Name**.
- You can view all audited changes to a given field on a specific row. To do this, enter the **Audited Table Name**, the **Audited Field Name**, and row's prime key (the row's prime key is entered in the field(s) beneath **Audited Field Name**).

Navigate to this page by selecting **Admin**, and then **Database**, and then **Audit Query By Table/Field/Key**.

Description of Page

To use this transaction:

- Enter the name of the table whose changes you wish to view in **Audited Table Name**.
- If you wish to restrict the audit trail to changes made to a specific field, enter the **Audited Field Name**.
- If you wish to restrict the audit trail to changes made to a given row, enter the row's prime key (the row's prime key is entered in the field(s) beneath **Audited Field Name**). These fields are dynamic based on the **Audited Table Name**.
- Specify a date and time range in **Created between** to restrict the records that result from the query.

> **ⓘ Note**
>
> The current date is defaulted.

- Click the search button to display all changes made to this data.

Information on this query is initially displayed in reverse chronological order by field.

The following information is displayed in the grid:

- **Create Date/Time** is the date / time that the change was made.
- **User Name** is the name of the person who changed the information.
- **Primary Key** is the prime key of the row in the **Audited Table** whose contents where changed.
- **Audited Field Name** is the name of the field that was changed.
- **Audit Action** indicates whether the row action was **Add**, **Change** or **Delete**.

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- **Value Before Update** contains the content of the field before the change. This column is blank if information was **Added**.
- **Value After Update** contains the content of the field after the change. This column is blank if information was **Deleted**.

Bundling

The topics in this section describe the bundling features in the application.

- About Bundling
- Configuring Maintenance Objects for Bundling
- Working with Bundles

About Bundling

Bundling is the process of grouping entities for export or import from one environment to another.

For example, you might export a set of business objects and service scripts from a development environment and import them into a QA environment for testing. The group of entities is referred to as a bundle. You create export bundles in the source environment; you create import bundles in the target environment.

Working with bundles involves the following tasks:

- Configuring entities for bundling if they are not preconfigured
- Creating an export bundle, which contains a list of entities to be exported from the source environment
- Creating an import bundle to import those entities to the target environment
- Applying the import bundle, which adds or updates the bundled entities to the target environment

- Sequencing of Objects in a Bundle
- Recursive Key References
- Owner Flags on Bundled Entities

Sequencing of Objects in a Bundle

Bundle entities are added or updated to the target environment in the sequence defined in the bundle

Typically, the sequence of entities does not matter. However, sequence is important in the following situations:

- Entities that are referenced as foreign keys should be at the top of the sequence, before the entities that reference them. Specify zones last, as they typically contain numerous foreign key references.
- When importing a business object, specify the business object first, then its plug-in scripts, then the algorithms that reference the scripts, and then the algorithm types that reference the algorithms.
- When importing a portal and its zones, specify the portal first and then its zones.

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- When importing a multi-query zone, specify the referenced zones first and then the multi-query zone.
- Always specify algorithms types before algorithms.

You can specify the sequence when you define the export bundle or when you import the bundle to the target environment.

Recursive Key References

Recursive foreign keys result when one object has a foreign key reference to another object that in turn has a foreign key reference to the first object.

For example, a zone has foreign keys to its portals, which have foreign keys to their zones. If the objects you want to bundle have recursive relationships, you must create a 'bundling add' business object that has only the minimal number of elements needed to add the entity. A bundling add business object for a zone contains only the zone code and description, with no references to its portals. In the same way, a bundling add business object for a portal defines only its code and description.

When you apply the bundle, the system initially adds the maintenance object based on the elements defined in the bundling add business object. Before committing the bundle, the system updates the maintenance object with the complete set of elements based on its physical business object.

Note that use of the bundling add BO also benefits records that have optional foreign keys or foreign keys that are part of a child table. That way the person creating the bundle does not have to worry about the sequence of the records. For example, an FK Reference may optionally reference a zone for searching. If a new FK Reference and its search zone are bundled together to copy to another region, the bundling add BO for FK Reference (which doesn’t include the Zone) ensures that the FK reference could be added before the zone without getting any validation errors.

Owner Flags on Bundled Entities

The owner flag of the entities in an import bundle must match the owner flag of the target environment.

If you need to import objects that your source environment does not own, you must replace the owner flag in the import bundle with the owner flag of the target environment.

Configuring Maintenance Objects for Bundling

Most base package meta-data objects are pre-configured to support bundling. All other objects must be manually configured.

If a base package maintenance object is pre-configured for bundling, the **Eligible For Bundling** option will be set to "Y" on the Options tab for the maintenance object.

To configure other objects for bundling, review the configuration tasks below and complete all those that apply:

Configuration Task	Scope of Task
Make maintenance objects eligible for bundling	All objects to be included in the bundle.
Add a foreign key reference	All objects to be included in the bundle.

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Configuration Task	Scope of Task
Create a physical business object	All objects to be included in the bundle.
Create a bundling add business object	Only needed if there are objects with recursive or optional foreign key references.
Add the Current Bundle zone	Perform this step for any object where you want the Current Bundle zone to appear on the sidebar when on the maintenance page for this maintenance object. This is not required by the bundling process.
Create a custom Entity Search zone and add it to the Bundle Export portal	Perform this step if you would like the object to be listed in the Entity Search zone in the Bundle Export portal. This is not required by the bundling process.

Making Maintenance Objects Eligible for Bundling

The "Eligible For Bundling" maintenance object option must be set to "Y" for all bundled objects. Go to the Maintenance Object page and search for the maintenance object. On the Options tab, add a new option with the type **Eligible For Bundling**. Set the value to "Y" and click **Save**. This configuration must be in both the source environment and the target environment.

Adding a Foreign Key Reference

Foreign key references are used for many purposes and most maintenance objects should have them anyway. Check the Maintenance Object options to see if there is an entry for the **Foreign Key Reference** option. If one is not configured, navigate to FK Reference and set up a foreign key reference for the primary table of the maintenance object. Configure that new FK reference on the maintenance object using an option.

Creating a Physical Business Object

If the maintenance object does not already have a Physical BO configured, one must be created to support using it in a bundle. Refer to Creating a Physical Business Object for more information.

Creating a Bundling Add Business Object

If the objects to be bundled have recursive foreign key references, optional foreign key references or child tables that include foreign key references, create a bundling add business object to avoid problems with referential integrity.

1. Navigate to Business Object and add a business object for the maintenance object. Do not fill in any of the UI oriented configuration.
2. The business object is created with a schema that looks like the physical structure of the maintenance object.
3. Remove all child tables and all elements that are not required.
4. Save the business object.
5. Navigate to Maintenance Object and search for the maintenance object you want to bundle.
6. On the **Option** tab, add a new option with the type **Bundling Add BO**. The value is the name of the bundling add business object you just created.

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Adding the Current Bundle Zone

If you want the Current Bundle zone to appear on the sidebar when the a user is on the maintenance page for the maintenance object, you must add the Current Bundle zone as a context-sensitive zone for the maintenance page's navigation key.

1. Navigate to Context Sensitive Zone and search for the navigation key for the maintenance page of this object.
2. Add the Current Bundle zone F1-BNDLCTXT, to that navigation key.

Adding a Customized Entity Search Query Zone to the Bundle Export Portal

If you want the maintenance object to be searchable in the Bundle Export portal in the Entity Search zone, you must first create an entity-specific query zone to search for the maintenance object. Then you must create a customized entity search zone that references this new query zone. Finally, you must add the customized entity search zone to the Bundle Export portal.

Note that not all base product entities that are eligible for bundling have a search configured for this zone. There is a limit to the number of searches that may be listed here. The base product has provided searches for only the most common objects that are bundled.

Create an entity-specific query zone to search for the maintenance object:

1. Navigate to Zone and search for one of the base query zones, such as the Algorithm Search zone F1-BNALGS.
2. Click the **Duplicate** button in the record actions section.
3. Enter a name and description for the new zone.
4. Click **Save**.
5. Customize the details of the parameters for your maintenance object.

Create a customized entity search zone. This step only needs to be done once. If you already have a customized search zone in the Bundle Export portal, skip this step.

1. Navigate to Zone and search for the F1-BNDLENTQ Entity Search zone.
2. Duplicate this zone.
3. Remove any references to base query zones.

Add the new entity-specific query zone to the customized entity search zone:

1. Locate the customized entity search zone for your Bundle Export portal. This is the zone created in the previous step.
2. Add the name of the query zone you created in the first step to the list of Query Zones.

Add the customized entity search zone to the Bundle Export portal. This step needs to be done only once.

1. Navigate to Portal and search for the Bundle Export portal, F1BNDLEM.
2. In the zone list, add the entity search zone you created above. (Add the new zone after the base entity search zone).
3. Save the portal.

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Working with Bundles

Use the Bundle Export portal to create an export bundle. The export bundle contains a list of entities to be exported from the source environment. When you are ready to import the objects, use the Bundle Import portal to import the objects to the target environment.

- Creating Export Bundles
- Creating and Applying Import Bundles
- Editing Export Bundles
- Editing Import Bundles

Creating Export Bundles

An export bundle contains a list of entities that can be imported into another environment.

To create an export bundle:

1. Log on to the source environment from which objects will be exported.
2. Select **Admin**, and then **Implementation Tools**, and then **Bundle Export**, and then **Add**.
3. Complete the fields in the Main section to define the bundle's basic properties.

> **Note**
>
> You can use the Entities section to add bundle entities now, or save the bundle and then add entities as described in step 5.

4. Click **Save** to exit the Edit dialog. The export bundle status is set to Pending.
5. While an export bundle is in Pending state, use any of the following methods to add entities to the bundle:
   a. Use the **Entity Search** zone on the Bundle Export portal to search for entities and add them to the bundle. If an entity is already in the bundle, you can remove it.
   b. To import entities from a .CSV file, click **Edit** on the Bundle Export portal, and then click **CSV File to Upload.** Specify the file name and location of the .CSV file containing the list of entities. Click **Submit** to upload the file, and then click **Save** to save the changes.
   c. Use the **Current Bundle** zone in the sidebar of the entity you want to add. (All entities that are configured to support bundling display a Current Bundle zone). This zone displays a list of all pending export bundles to which you can add the entity.
   d. When you check an entity into revision control, specify the export bundle on the **Revision Info** dialog.
6. When you have added all entities, click **Bundle** in the Bundle Actions zone on the Bundle Export portal. The export bundle state is set to Bundled and the Bundle Details zone displays the XML representation of every entity in the bundle.

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> **Note**
>
> The owner flags of the entities in the bundle must match the owner flag of the bundle itself. If the owner flags do not match, the system displays a warning message. Click **OK** to continue or **Cancel** to abort the bundle. If you click OK, you will need to resolve the owner flag discrepancy before you import the bundle to the target environment.

7. Copy the XML from the **Bundle Detail** zone to the clipboard (or to a text file). You can now create an import bundle and apply it to the target environment.

> **Note**
>
> If you need to make additional changes to the bundle, you must change the bundle state by selecting the **Back to Pending** button in the **Bundle Actions** zone.

Creating and Applying Import Bundles

Import bundles define a group of entities to be added or updated in the target environment.

Before you create an import bundle, you must have already created an export bundle, added entities, and set the bundle's state to Bundled.

To create an import bundle and apply it to the target environment:

1. If you have not already copied the XML from the export bundle, do so now:
   a. Select **Admin**, and then **Implementation Tools**, and then **Bundle Export** and search for the bundle.
   b. Copy the XML from the **Bundle Detail** zone to the clipboard (or to a text file).
2. Log on to the target environment.
3. Select **Admin**, and then **Implementation Tools**, and then **Bundle Import**, and then **Add**.
4. In the **Bundle Actions** zone, click **Edit XML**.
5. Paste the contents of the clipboard (or text file if you created one) into the **Bundle Detail** zone.
6. Make any necessary changes to the XML and click **Save**. The status of the import bundle is set to Pending.

> **Note**
>
> Use caution when editing the XML to avoid validation errors.

7. To remove entities from the import bundle or change their sequence, click **Edit**. Enter your changes and click **Save** to exit the Edit dialog.
8. When you are ready to apply the bundle, click **Apply**. The import bundle state is set to Applied and the entities are added or updated in the target environment.

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Editing Export Bundles

You can add or remove entities from an export bundle when it is in Pending state. You can also change the sequence of entities.

To edit to an export bundle that has already been bundled, you must change the bundle state by selecting the **Back to Pending** button on the Bundle Export portal.

To edit a pending export bundle:

1. Open the bundle in edit mode.
2. Click **Edit** on the Export Bundle portal.
3. Make any necessary changes on the edit dialog and then click **Save**.

Editing Import Bundles

You can remove entities from an import when it is in Pending state. You can also change the sequence of entities and edit the generated XML.

To edit a pending import bundle:

1. Open the bundle in edit mode.
2. To edit the XML snapshot, click **Edit XML**. Edit the XML code as needed, then click **Save**.

> **Note**
>
> Use caution when editing the XML to avoid validation errors.

3. To remove entities or change their sequence, click **Edit**. Make any necessary changes and click **Save**.

Revision Control

The topics in this section describe the revision control features in the application.

- About Revision Control
- Working with the Revision Control Zones
- Revision Control Portal

About Revision Control

Revision control is a tool provided for the development phase of a project to allow a user to check out an object that is being worked on. In addition, it captures the version of the maintenance object when users check in an update, maintaining a history of the changes to the object.

If revision control is enabled for an object you must check out the object to change it. While the object is checked out no one else can work on it. You can revert all changes made since checking out an object, reinstate an older version of an object, recover a deleted object, and force a check in of an object if someone else has it checked out. You may also compare two versions of the object to more easily review changes.

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> **Note**
>
> Revision control does not keep your work separate from the environment. Because the metadata for maintenance objects is in the central database, any changes you make to an object while it is checked out will be visible to others and may impact their work.

Many of the maintenance objects used as configuration tools are already configured for revision control, but it is turned off by default. For example, business objects, algorithms, data areas, UI maps, and scripts are pre-configured for revision control.

- Turning On Revision Control
- Configuring Maintenance Objects for Revision Control

Turning On Revision Control

Revision control is turned off by default for maintenance objects that are configured for revision control.

To turn on revision control:

1. Add the base package **Checked Out** zone to the Sidebar portal.
   a. Navigate to Portal.
   b. Search for the sidebar portal F1SDBTOOL.
   c. In the zone list for the portal, add the zone F1-USRCHKOUT.
2. Set up application security.

   For users to have access to revision control, they must belong to a user group that has access to the application service F1-OBJREVBOAS.
3. Add the revision control algorithm to the maintenance object that you want to have revision control.

   This step must be repeated for each maintenance object that you want to have revision control.
   a. Go to the Maintenance Object page and search for the maintenance object that you want to have revision control.
   b. On the **Algorithms** tab of the maintenance object, add the revision control algorithm F1-REVCTL.

Configuring Maintenance Objects for Revision Control

Most configuration tool maintenance objects are pre-configured for revision control. You can configure other maintenance objects for revision control, as well.

To configure other objects for revision control:

1. Create a physical business object for the maintenance object, if it doesn't already have one. Refer to Creating a Physical Business Object for more information.
2. Add a foreign key reference to the maintenance object (if it doesn't already have one) so that the standard information string is displayed. Foreign key references are used for many purposes and most maintenance objects should have them anyway. Check the Maintenance Object options to see if there is an entry for the **Foreign Key Reference** option. If one is not configured, navigate to FK Reference and set up a foreign key

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reference for the primary table of the maintenance object. Configure that new FK reference on the maintenance object using an option.

3. Add the **Revision Control** zone to the maintenance object.
    a. Navigate to Context Sensitive Zone and search for the navigation key for the maintenance object.
    b. Add the Revision Control zone, F1-OBJREVCTL, to that navigation key.
4. Add the revision control algorithm to the maintenance object.
    a. Go to the Maintenance Object page and search for the maintenance object that you want to have revision control.
    b. On the **Algorithms** tab of the maintenance object, add the revision control algorithm F1-REVCTL.

Working with the Revision Control Zones

You use two zones in the sidebar to work with revision controlled objects when revision control is turned on.

The **Revision Control** zone gives you several options for managing the revision of the currently displayed object. This zone also shows when the object was last revised and by whom. This information is linked to the **Revision History** portal which lists all of the versions of the object.

Using the Revision Control zone you can:

- Check out an object in order to change it.
- Check in an object so others will be able to work on it.
- Revert the object back to where it was at the last checkout.
- Force a check in of an object that is checked out by someone else. You need special access rights to force a check in.
- Compare the latest version of the object to the previous checked in version.
- Delete an object.

See the subsequent sections for more information about each action.

The **Checked Out** zone lists all of the objects that you currently have checked out. Clicking on an object listed in this zone will take you to the page for that object. The zone is collapsed if you have no objects checked out.

See Revision Control Portal for more information about Check In, Force Check In, and Check Out one or more records simultaneously.

Checking Out an Object

If an entity's maintenance object is configured for revision control, you must check out the entity in order to change it. Go to the object you want to work on and click **Check Out** in the Revision Control sidebar zone.

The following points highlight behavior related to this functionality:

- When you create a record for a maintenance object that is managed with revision control, the system automatically associates the new record with a revision control in Checked Out status.

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- When you update an object governed by revision control, if you forget to check it out first, a dialog box informs you that the object is under revision control. You can select **OK** to check out the object and save your changes, or **Cancel** to stop the update.
- If another user has the object checked out, you will not be able to make changes.

> **Note**
>
> The system also supports Mass Check Out from the Revision Control search portal.

Checking In an Object

Once you are finished with changes, you should check in the object. This captures the latest revision and allows others to check it out.

While viewing the object, click **Check In** in the Revision Control sidebar zone. You are prompted for an **External Reference** and **Detailed Description**. It is recommended to put meaningful information in both of these fields to allow for future users that review changes to this object have a good understanding of the reason for the change.

The **Keep Checked Out** option is useful if you are checking in a version of the object that is stable but allows you to keep it checked out for further changes. The latest revision is one available for you to restore to later if you want to back out newer changes.

If you are using Bundling to manage copying objects to another environment, use the Add to Bundle option to automatically include this object in a current open bundle.

> **Note**
>
> The system also supports Mass Check In from the Revision Control search portal.

Reverting Changes

Reverting changes will undo any changes you made since you checked out an object.

While viewing the object, click **Revert** in the Revision Control sidebar zone. Once your change is reverted, the object is available to be checked out by another user.

> **Note**
>
> To restore the version of the object to a different revision than the most recent checked in revision, drill into the object's revision history. Refer to Revision Control Portal for more information.

> **Note**
>
> Any change to the object increments the version number. If you make changes and then revert your changes, internally the system updates the object to match the previously checked in revision. The version number, however, is incremented. It is not restored to the version number of the previous revision.

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Comparing Versions

When viewing an object that is governed by revision control, a link on the Revision Control sidebar zone allows you to **Compare to Previous Version**. The comparison works as follows:

- When viewing an object that is currently checked out, clicking the link compares the current view of the object in the database with the snapshot view of the object from its most recent checked in revision.
- When viewing an object that is checked in, when clicking the link, the behavior differs based on whether or not the current view of the object matches the most recent revision.
  - If they match, you are shown the comparison between the most recent check in to the check in before that.
  - If they do not match, it means that some process changed the object outside of revisions. In that case, you are shown the difference between the current view of the object and the most recent revision.

> **Note**
>
> The revision history view of an object in the Revision Control Portal allows you to select any two revisions to compare.

Forcing a Check In or Restore

If an object is checked out by another user and that person is not available to check it in or revert it, you may force a check in or force a restore (which is equivalent to a Revert action).

While viewing the object, click **Force Check In** in the Revision Control sidebar zone to keep the latest updates made by the checked out user. Click **Force Restore** in the Revision Control sidebar zone to discard the changes made by the checked out user and revert the object to the previously checked in revision.

> **Note**
>
> A user can only perform the Force Check In or Force Restore actions if they have security for the **Force Check In** and **Restore** access modes, respectively for the Object Revision BO application service (**F1-OBJREVBOAS**).

> **Note**
>
> The system also supports Mass Force Check In from the Revision Control search portal.

Deleting an Object

If revision control is turned on for an object, you must use the **Revision Control** zone to delete it. The object must be checked in before it can be deleted.

While viewing the checked in object, click **Delete** in the Revision Control sidebar zone. You are prompted for an **External Reference** and **Detailed Description**. Provide this information and then click OK. The system creates a revision record before the object is deleted so that the deleted object can be restored.

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> **Note**
>
> If the object is maintained on a legacy UI page, you remain on the page with a cleared input form. If the object is maintained on a portal page, after deleting an object, you remain on the maintenance portal page, which should now be blank, which is unusual. Unlike deleting an object using the record actions on the record's maintenance page, deleting from the sidebar zone lacks the metadata to bring the user to a better portal after deletion, such as the related query portal for the deleted object.

Revision Control Portal

The **Revision History** portal lists the revision control history for a given object.

You can navigate to the **Revision History** portal from either a link in the **Revision Control** sidebar zone from that object's maintenance page or by going to **Revision Control** portal through the **Admin Menu** and using the search function to find the object whose history you want to view.

Use the broadcast icon to view the details of a given entry in the revision history.

To view the differences between two revision entries, click any two entries and then use the **Compare** button to see the differences.

You can restore a previous version of the object by clicking **Restore** in the row for the version that you want to restore. You would also use this option if an object was deleted and you want to reinstate it to a specific revision from before it was deleted.

See Working with Revision Control Zones for more information about tasks that can be performed through the Revision Control sidebar zone.

The following sections highlight other actions that are supported using the Revision Control Search portal besides searching for a specific revision. Navigate to this portal via **Admin Menu**, and then **Implementation Tools**, and then **Revision Control.**

Mass Check In

To perform a mass check in of several objects that you have checked out, choose **Check In** from the Search By dropdown on Revision Control Search.

Use the filters to narrow down the list of objects that you have checked out, if desired.

Select the desired entries and click **Check In**.

Mass Force Check In

If there are entities that are currently checked out by other users and they are not able to check them in, you can do a mass Force Check In of those objects. Choose **Force Check In** from the Search By dropdown.

Use the filters, including the Checked Out By User filter, to narrow down the list of objects to force check in on.

Select the desired entries and click **Force Check In**.

Mass Check Out

If you plan to work on updates to several objects, you can opt to proactively check out the objects en masse. Choose **Check Out** from the Search By dropdown.

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Use the filters to narrow down the list of objects to check out. Note that only objects that are currently checked in are available to check out.

Select the desired entries and click **Check Out**.

Information Lifecycle Management

Information Lifecycle Management (ILM) is designed to address data management issues, with a combination of processes and policies so that the appropriate solution can be applied to each phase of the data's lifecycle.

Data lifecycle typically refers to the fact that the most recent data is active in the system. As time progresses, the same data becomes old and unused. Older data becomes overhead to the application not only in terms of storage, but also in terms of performance. This older data's impact can be reduced by using advanced compression techniques, and can be put into slower and cheaper storage media. Depending on how often it's accessed, it can be removed from the system to make an overall savings of cost and performance. The target tables for ILM are transactional tables that have the potential to grow and become voluminous over time.

- The Approach to Implementing Information Lifecycle Management
- Enabling ILM for Supported Maintenance Objects
- Ongoing ILM Tasks
- Archived Foreign Keys

The Approach to Implementing Information Lifecycle Management

This section describes the product approach to implementing ILM for its maintenance objects (MOs).

> **Note**
>
> The term archiving is used to cover any of the possible steps an implementation may take in their data management strategy, including compression, moving to cheaper storage, and removing the data altogether.

Age is the starting point of the ILM product implementation for some of its high volume data. In general "old" records are considered eligible to be archived. In the product solution, maintenance objects (MOs) that are enabled for ILM have an ILM Date on the primary table and the date is typically set to the record's creation date. (An MO may have special business rules for setting this date, in which case, a different date may be used to set the initial ILM Date). For implementations that want to use ILM to manage the records in the MO, the ILM date is used for defining partitions for the primary table.

There are cases where a record's age is not the only factor in determining whether or not it is eligible to be archived. There may be some MOs where an old record is still 'in progress' or 'active' and should not be archived. There may be other MOs where certain records should never be archived. To evaluate archive eligibility using information other than the ILM Date, the ILM enabled MOs include an ILM Archive switch that is used to explicitly mark records that have been evaluated and should be archived. This allows DBAs to monitor partitions based on age and the value of this switch to evaluate data that may be ready to be archived.

Evaluating records to determine their archive eligibility should still occur on "old" records. The expectation is that a large percentage of the old records will be eligible for archiving. The small

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number that may be ineligible could be updated with a more recent ILM date. This may cause the records to move into a different partition and can delay any further evaluation of those records until more time has passed.

For each MO enabled for ILM, the product provides a batch process to review "old" records and an ILM eligibility algorithm that contains business logic to evaluate the record and mark it eligible for archiving or not. The following sections provide more information about the batch process and algorithm functionality.

- Batch Processes
- Eligibility Algorithm

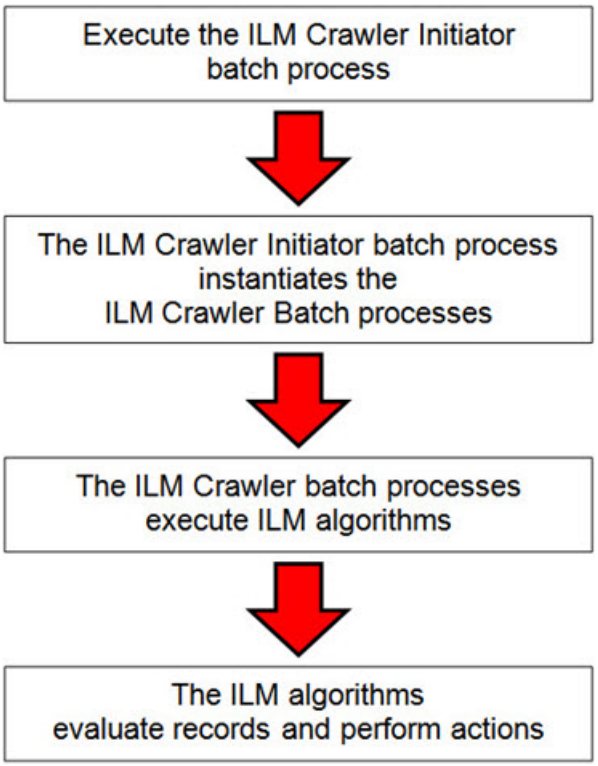
Batch Processes

There are two main types of batch processes that manage data for ILM in the application: ILM Crawler Initiator and individual ILM Crawlers (one for each MO that is configured for ILM).

- **ILM Crawler Initiator**: (`F1-ILMIN`) - The ILM Crawler Initiator is a *driver* batch process that starts the individual ILM Crawler batch control as defined by the MO's options.

  Restartable: In case of server failure, the ILM Crawler Initiator process can be restarted, which will also restart the ILM Crawler processes.

- **ILM Crawler**: Each maintenance object that is configured for ILM defines an ILM Crawler. These are *child* batch processes that can be started either by the ILM Crawler Initiator or by a standalone batch submission.



The ILM Crawler batch process selects records whose retention period has elapsed and invokes the MO's ILM eligibility algorithm to determine if the record is ready to be archived or not. The ILM eligibility algorithm is responsible for setting the record's ILM archive switch to 'Y' and updating the ILM date, if necessary.

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The retention period defines the period that records are considered active. It spans the system date and cutoff date (calculated as system date - retention days).

The retention days of an MO is derived as follows:

- If the ILM Retention Days MO option is defined, that is used.
- Otherwise, the Default Retention Days from the ILM Master Configuration record is used.

An error is issued if no retention period is found.

The crawler calculates the cutoff date and selects all records whose ILM archive switch is 'N' and whose ILM date is prior to the cutoff date. Each record returned is subject to ILM eligibility.

If the Override Cutoff Date parameter is supplied, it will be used instead of the calculated cutoff date. An error is issued if the override cutoff date is later than the calculated cutoff date. This parameter is useful if an object has many years of historic data eligible for archiving. Setting this parameter allows for widening the retention period and therefore limiting the process to a shorter period for initial processing.

> **Note**
>
> ILM Crawler batch processes are designed not to interfere with current online or batch processing. Because of this, these batch processes can run throughout the day.

> **Note**
>
> Before passing the cut-off date to the algorithm, the ILM crawler ensures that the number of days calculated (System Date – override cut-off date) is more than the retention period specified in the MO option or the Master Configuration. If the number of days calculated **is less than** the retention period specified on the MO option or the Master Configuration, then it throws an error.

Eligibility Algorithm

Algorithms are triggered by the ILM batch crawler for the maintenance object. The key responsibility of the ILM algorithm is to determine whether a record can be marked as ready to be archived or not. If a record is determined to be ready for archive, the algorithm should set the ILM Archive switch to Y. If not, the algorithm leaves the switch set to N and may decide to update the ILM Date to something more recent (like the System Date) to ensure that the record does not get evaluated again until the future.

This algorithm is plugged into the Maintenance Object — Algorithm collection.

Oracle Utilities Application Framework provides the algorithm **ILM Eligibility Based on Status** (`F1-ILMELIG`) to support the ILM batch crawler. Refer to the algorithm type description for details about how this algorithm works. If a maintenance object has special business rules that are evaluated to determine the eligibility for ILM, a custom algorithm can be created and applied by the implementation team.

Enabling ILM for Supported Maintenance Objects

In order to enable ILM for one or more maintenance objects, several steps are needed in both the configuration and in the database. This section describes some configuration enabled by

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default and some steps that must be taken in order to fully implement ILM. While some configuration is enabled by default, it will not be used unless ILM is fully configured.

Managing a maintenance object's data for ILM involves the following aspects:

- Determining which records are eligible for archiving and marking them as such. Depending on the entity, this step is implemented using one of this methods:
  - **Configurable.** This option relies on a configurable eligibility algorithm that is processed in batch periodically.
  - **Non-configurable batch.** This option uses a specific batch process that embeds non-configurable eligibility rules as part of its logic for performance reasons.
  - **Set at creation time.** Records in very high volume tables that rarely change are marked as eligible for archival at creation time for performance reasons. For example, measurement data, some snapshot tables, etc.
- Partitioning the entity's tables and archiving old partitions as needed.

Each maintenance object that follows the configurable option has the following provided out of the box:

- **Special Table Columns**: Maintenance objects that support ILM include two specific columns: ILM Archive Switch (`ILM_ARCH_SW`) and ILM Date (`ILM_DT`).
- **Crawler Batch Process**: A "crawler" batch process is provided for each maintenance object that supports ILM and it is plugged into the MO as an option. Refer to Batch Processes for more information.
- **ILM Eligibility Algorithm**: Each maintenance object that is configured for ILM defines an eligibility algorithm that executes the logic to set the ILM Archive switch appropriately. This is plugged in to the MO algorithm collection.

If an implementation decides to implement ILM, there are steps that need to be followed, which are highlighted below.

Create the Master Configuration Record

The first step when enabling ILM is to create the **ILM Configuration** master configuration record.

The master configuration for ILM Configuration defines global parameters for all ILM eligible maintenance objects. For example, the Default Retention Period. In addition, your product may implement additional configuration. Refer to the embedded help for specific details about the information supported for your product's ILM configuration.

In addition, the user interface for this master configuration record displays summary information about all the maintenance objects that are configured to use ILM.

Confirm the Maintenance Objects to Enable

In viewing the list of maintenance objects that support ILM in the ILM master configuration page, your implementation may choose to enable ILM for only a subset of the supported maintenance objects. For example, some of the maintenance objects may not be relevant for your implementation. Or perhaps, the functionality provided by the maintenance object is used, but your implementation does not expect a high volume of data.

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> **Note**
>
> Customizing the list of maintenance objects managed by ILM is not supported in a cloud installation.

For each maintenance object that your implementation has confirmed for ILM, the following steps should be taken:

- Determine if the maintenance object should have a different number of default retention days than the system wide value defined on the master configuration. If so, use the MO option **ILM Retention Period in Days** to enter an override option for this maintenance object.
- When applicable, review the functionality of the ILM Eligibility algorithm provided by the product for this maintenance object. Each algorithm may support additional configuration based on business needs. If your organization has special business rules that aren't satisfied by the algorithm provided by the product, a custom algorithm may be provided to override the base algorithm.

For each maintenance object that follows the configurable option and that your implementation does not want to enable for ILM, inactivate the eligibility algorithm. This will ensure that the ILM Crawler Initiator background process does not submit the crawler batch job for the maintenance object in question.

- Go to the Maintenance Object - Algorithm tab for each maintenance object and inactivate the **ILM Eligibility** algorithm.

Database Administrator Tasks

In order to implement ILM for each of the maintenance objects determined above, your database administrator must perform several steps in the database for the tables related to each MO. The following points are a summary of those steps. More detail can be found in the Information Lifecycle Management section of your product's *Database Administration Guide*.

- **Initializing ILM Date**: Your existing tables that are enabled for ILM may not have the ILM Date and ILM Archive switch initialized on all existing records. When choosing to enable ILM, a first step is to initialize this data based on recommendations provided in the *Database Administration Guide*.
- **Referential Integrity**: The recommended partitioning strategy for child tables in a maintenance object is referential partitioning. In order to implement this, database referential integrity features must be enabled.
- **Partitioning**: This provides a way in which the data can segregate into multiple table partitions and will help in better management of the lifecycle of the data.

Schedule the ILM Crawler Initiator

The final step of enabling the system for ILM is to schedule the ILM crawler initiator `F1-ILMIN` regularly based on your implementation's need. It is recommended to only schedule this batch process once all the required database activities are complete.

Ongoing ILM Tasks

For an environment where ILM is enabled, besides the periodic execution of the ILM crawler batch processes to review and mark records, your database administrator has ongoing tasks.

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The DBA reviews and maintains partitions and identifies partitions that may warrant some type of archiving step. The Information Lifecycle Management section of your product's *Database Administration Guide* provides more information for your DBA.

Archived Foreign Keys

If your DBA chooses to archive a partition, there may be records in the system that refer to one of the archived records as a foreign key.

When a user attempts to view a record using a hyperlink or drill down mechanism, if the implementation of the navigation uses FK Reference functionality, the system will first check if the record exists. If not, it will display a message to the user indicating that the record has been archived.

Configuration Tools

This section describes tools to facilitate detailed business configuration. The configuration tools allow you to extend both the front-end user interface as well as create and define specialized back-end services.

- Business Objects
- Data Areas
- Business Services
- User Interface (UI) Options
- Process Flows
- Action Method
- Algorithms
- Script Options
- Maintaining Managed Content
- Defining Entity Tags
- Advanced Schema Topics
- Business Event Log
- Miscellaneous Topics
- Extensions Dashboard

Business Objects

A maintenance object defines the physical tables that are used to capture all the possible details for an entity in the system. A business object is tool provided to further define business rules for a maintenance object.

This section provides an overview of business objects and describes how to maintain them.

- Understanding Business Objects
- Defining Business Objects
- Advanced BO Tips and Techniques

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- Defining Status Reasons

Understanding Business Objects

The topics in this section describe background topics relevant to business objects.

- What Is A Business Object?
- Business Object Inheritance
- Each Business Object Can Have A Different Lifecycle
- BO Algorithm Execution Summary
- Granting Access To Business Objects

What Is A Business Object?

A business object (BO) is a powerful tool used throughout the system. For many maintenance objects, a BO is a key attribute of the record used to define the data it captures, its user interface behavior and its business rules. Some business objects support the definition of a lifecycle, capturing different states that a record may go through, allowing for different business rules to be executed along the way. This type of business object is considered the "identifying" or "governing" business object. We will see later that other types of BOs exist that are different from the "identifying" business object.

The use of business objects allows for extensibility and customization of product delivered maintenance objects. There are many options to adjust the behavior of base delivered business objects. In addition, implementations may introduce their own business objects if the base product delivered objects do not meet their business needs.

> **Note**
>
> Not all maintenance objects in the product support business objects as a "identifying" or "governing" tool. This is the standard going forward for new maintenance objects. However, there are some maintenance objects created before this became a standard.

- A Business Object Has a Schema
- A Business Object May Define Business Rules
- A Business Object Defines its User Interface
- A Business Object Defines Options
- Invoking A Business Object
- Determine the Identifying BO
- Base Business Objects

A Business Object Has a Schema

A business object has elements. The elements are a logical view of fields and columns in one of the maintenance object's tables. The structure of a business object is defined using an XML schema. The main purpose of the schema is to identify all the elements from the maintenance object that are included in the business object and map them to the corresponding maintenance object fields. Every element in the BO schema must be stored somewhere in the maintenance object. The BO may not define elements that are derived.

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When defining elements for the primary table or the language table (for an administrative object) there is no need to define the name of the physical table in the schema. The system infers this information. The following is a snippet of a schema:

```
<schema>
    <migrationPlan mapField="MIGR_PLAN_CD" suppress="true" isPrimeKey="true"/>
    <bo mapField="BUS_OBJ_CD" fkRef="F1-BUSOB"/>
    <customizationOwner mapField="OWNER_FLG" suppress="input"/>
    <version mapField="VERSION" suppress="true"/>
    <description mapField="DESCR"/>
    <longDescription mapField="DESCRLONG"/>
  â€¦
```

Many maintenance objects have child table collections (e.g., a collection of names for a person, or a collection of persons on an account). Depending on the requirements, the business object may define the full collection such that the user will maintain the information in a grid. However, the schema also supports "flattening" records in a child table so that they can be treated as if they were singular elements. The following are examples of each:

Example of a child table. This is a snippet of the Instructions collection on the migration plan business object. You can see that the list attribute defines the child table and all elements within it map to the appropriate column in that table.

```
   <migrationPlanInstruction type="list" mapChild="F1_MIGR_PLAN_INSTR">
         <migrationPlan mapField="MIGR_PLAN_CD" suppress="true"/>
         <sequence mapField="PLAN_INSTR_SEQ" suppress="true"/>
         <instructionSequence mapField="INSTR_SEQ"/>
         <instructionType mapField="INSTR_TYPE_FLG"/>
         <parentInstructionSequence mapField="PARENT_INSTR_SEQ"/>
         <businessObject mapField="BUS_OBJ_CD" fkRef="F1-BOMO"/>
...
```

Example of a simple "flattened" field. The business object for Status Reason includes an element called Usage, which maps to a pre-defined characteristic of type **F1-SRUSG**. The "row" defines which child table is being flattened and the attributes of the row in that child that uniquely identify it.

```
    <usage mdField="STATUS_RSN_USAGE" mapField="CHAR_VAL">
        <row mapChild="F1_BUS_OBJ_STATUS_RSN_CHAR">
            <CHAR_TYPE_CD is="F1-SRUSG"/>
            <SEQ_NUM is="1"/>
        </row>
    </usage>
```

Example of a "flattened row". This business object for Account includes a single row for the Person collection where only the "financially responsible, main" customer is defined. The "accountPerson" attribute defines one field from that row (the Person Id) and includes the "˜flattening" criteria in the "row" information. In addition, a second field from that same row ("accountRelType") is defined. Instead of having to repeat the flattening criteria, the "rowRef" attribute identifies the element that includes the flattening.

```
    <accountPerson mapField="PER_ID">
        <row mapChild="CI_ACCT_PER">
            <MAIN_CUST_SW is="true"/>
```


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```
            <FIN_RESP_SW default="true"/>
          </row>
     </accountPerson>
     <accountRelType mapField="ACCT_REL_TYPE_CD" rowRef="accountPerson"
dataType="string"/>
```

Example of a "flattened list". The business object for Tax Bill Type includes an list of valid algorithms for "bill completion". The Sequence and the Algorithm are presented in a list. The list element identifies the child table and the "˜rowFilter" identifies the information about the list that is common.

```
       <taxBillCompletion type="list" mapChild="C1_TAX_BILL_TYPE_ALG">
         <rowFilter suppress="true" private="true">
             <TAX_BILL_TYPE_SEVT_FLG is="C1BC"/>
         </rowFilter>
         <sequence mapField="SEQ_NUM"/>
         <algorithm mapField="ALG_CD" fkRef="F1-ALG"/>
     </taxBillCompletion>
```

In addition, many maintenance objects support an XML structure field within the entity. These fields may be of data type CLOB or XML. One or more business object elements may be mapped to the MO's XML structure field. These elements may be defined in different logical places in the business object schema based on what makes sense for the business rules. When updating the MO, the system builds a type of XML document that includes all the elements mapped to the XML structure and stores it in one column. The following is an example of elements mapped to an XML column:

```
        <filePath mdField="F1_FILE_PATH" mapXML="MST_CONFIG_DATA"
required="true"/>
        <characterEncoding mdField="F1_CHAR_ENCODING"
mapXML="MST_CONFIG_DATA"/>
```

> **Note**
>
> If the MO's XML structure field is of the data type XML, the database will allow searching for records based on that data, assuming appropriate indexes are defined. If the MO's XML structure field is of the data type CLOB, indexing or joining to elements in this column via an SQL statement is not typically supported. Note that most MOs are currently using the CLOB data type for the XML structure column, if provided.

Some business objects may have child tables that allow data to be stored in an XML structure field. The schema language supports defining elements from those fields in your schema as well.

Besides including information about the physical "mapping" of the element to its appropriate table / field location in the maintenance object, the schema supports additional syntax to provide the ability to define basic validation and data manipulation rules, including:

- Identifying the primary key of the record or the primary key of the a row in a list.
- Identifying which elements are required when adding or changing a record.
- Default values when no data is supplied on an Add.

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- For elements that are lookup values, the lookup may be specified to validate that the value of the element is a valid lookup value.
- For elements that are foreign keys to another table, the FK Reference may be specified to validate the data.

The system will check the validity of the data based on the schema definition obviating the need for any special algorithm to check this validation.

In addition, the schema language may include some attributes that are used to auto-render the view of the record on the user interface, such as the `suppress` attribute. Refer to BO Defines its User Interface for more information.

> **Note**
>
> Refer to Schema Syntax for the complete list of the XML nodes and attributes available to you when you construct a schema.

A business object's schema may include a subset of the fields and tables defined in the maintenance object. There are two reasons for this:

- The fields or tables may not be applicable to the type of record the business object is governing. For example, a field that is specific to gas may not be included on a Device business object that is specific to electric meters.
- The information is not maintained through the business object, but rather maintained separately. For example, many BO based maintenance objects include a Log table. The records in the log table are typically not included the BO because they are viewed and maintained separately from the business object.

A Business Object May Define Business Rules

A business object may define business rules that govern the behavior of entities of this type. The following table describes supported system events that can be associated with such rules.

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System Event	Optional / Required	Description
Audit	Optional	Algorithms of this type may be used to audit certain changes made to business object instances. The system hands over to the algorithms a summary of all the elements that were changed throughout a specific call to update an object. For each element its original value before the change as well as its new value are provided. It is the responsibility of such algorithms to log the changes if and where appropriate, for example as a log entry in the maintenance object's log table or an entry in the business event log. These plug-ins are executed after all the post-processing rules are executed. The system invokes all algorithms of this type defined on the business object's inheritance hierarchy. Refer to Business Object inheritance for more information. By default all elements of the business object are subject to auditing. You can however mark certain elements to be excluded from the auditing process using the **noAudit** schema attribute. Marking an element as not auditable will prevent it from ever appearing as a changed element in the business object's audit plug-in spot. In addition, if the only elements that changed in a BO are ones marked to not audit, the audit algorithm is not even called. Refer to Schema Syntax for more information on this attribute.

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System Event	Optional / Required	Description
Information	Optional	We use the term "Business Object Information" to describe the basic information that appears throughout the system to describe an entity defined by the business object. The data that appears in this information description is constructed using this algorithm. The system invokes a single algorithm of this type. If more than one algorithm is plugged-in the system invokes the one with the greatest sequence number found on the business object closest to the current business object in the inheritance hierarchy. Refer to Business Object inheritance for more information.
`Post-Processing`	Optional	Algorithms of this type may be used to perform additional business logic after a business object instance has been processed. For example, such an algorithm may be used to create a To Do Entry or add a log record as part of the business object logical transaction. These plug-ins are executed after all the validation rules are executed. The system invokes all algorithms of this type defined on the business object's inheritance hierarchy. Refer to Business Object inheritance for more information.

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System Event	Optional / Required	Description
`Pre-Processing`	Optional	Algorithms of this type further populates a request to maintain a business object instance right before it is processed. Such algorithm may be used to "massage" a business object's elements prior to any maintenance object processing. For example, although simple element-level defaulting is supported by schema attributes. you may use this type of algorithm to default element values that are more sophisticated. The system invokes all algorithms of this type defined on the business object's inheritance hierarchy. Refer to Business Object inheritance for more information.
Validation	Optional	Algorithms of this type may be used to validate a business object instance when added, updated or deleted. Simple element-level validation is supported by schema attributes. Note that element-level validation is executed before any maintenance object processing. For more sophisticated rules you create validation algorithms and associate them with your business object. BO validation algorithms are only executed after "core validation" held in the MO is passed. The system invokes all algorithms of this type defined on the business object's inheritance hierarchy. Refer to Business Object inheritance for more information.

The system applies business object rules (schema based and algorithms) whenever a business object instance is added, changed or deleted. This is only possible when the call is made via the maintenance object service. For example, when made via business object interaction ("invoke BO"), the MO's maintenance page or inbound web services that reference the BO. In addition the system must be able to determine the identifying business object associated with the actual object being processed. If the business object cannot be determined for a maintenance object instance business object rules are not applied.

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> **Note**
>
> **Pre-Processing is special.** The pre-processing algorithm plug-in spot is unique in that it only applies during a BO interaction. It is executed prior to any maintenance object processing. It means that when performing add, change or delete via the maintenance object service, the pre-processing plug-in is not executed.

> **Caution**
>
> Direct entity updates bypass business rules! As mentioned above, it is the maintenance object service layer that applies business object rules. Processes that directly update entities not via the maintenance object service bypass any business object rules you may have configured.

> **NOT_SUPPORTED**
>
> Refer to BO Algorithm Execution Order for a summary of when these algorithms are executed with respect to lifecycle algorithms.

The plug-in spots described above are available for all business objects and they are executed by the system when processing adds or updates to the business object. It is possible for a specific maintenance object to define a special plug-in spot for business objects of that MO. When this happens, the maintenance object identifies the special algorithm entity lookup value as an MO option: **Valid BO System Event**, causing the BO Algorithm collection to include that system event in its list.

A Business Object Defines its User Interface

One of the responsibilities of an identifying business object is to define its user interface rules for viewing and maintenance of its record. The standard implementation for maintaining a business object is that a maintenance portal is used to display a record. This portal includes a "map" zone that displays the information about the business object. To add or make changes to a record, the user clicks a button that launches a maintenance BPA script which displays a maintenance "map".

The display and maintenance "maps" are driven by the business object.

- **Schema based UI.** This is the preferred option. The BO's schema definition and UI Hints define user interface behavior that results in generated HTML. The schema language includes some basic display attributes such as **label** and **suppress**. UI hints provide many additional tags and elements that allow dynamic generation of formatted UI Maps. For more complex behavior in the user interface, for example where javascript is needed, UI map fragments may be defined within the schema via UI hints. In this way only complex UI behavior warrants small snippets of javascript and HTML. However the rendering of standard fields can be dynamically rendered. UI map fragments also allow for derived fields to be included in the user interface.
- **Explicit UI map.** The BO may rarely define a full UI map where all the information is displayed based on the map's HTML. Note that for a child BO, the maps may be inherited by a parent BO (or any BO "up the chain"). This technique is less flexible for describing a business object and as such is mainly supported for backward compatibility.

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A business object schema may include data areas for segments of its schema definition to allow for reusable components. In this case the data area would also include schema attributes and UI hints for the elements that it is including.

> **Note**
>
> Refer to UI Hint Syntax for detailed information about the supported syntax.

As mentioned in Business Object Inheritance, schemas are not inherited on a child business object. As such, when using UI hints for automatic UI rendering, the child BO must define the full schema with all the definitions. A good business object hierarchy will be designed for reuse meaning that the child BO will include the parent BO schema or alternatively, the BO schemas will include reusable data areas.

By default, the input form used to add or update an entity is presented in the large drawer panel. If the small or medium drawer panel fits better to display this form, you can configure the **Maintenance Drawer Size** BO option accordingly.

A Business Object Defines Options

A business object may be associated with configuration options that control specific features. For example, the scripts used to maintain and display a business object are defined as options. Refer to the detailed description of each option type for more information on the functionality it controls.

> **Note**
>
> **You can add new options types**. Your implementation may want to add additional option types. For example, your implementation may have plug-in driven logic that would benefit from a new option. To do that, add your new values to the customizable lookup field `BUS_OBJ_OPT_FLG`. If you add a new option type for a business option, you must update its maintenance object to declare this new option type. Otherwise, it won't appear on the option type dropdown. You do that by referencing the new option type as a **Valid BO Option Type** maintenance object option.

Some options may be defined for a specific lifecycle status. For example, marking a status specific base algorithm as inactive is defined as an option on that staus definition record.

> **Note**
>
> **You can add new options types**. Your implementation may want to add additional option types. For example, your implementation may have plug-in driven logic that would benefit from a new option. To do that, add your new values to the customizable lookup field `BO_OPT_FLG`. If you add a new option type for a status, you must update the business object's maintenance object to declare this new option type. Otherwise, it won't appear on the option type dropdown. You do that by referencing the new option type as a **Valid BO Status Option Type** maintenance object option.

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Invoking A Business Object

We have talked about defining a business object. This section describes how business objects are used throughout the system to view, add and update records.

- Various parameters for zones that are used to display data in the system include support for retrieving data by referencing a business object. The zone code will "invoke" the BO, meaning that the record will be retrieved using the referenced BO.
- The system's scripting language includes a step type to "invoke BO". This allows for BPA scripts, service scripts and plug-in scripts to retrieve information and add or update records using BO interaction.
- Inbound web services may reference a business object in its operations collection. This allows external systems to add or update records in our product via web service interaction.

Often when configuring a zone or writing a script, the BO to use in the "invoke BO" statement should be the identifying BO of the record. As such, often the script will include steps prior to the "invoke BO" step to "determine the identifying BO of the record" and once the identifying BO is found, the script step will invoke that BO. Note that zones and inbound web services reference a BO directly. In each case, if the BO to use should be dynamic, then the zone / inbound web service should reference a service script that can perform the steps to identify the BO and then invoke that BO.

It should be noted however that the BO used in an "invoke BO" statement (or referenced in an inbound web service) **does not have to match** the identifying BO for the record. Here are some examples of where this may be true:

- A script may only require a subset of elements for a record and not the entire record. In this case, it is better for performance purposes to define a special BO (sometimes called a "lite" BO or a "mini" BO) that only defines the needed elements. When the system retrieves the data, it will only access the tables that are included in the BO's schema definition. In addition, if there are no elements that map to an XML structure field, the system will skip any parsing of that column. Similarly, if a script is **updating** a subset of elements on a record, it may be beneficial to use a "mini" BO to do the updates.

  > **Note**
  >
  > Please note the following with respect to using a mini BO. This BO is only used for its schema. This type of BO would not define algorithms or a lifecycle. Because the BO is special, it often should not be able to be used as any record's identifying BO. To control that, these BOs are often configured to not allow new instances. Refer to Determine the Identifying BO for more information.

- The maintenance object to be added or updated in a script may not support business objects as "identifying BOs". For example, Batch Control maintenance object does not have an identifying BO. However, scripts may still wish to retrieve data (or make updates) to these types of records. An easy way to achieve that goal is to define a business object and use "invoke BO" to access the data.

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> **Note**
>
> Not all maintenance objects support being maintained through a business object interaction. This is true in a small number of older objects where the underlying maintenance service includes additional functionality besides simply updating the database tables. These maintenance objects are identified via the MO option **BO Maintenance**, set to N.

- Some functionality may be trying to add or update records for a maintenance object in a 'physical' manner and do not want or need to use the object's identifying BO. Or the MO may not have an identifying BO. For example, revision control takes a snapshot of a record for audit purpose and to be able to restore a previous version. In this case, the system wants to capture a full "physical" view of the record. To do this, a special "physical" BO may be created that includes all (or most of) the columns and the child tables.

> **Note**
>
> Like the mini BO, the physical BO would not define algorithms or a lifecycle and should not be able to be used as any record's identifying BO. To control that, these BOs are often configured to not allow new instances. Refer to Determine the Identifying BO for more information.

> **Note**
>
> To reiterate, the BO referenced in the "invoke BO" statement or referenced in an inbound web service does not have to match the identifying BO and does not have to be configured to "allow new instances".

Determine the Identifying BO

As mentioned in other topics, the identifying BO is the business object that governs the business rules for a record. This is the business object that the record will be validated against when any additions or changes are made to the record as long as updates are made via the maintenance service. This includes using "invoke BO" for add or update, using inbound web service interaction and for access to the maintenance page service (via an old style fixed page or via a business service).

How does the system determine the identifying BO? An algorithm plugged into the maintenance object (the **Determine BO** plug-in spot) is responsible for this. If the maintenance object is not configured with an algorithm for this plug-in spot, or no BO is found by the algorithm, no BO business rules are applied.

Most maintenance objects in the system capture the record's identifying BO directly on the record. However, it is possible to define the identifying BO somewhere else. For example, there may be some maintenance objects that are master or transaction objects with an associated "type" object where the identifying BO is defined on its "type" object. Note that the standard Determine BO algorithm plugged into most maintenance objects (**F1-STD-DTMBO - Determine Standard Business Object**) checks for these two conditions.

There may also be cases where a single identifying BO is used for all BOs for a given MO. This may be an option used for some older maintenance object created prior to the business object functionality when implementations wish to introduce custom business rules that are

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common for all records of that MO. The product provides a base algorithm type (**F1–MOBO - Determine Specific Business Object**) that captures the BO as a parameter.

Base Business Objects

For each maintenance object (MO) that supports an "identifying" business object, the type of business object provided by the product depends on the functionality and expected use by implementations. The following are some common patterns.

- There are MOs where the product provides base BOs that implementations may use if applicable for their business rules. In addition, it is expected that implementation will define custom BOs to support their business needs. Good examples of this type of MO are any of the various "rule" MOs. For example, calculation rule in Oracle Utilities Customer Care and Billing or the usage rule in Oracle Utilities Meter Data Management. The product provides business objects for common rules but each implementation could have special rules that they need to implement and will need to create custom business objects.
- There are MOs where the product provides base BOs that supply common behavior for an object. Implementations may find that supplied the business objects match their business requirements and use the BOs as is. It is expected, however that for many implementations, their business rules will require additional elements to be captured or have special rules to apply. In this case the base business objects may be extended. This scenario may apply to 'master' data objects in various products such as the Device or Meter.
- There are MOs where the product may deliver a base BO that is not expected to satisfy most implementations because different jurisdictions or different implementations will typically have their own rules. In this case the base delivered BO can be used as a template or starting point for custom defined BOs. Some examples of this are Rebate Claim in Oracle Utilities Customer Care and Billing.
- There are MOs where the expectation is that every implementation will have different requirements for the type of data to capture and the product will not supply base BOs that can be used as the "identifying" BO. However, it may supply a "parent" BO that defines the lifecycle and many of the business rules that it expects all records to follow. In these scenarios, the implementations will create "child" BOs that will serve as the "identifying" BOs and refer to the base "parent" BO for many of its rules through inheritance. An example of this is the Activity in Oracle Utilities Mobile Workforce Management.
- There are some scenarios where the base product provides business objects and the expectation is that implementations will use the business objects as delivered with little or no customization. This is a case where the system used business objects to implement product functionality, not because there is an expectation that the implementers will extend the functionality, but because the business object model is the favored development tool even for the product. The objects delivered for Content Migration Assistant are an example.

> **Note**
>
> Not all maintenance objects in the product support business objects as a "identifying" or "governing" tool. This is the standard going forward for new maintenance objects. However, there are some maintenance objects created before this became a standard.

For all maintenance objects, the base product may provide additional BOs that are not meant to be "identifying" BOs, but instead are provided to support functionality to interact with the MO using the BO as a tool as described in Invoking a BO.

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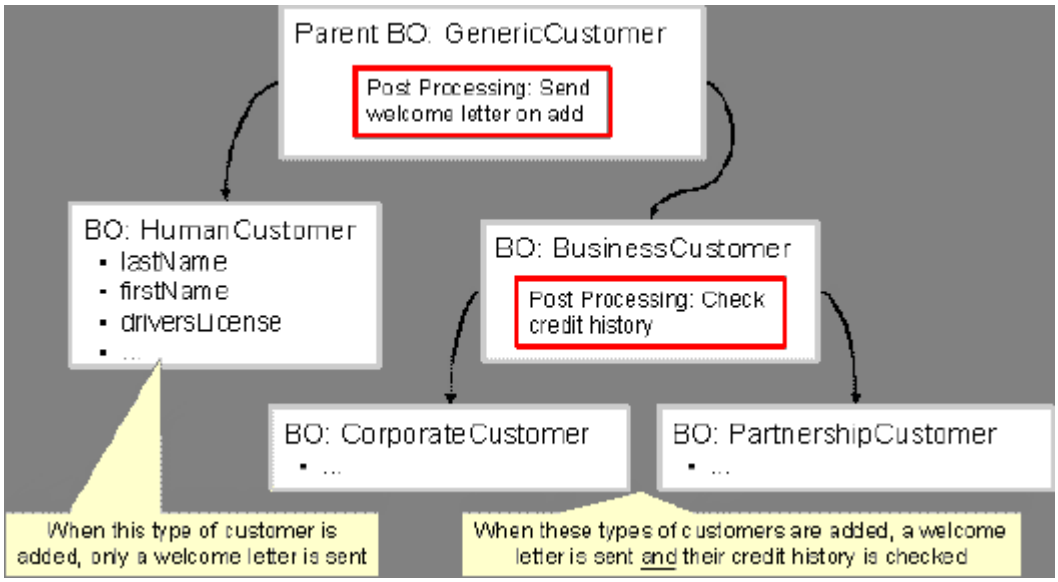
- One or more "mini" or "lite" BOs may be supplied for a maintenance object. This may be found when the product has functionality to retrieve a subset of elements for the maintenance object via scripting or via a user interface.
- A "physical" BO may be supplied. This a BO that typically includes all tables and all fields of the maintenance object in there "physical" form. In other words, there is no "flattening" of child tables and any XML structure fields are defined as a single field. Physical BOs are used in system processing where the full record needs to be captured as is. Some functionality that uses a physical BO includes bundling, revision control and the pre-compare algorithm for CMA to adjust data prior to comparing. If there are any maintenance objects that do not have a base supplied physical BO, refer to Creating a Physical Business Object for steps on how to provide one.
- A "bundling add" BO may be supplied. Refer to Recursive Key References for more information as to why this type of BO may be supplied.

Business Object Inheritance

A business object may inherit business rules from another business object by referencing the latter as its parent. A child business object can also have children, and so on. A parent's rules automatically apply to all of its children (no compilation - it's immediate). A child business object can always introduce rules of its own but never remove or bypass an inherited rule.

The following is an illustration of multiple levels of business object inheritance.



Notice how the "Business Customer" business object extends its parent rules to also enforce a credit history check on all types of customers associated with its child business objects.

Most types of business object system events allows for multiple algorithms to be executed. For example, you can have multiple **Validation** algorithms defined for a business object. For these, the system executes all algorithms at all levels in the inheritance chain starting from the highest-level parent business object moving on to lower levels.

Other types of system events allows for a single algorithm to be executed. For example, you can only have one **Information** algorithm to format the standard description of a business object instance. For these, the system executes the one at the level nearest to the business object currently being processed.

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> **Note**
>
> The parent and its children must reference the same maintenance object.

> **Note**
>
> **Data structures are not inherited.** While you can declare schemas on parent business objects, their children will not inherit them. A good practice is to design child business object schemas to **include** their parent business object's schema.

> **Note**
>
> **User interface maps are inherited.** When determining if the business object has a UI map to use for UI rendering, the system looks for display and maintenance maps linked to the BO as options. If the identifying BO does not have maps defined, the system follows “up the chain” of inheritance until it finds a map to use. This allows for a child BO to be used to extend business rules of a parent BO but inherit its user interface behavior. Refer to Business Object Defines its User Interface for more information.

> **Note**
>
> **Use Inheritance Wisely.** While it is intellectually attractive to abstract behavior into parent BOs to avoid redundant logic and simplify maintenance, before doing this weigh the reuse benefits against the cost in transparency, as it is not easy to maintain a complex hierarchy of business objects.

Each Business Object Can Have A Different Lifecycle

Many maintenance objects have a status column that holds the business entity's current state within its lifecycle. Rules that govern lifecycle state transition (what is its initial state, when can it transition to another state, and so on.) and the behavior associated with each state are referred to as lifecycle rules. Older Maintenance Objects, such as To Do Entry, have predefined lifecycles whose rules are governed by the base-package and cannot be changed. The lifecycle of newer Maintenance Objects exists in business object meta-data and as such considered softly defined. This allows you to have completely different lifecycle rules for business objects belonging to the same maintenance object.

Here are examples of two business objects with different lifecycles thast belong to the same maintenance object.

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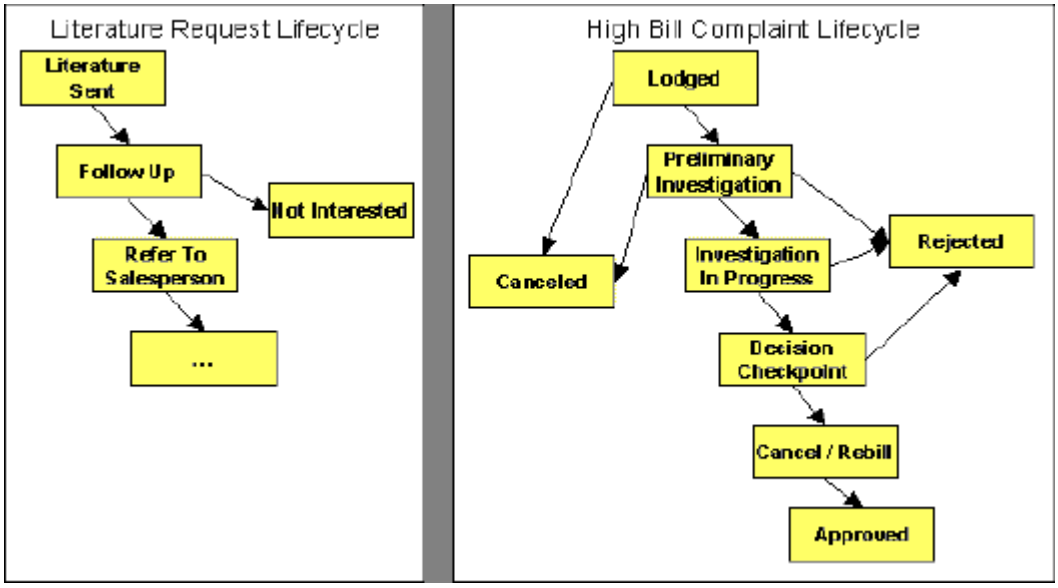

The boxes in the above diagram show the potential valid states a business entity of the above business object can be in. The lines between the boxes indicate the state transition rules. These rules govern the states it can move to while in a given state. For example, the above diagram indicates a high bill complaint that's in the **Lodged** state can be either **Canceled** or moved into the **Preliminary Investigation** state.

When you set up a business object, you define both its valid states and the state transition rules, including the label for the Action to display on a button for users that may initiate a transition. For example, the action label to transition to the 'Approved' state could be configured as 'Approve'.

> ⓘ **Note**
>
> The status description and the action label of base delivered values may be overridden by your implementation.

> ⓘ **Note**
>
> A Maintenance Object supports soft lifecycle rules if it is defined with a **Status Field** Maintenance Object option and that field is not a lookup field (which denotes a hard-coded lifecycle).

The topics that follow describe important lifecycle oriented concepts.

- One Initial State and Multiple Final States
- State-Specific Business Rules
- Inheriting Lifecycle
- Auto-Transition
- Keeping An Entity In Its Last Successful State
- Monitoring Batch Processes
- Transitory States

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- State Transitions Are Audited
- Required Elements Before Entering A State
- Capturing a Reason for Entering a State
- Opening UI Maps Before Entering A State

One Initial State and Multiple Final States

When you set up lifecycle states, you must pick one as the initial state. The initial state is the state assigned to new entities associated with the business object. For example, the above high-bill complaint business object defines an initial state of **Lodged**, whereas the literature request one defines an initial state of **Literature Sent**.

You must also define which statuses are considered to be "final". Typically when an entity reaches a "final" state, its lifecycle is considered complete and no further processing is necessary.

> **Note**
>
> **Allowing An Entity To Be "Reopened".** You can set up your state transition rules to allow a business entity to be "reopened" (i.e., to be moved from a final state to a non-final state). Neither of the above examples allows this, but it is possible if you configure your business object accordingly.

State-Specific Business Rules

For each state in a business object's lifecycle, you can define the following types of business rules.

System Event	Optional / Required	Description
Enter	Optional	Algorithms of this type apply business rules when a business object instance enters a given state.
Exit	Optional	Algorithms of this type apply business rules when a business object instance exits a given state.
Monitor	Optional	Algorithms of this type monitor a business object instance while in a given state. Typically these are used to auto-transition it to another state.

The system invokes all algorithms of this type defined on the business object's inheritance hierarchy. Refer to Business Object Inheritance for more information.

> **NOT_SUPPORTED**
>
> Refer to BO Algorithm Execution Order for a summary of when these lifecycle algorithms are executed with respect to BO level algorithms.

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- Entering A State
- Exiting A State
- Monitor Rules

Entering A State

You can define algorithms that execute before a business entity enters a given state. For example, you could develop an algorithm that requires a cancellation reason before an entity is allowed to enter the **Canceled** state.

You can also incorporate state auto-transitioning logic within this type of algorithms. Refer to auto-transition for more information.

Also note that when a record is processed by the monitor batch program, by default the BO Post Processing, BO Audit and MO Audit algorithms are not executed. However, it is possible for an enter algorithm to indicate that the other algorithms should be executed by the batch process by setting the “force post processing” indicator to true.

Exiting A State

You can define algorithms that execute when a business entity exists a given state. For example, you could develop an algorithm that clears out error messages when a given entity exits the **Error** state.

Also note that when a record is processed by the monitor batch program, by default the BO Post Processing, BO Audit and MO Audit algorithms are not executed. However, it is possible for an exit algorithm to indicate that the other algorithms should be executed by the batch process by setting the “force post processing” indicator to true.

Monitor Rules

You can define algorithms to monitor a business entity while it is in a given state. This type of logic is typically used to check if the conditions necessary to transition the entity to another state exist (and, if so, transition it). For example, transition an entity to the **Canceled** state if it's been in the **Error** state too long. Another common use is to perform ancillary work while an entity is in a given state. For example, update statistics held on the object while it's in the **Active** state.

Monitor algorithms are invoked when a business entity first enters a state and periodically after that in batch. You have the option to defer the monitoring of a specific state until a specific monitoring batch job runs. You do so by associating the state with a specific monitoring process. In this case the system will only execute the monitoring rules of this state when that specific batch process runs. This is useful when processing one type of record typically creates another type of record. You may want the processing of the second set of records to be deferred to a later time.

A monitor algorithm can carry out any business logic. In addition it can optionally tell the system to do either of the following:

- Stop monitoring and transition to another state. The system will not call any further monitoring algorithm plugged in on the state and attempt to transition the entity to the requested new state.
- Stop monitoring. Same as above except that no transition takes place. You may want to use this option to prevent transitions while some condition is true.

If none of the above is requested the system keeps executing subsequent monitoring algorithms.

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Also note that when a record is processed by the monitor batch program, by default the BO Post Processing, BO Audit and MO Audit algorithms are not executed. However, it is possible for a monitor algorithm to indicate that the other algorithms should be executed by the batch process by setting the “force post processing” indicator to true.

> **NOT_SUPPORTED**
>
> Refer to Business Object - Lifecycle for more information on how to set up state-specific algorithms.

Inheriting Lifecycle

If a business object references a parent business object, it always inherits its lifecycle from the highest-level business object in the hierarchy. In other words, only the highest-level parent business object can define the lifecycle and the valid state transitions for each state. Child business objects, in all levels, may still extend the business rules for a given state by introducing their own state-specific algorithms.

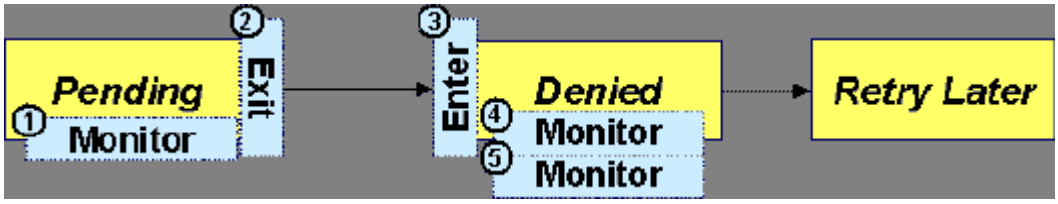
The system executes all state-specific algorithms at all levels in the inheritance chain starting from the highest-level parent business object moving on to lower levels.

Auto-Transition

In a single transition from one state to another, the system first executes the **Exit** algorithms of the current state, transitions the entity to the new state, executes the **Enter** algorithms of the new state followed by its **Monitor** algorithms. At this point if a **Monitor** algorithm determines that the entity should be further automatically transitioned to another state the remaining monitoring algorithm defined for the current state are not executed and the system initiates yet another transition cycle.

Notice that an **Enter** algorithm can also tell the system to automatically transition the entity to another state. In this case the remaining **Enter** algorithm as well as all **Monitor** algorithms defined for the current state are not executed.

The following illustration provides an example of an auto-transition chain of events.



In this example a business entity is in a Pending state. While in that state a **Monitor** algorithm determines to auto-transition it to the Denied state. At this point the following takes place:

- No further **Monitor** algorithms of the Pending state are executed
- Pending state **Exit** algorithms are executed
- The system transitions the entity to the Denied state
- Denied state **Enter** algorithms are executed. No further auto-transition is requested.
- Denied state **Monitor** algorithms are executed. No further auto-transition is requested.

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Keeping An Entity In Its Last Successful State

By default, any error encountered while transitioning a business entity from one state to another rolls back all changes leaving the entity in its original state.

When applicable, the Maintenance Object can be configured to always keep an entity in its last successful state rather than rolling all the way back to the original state. This practice is often referred to as "taking save-points". In case of an error, the entity is rolled back to the last successfully entered state and the error is logged on the maintenance object's log. Notice that with this approach no error is returned to the calling process, the error is just logged.

The logic to properly log the error is in a **Transition Error** Maintenance Object plug-in. The system considers a maintenance object to practice "save-points" when such an algorithm is plugged into it.

Even if the maintenance object practices "save-points", in case of an error the system will not keep an entity in the last successfully entered state if that state is either marked as transitory or one of its **Enter** algorithms has determined that the entity should proceed to a next state. The system will roll back to the first previous state that does not match these conditions.

Monitoring Batch Processes

A monitor batch process may be used to transition a business object into its next state by executing the monitor algorithms associated with the current state of the entity. The use cases for performing the monitor logic in batch are as follows:

- The record may be waiting for something else to occur before transitioning. The monitor algorithm may be coded to determine if the condition is satisfied and initiate the transition then. For example perhaps when entering a state, a field activity is generated and the record should exit the state when the field activity is complete. The monitor algorithm can check the status of the field activity.
- Perhaps a record is added or updated manually and the next step in the BO lifecycle includes a large amount of processing such that the logic should occur in batch. In this case the BO status is configured with an explicit reference to a batch control (referred to as "deferred"), which indicates to the system that the monitor algorithms should not be performed automatically (but should be deferred to batch). Later when the batch process runs, it selects all the records to process to progress the records.

> **Note**
>
> When a status includes a deferred batch control, it may also be configured to allow a user to manually transition the record to the next state rather than waiting for batch. When a user manually transitions a record that includes monitor algorithms, those algorithms are not executed.

- Perhaps a record is added or updated in batch, but a subsequent step in the overall lifecycle should be processed later. This may be accomplished by ensuring that the batch control linked to the state to process later does not match the batch control that added or updated the record.
- Monitor processes may also be used to periodically perform some logic related to the record without actually transitioning the record.

Note that only the parent business object may refer to a deferred monitor batch process. However, any business object in the "inheritance" chain may be configured with monitor algorithms, which will all be executed.

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The base package provides a periodic monitoring batch process for each maintenance object that supports a configurable BO lifecycle. The process periodically executes the monitoring algorithms associated with the current state of an entity, excluding states explicitly referencing a deferred monitoring batch process that is for a different batch control.

A deferred monitoring process selects records whose current state references this particular batch control as their monitor process. Deferred monitor process is only needed when an object has different use cases for monitoring the same type of records with different schedules. In this case only one periodic monitor batch should be configured. Other monitors should be configured to restrict by batch control so that there is no overlap in processing.

> **Note**
>
> **MO option configuration**. The maintenance object includes options to indicate the batch controls delivered for periodic and deferred monitor batch controls.

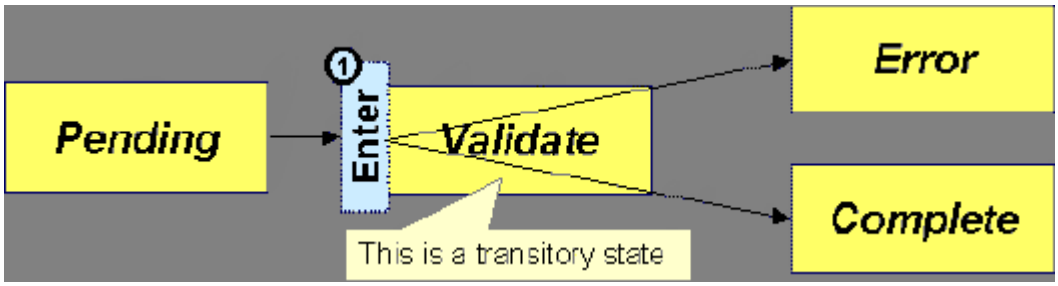
Your business rules will dictate the execution frequency of each monitoring process and the order in which they should be scheduled. Refer to Monitor Background Processes in the background process chapter for more information about the parameters supported for this type of batch process.

> **Note**
>
> **Updates to the business object.** When the monitor algorithms indicate that the business object should transition, the monitor batch processes are responsible for ensuring the business object is transitioned appropriately and that the appropriate exit, enter and monitor algorithms are executed. Please note that the business object is not updated using a call to the maintenance object service and therefore by default the business rules plugged in to the business object are not executed. However, it is possible for an Enter algorithm, Exit algorithm or Monitor algorithm to indicate that the other algorithms should be executed by the batch process. If the "force post processing" indicator is set to true, then the batch process invokes the BO Post Processing, BO Audit and MO Audit algorithms.

Transitory States

You can define a state as **Transitory** if you do not wish the business entity to ever exist in that particular state.

The following illustrates a lifecycle with a transitory Validate state.



In this example, the business entity is saved still not validated in the Pending state. At some point, the user is ready to submit the entity for validation and transitions it into a transitory state Validate whose **Enter** rules contain the validation logic. The responsibility of the transitory

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state's **Enter** algorithms is to decide if the entity is valid or in error and then transitions it into the appropriate final state. In this scenario, you may not ever want the business entity to exist in the Validate state.

Let's also assume that the maintenance object in this example is practicing "save-points" and requires the entity to be kept in its last successful state. If an error were to occur during the transition from **Validate** to the next state, the system would roll back the entity back to Pending, and not Validate even though the entity has successfully entered the Validate state. Refer to the Auto Transition section for more information.

State Transitions Are Audited

Most Maintenance Objects that support soft lifecycle definition also have a log to hold significant events throughout a business entity's lifecycle. For example, log entries are created to record:

- When the business entity is created (and who created it)
- When its status changes (and who changed it)
- If a transition error occurred (and the error message)
- References to other objects created throughout the entity's lifecycle. For example, if a To Do entry is created as part of processing the entity, the To Do Entry is referenced in the log.
- Manual entries added by a user (think of these as "diary" entries)

When a business entity is first created and when it transitions into a new state the system calls **Transition** algorithm(s) plugged in on the Maintenance Object to record these events. If the maintenance object supports a log these events can be captures as log entries.

> **Note**
>
> Most base package maintenance objects supporting a log may already provide state transition logging as part of their core logic. In this case you only need to provide a **Transition** plug-in if you wish to override base logging logic with your own.

Required Elements Before Entering A State

You can define additional elements that are required before a business entity can enter a given state. For example, let's assume that a Cancel Reason must be defined before an object can enter the *Canceled* state. You do this by indicating that element as a **Required Element** state-specific option on the appropriate state on the business object.

Capturing a Reason for Entering a State

Some business objects support configuring certain states to allow or require a status reason when an object enters the state. The product provides a centralized status reason table that may be used to define the valid BO status reasons for various business objects and various states. The status reasons are defined using the Status Reason portal.

The following sections provide additional information about the BO status reason functionality.

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Maintenance Object Must Support Status Reason

In order for a business object to use the centralized status reason table to define reasons, the maintenance object must first support the status reason. MOs that support status reason have the following characteristics:

- The primary table includes a column for Status Reason. This represents the status reason for the record's current status, if applicable.
- The log table includes a column for Status Reason. The standard logic for capturing a log record when entering a state also captures the status reason, if applicable. This allows a user to review the history of the changes in status and the status reason captured for a previous state transition, if applicable.
- The maintenance object option collection includes an option that defines the Status Reason field. This setting is a trigger for business objects of this MO to be able to configure states to allow or require status reason.

Business Object State Indicates if Reasons are Applicable

Once the MO is configured to support status reason, configuration on the business object is required to indicate the states where a reason is applicable. States may be configured to require status reasons, allow status reasons as optional or not allow status reasons. With this configuration, the framework will automatically get the list of valid reasons for a state that allows or requires them and then prompt the user for a status reason when a manual state transition occurs for that state. It also automatically triggers an error if the state requires a status reason and no reason is provided.

> **Note**
>
> The status reason configuration on the business object state is customizable. That means that for a product owned business object, an implementation may opt to change the delivered configuration.

Status reasons are defined for the parent (or "lifecycle") business object. All business objects in the hierarchy of the parent business object have the same valid reasons for their states.

The status reason code must be unique for the centralized status reason table. Business object and status are required fields, so it is not possible to share a common reason code (like "Not applicable") across multiple business objects or states. If multiple BOs / states want to support a reason "Not applicable" then each must define a unique record for it. This point should be considered when planning for your status reasons.

Override Description

The description of product owned status reasons may be overridden by your implementation.

Selectable vs. Not Selectable

When defining a status reason, you may indicate whether it's **Selectable** or **Not Selectable**. When a manual transition is performed and a user is prompted for a status reason, only the **Selectable** reasons are presented. The **Not Selectable** reasons may be defined to support transitions that occur via algorithm processing.

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> **Note**
>
> The Selectable setting is customizable. That means that if a product provides a base owned status reason for a business object state, an implementation may opt to change whether it is selectable or not. Careful consideration should be made before changing a base delivered status reason from **Not Selectable** to **Selectable** as this may affect base provided algorithm functionality that could be relying on the setting of **Not Selectable**.

Status Reason Business Object

The status reason maintenance object, as with many maintenance objects in the product, references a business object used to define attributes and behavior related to defining status reasons. The framework provides a business object for status reason (`F1-BOStatusReason`). For the business objects that have states that require a status reason (let's call these "transactional BOs"), if there is some special logic required for defining the status reasons, it is possible to define a different status reason BO. In this situation, the override status reason BO to use for capturing status reasons should be defined as a BO option on the transactional BO using the **Status Reason Business Object** option type. If a transactional BO does not define any status reason BO option, then the `F1-BOStatusReason` is used when adding a status reason.

Defining a Usage

The base product status reason BO provides the ability to define a "usage" value. This is useful for algorithms that perform state transitions where a status reason is needed and where the algorithm is usable by more than one business object. In this case, the status reason to use cannot be provided as a parameter because each business object must define its own set of status reasons for each state. The Usage value can be used instead. Each business object can configure the status reason to use in the algorithm and set the appropriate usage value. The algorithm can reference the usage value and retrieve the correct status reason to use based on the record's transactional BO.

The status reason business object provided with the framework product (`F1-BOStatusReason`) supports capturing a usage. The valid usage values are defined in the **Status Reason Usage** characteristic type.

Alternatives for Defining Reasons

There may be business objects in the system that capture reasons that are defined somewhere besides the BO status reason table. For example, some objects may have an explicit administrative table for status reasons. Some objects may use a Lookup or an Extendable Lookup to capture reasons. Refer to the business object description for information about how valid reasons are defined, if applicable.

If a business object supports a reason that is not related to a state transition (such as a creation reason), the BO status reason would not be used. One of the alternate methods for defining a reason, described above, would be used.

Opening UI Maps Before Entering A State

You can define a UI Map to capture additional elements before a business entity can enter a given state. You do this by configuring the **State Transition UI Map** state-specific option on the appropriate state on the business object.

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There may be circumstances in which the status pre-processing logic can determine the value of the elements, in which case it is not necessary to invoke the map. The system provides a data area (`F1-StateTransitionCommon`) which contains a boolean element to indicate if the state transition map can be skipped. This data area can be included in your pre-processing script to allow the element to be set according to your business logic. The base maintenance script (`F1-MainProc`) references this element to determine whether to open the state transition map.

BO Algorithm Execution Summary

This table highlights the processing steps that occur when adding or changing a record that is governed by a business object.

Invoke BO	
Event	**Comments**
BO Pre-processing algorithms executed	These algorithms are only executed when Invoke BO is used. The business object in the Invoke BO is the one whose rules are executed.

MO Processing	
Event	**Comments**
Determine if status has changed.	The system keeps a note of the new status value but initially proceeds with the old value.
MO Processing.	Standard MO processing, including MO validation is executed.
Determine BO algorithm executed.	The MO level algorithm is executed to determine the identifying BO.
BO Validation algorithms executed.	
State transition rules are performed if the status has changed.	BO Status Exit algorithms for the "old" status executed. Status updated to the new value. BO Status Enter algorithms for the "new" status executed. If no error â€” MO Transition algorithms are executed.

NOT_SUPPORTED

Refer to State Transitions are Audited for more information.

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MO Processing	
	If error and there are "save points" the MO Transition Error algorithms are executed. **NOT_SUPPORTED** Refer to Keeping An Entity In Its Last Successful State for more information. Otherwise, the error is reported.
BO Status Monitor algorithms are executed.	If the record transitions again, the prior step (State transition rule step) is repeated for the new transition.
BO Post-processing algorithms are executed.	
BO Audit algorithms are executed.	These algorithms are only executed if the system detects a change in elements that are not marked with "no audit".

Note

To emphasize, the steps in the MO Processing table are only executed when the maintenance object service is invoked. Any add or update initiated by an "invoke BO" statement will invoke the MO service. This is also true for web service that invoke the business object. The Monitor Batch Process does not invoke the maintenance service. By default the monitor batch process only executes the monitor algorithms and the state transition rules (if the monitor algorithms indicate that a status change should occur). However, it is possible for an Enter algorithm, Exit algorithm or Monitor algorithm to indicate that the other algorithms should be executed by the batch process. If the "force post processing" indicator is set to true, then the batch process invokes the BO Post Processing, BO Audit and MO Audit algorithms.

Note

For records that do not have a status, the state transition rules and the monitor rules are not applicable.

Granting Access To Business Objects

Every business object must reference an application service. When you link a business object to an application service, you are granting all users in the group access to its instances. You can prevent users from transitioning a business object into specific states by correlating each business object status with each application service action (and then don't give the user group rights to the related action).

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NOT_SUPPORTED

Refer to The Big Picture Of Application Security for information about granting users access rights to an application service.

The system checks if a user has access rights each time the application is invoked to add, change, delete, read, or transition a business object. However, if a business object invokes another business object, we assume that access was controlled by the initial business object invocation and we do not check access for other business objects that it invokes. In other words, access rights are only checked for the initial business object invoked in a service call.

In order to apply business object security the system must be able to determine the business object associated with the actual object being processed. To do that the Maintenance Object itself has to have a **Determine BO** algorithm plugged in. If this algorithm is not plugged in or it cannot determine the BO on the MO, the system will not invoke any BO rules. If the business object cannot be determined for a maintenance object instance, business object security is not checked. In this case the system checks the user's access rights using standard maintenance object security.

Note

Parent business objects are ignored. If a child business object exists, a user need only have access to the child business object's application service (not to every application service in the business object hierarchy).

Defining Business Objects

This portal is used to view and maintain information about a business object.

You can access the portal from the **Admin Menu**, and then **System**, and then **Business Object**. You are brought to a query portal with options for searching for a specific business obejct. Once a business object has been selected you are brought to the maintenance portal to view and maintain the selected record.

Refer to Understanding Business Objects for more information.

Caution

Important! If you introduce a new business object, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page.

- **Business Object.** This zone provides information about the selected business object.
- **Schema Editor.** This zone describes the business object’s schema and supports basic edits in plain text. Refer to the **Schema** tab below for additional schema editor information.

The following zones may appear as part of the portal's **Schema** tab page.

- **Schema Editor.** This zone allows you to edit the business object's schema using the Schema Designer tool. The purpose of the schema is to describe the business object's properties and map them to corresponding maintenance object fields.

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> **NOT_SUPPORTED**
>
> Refer to Schema Syntax and UI Hint syntax for a complete list of the XML nodes and attributes available to you when you construct a schema.

> **Tip**
>
> Click the **View Schema** hyperlink to view the business object's expanded schema definition. Doing this opens the schema viewer window.

The following zones may appear as part of the portal's **Algorithms** tab page. Refer to A Business Object May Define Business Rules for more information.

- **Algorithms.** This zone is used to maintain the algorithms associated with the current business object.
- **Hierarchy Algorithms.** This zone displays all algorithms associated with the business object's inheritance hierarchy. The zone is visible when the current business object is part of a hierarchy and such algorithms exist.

The following zones may appear as part of the portal's **Options** tab page. Refer to A Business Object Defines Options for more information.

- **Options.** This zone is used to maintain various configuration options associated with the current business object.
- **Hierarchy Options.** This zone displays all options associated with the business object's inheritance hierarchy. The zone is visible when the current business object is part of a hierarchy and such options exist.

The following zones may appear as part of the portal's **Lifecycle** tab page. This tab is only available when the maintenance object supports lifecycle definition.

- **Lifecycle.** This zone describes and maintains the current business object's lifecycle definition. Broadcast a specific status to review its complete configuration.
- **Status Details.** This zone is used to maintain basic definition information for a selected status within the current business object's lifecycle.
- **Status Algorithms.** This zone is used to maintain algorithms for a selected status within the current business object's lifecycle.
- **Status Options.** This zone is used to maintain various configuration options for a selected status within the current business object's lifecycle.
- **Hierarchy Status Algorithms.** This zone displays all algorithms associated with the business object's inheritance hierarchy for a selected status. The zone is visible when the current business object is part of a hierarchy and such algorithms exist.
- **Hierarchy Status Options.** This zone displays all options associated with the business object's inheritance hierarchy for a selected status. The zone is visible when the current business object is part of a hierarchy and such options exist.
- **Status Reasons.** This zone is used to maintain reasons for a selected status. The zone is visible when the maintenance object supports a reason field and usage of reasons is allowed by the status definition.

The following zones may appear as part of the portal's **Lifecycle View** tab page. This tab is only available when the maintenance object supports lifecycle definition.

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- **Lifecycle View.** This zone provides a schematic view of the current business object's lifecycle definition. Broadcast a specific status to review its complete configuration.
- **Status Details.** This zone is used to maintain basic definition information for a selected status within the current business object's lifecycle.
- **Status Algorithms.** This zone is used to maintain algorithms for a selected status within the current business object's lifecycle.
- **Status Options.** This zone is used to maintain various configuration options for a selected status within the current business object's lifecycle.

The following zones may appear as part of the portal's **Hierarchy** tab page. This tab is only available when the current business object is part of a hierarchy.

- **Business Object Hierarchy.** This zone lists the inheritance hierarchy of business objects up to and including the current business objects. The zone is visible if the current business object is not the top level business object of the hierarchy.
- **Business Object Tree.** This zone describes the entire hierarchy of the current business object.
- **Hierarchy Algorithms.** This zone lists all algorithms defined for the current business object. The zone is visible if algorithm information exists for the current business object.
- **Hierarchy Lifecycle Algorithms.** This zone lists all algorithms associated with the current business object's inheritance hierarchy. The zone is visible if the current business object is not the top level business object of the hierarchy and algorithm information exits. Refer to Inheriting Lifecycle for more information.
- **Hierarchy Options.** This zone lists all configuration options for the current business object's lifecycle. The zone is visible if options information exists for the current business object.
- **Hierarchy Lifecycle Options.** This zone displays all options associated with the current business object's inheritance hierarchy. The zone is visible if the current business object is not the top level business object of the hierarchy and options information exits. Refer to Inheriting Lifecycle for more information.

The following zones may appear as part of the portal's **References** tab page.

- **Business Object References.** This zone list various configuration entities referencing the current business object or its schema.

Actions

The page supports the following special actions:

- **Generate User Interfact Configuration Artifacts.**When creating a new buisiness object or editing an existing one, you may request to generate the user interface configuration artifacts needed to properly maintain and display the business object on an existing portal. For example, if a display script is needed to further prepare the business object's details for presentation then request to generate such script. You can then navigate to the script from the **User Interface Configuration** section and adjust it as needed.
- **Subclass a Business Object.** Use the **Subclass** action to create a new business object that is a child of an existing business object. The action generates the new business object's schema as inherited from the existing business object. Refer to Business Object Inheritance for more information.
  Once created, you may extend and adjust the new business object's schema and rules as needed.

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- **Create an Algorithm.** Use this action, on the Algorithm tab or the Lifecycle tab for a specific status, to creates a script based algorithm related to this business object. You are prompted for information regarding the plug-in spot (BO or BO Status) and the system event, the name, description, etc. Once all the information is provided, the system creates an algorithm type, a script, an algorithm and links the algorithm to the business object. You may then navigate to the script to adjust it as needed.
- **Inactivate / Activate Base Algorithms.** You can inactivate algorithms on base Business Objects. Your implementation may want to use a business object provided by the base product, but may want to inactivate one or more algorithms provided by the base business object. To do that, use the "Inactivate" action on the appropriate algorithm entry on the Algorithm tab. Use use the "Activate" action to mark an inactive algorithm as active. Note that these actions add and remove the "Inactive Algorithm" businesss option as needed.
- **View Schema.** Click the hyperlink to view the business object's expanded schema definition. Doing this opens the schema viewer window.

Advanced BO Tips and Techniques

The topics in this section describe some advanced tips and techniques for configuring business objects.

- Creating a Physical Business Object
- Managing To Do Entries
- Submitting a Batch Job

Creating a Physical Business Object

The physical business object's schema represents the complete physical structure of the maintenance object, and includes elements for all fields in the maintenance object's tables. There are several processes in the system that may use a maintenance object's physical BO.

To create a physical business object for the maintenance object:

1. Navigate to Business Objectand add a business object for the maintenance object. Do not fill in any of the UI oriented configuration.
2. The business object is created with a schema that looks like the physical structure of the maintenance object.
3. Save the physical business object.
4. Navigate to Maintenance Object and search for the maintenance object.
5. On the **Option** tab, add a new option with the type **Physical Business Object**. The value is the name of the physical business you just created.

Managing To Do Entries

The product provides several base algorithm types that may be used to manage To Do entries through status changes for a given record via BO lifecycle plug-ins.

Create To Do Entry

The product supplies a BO status Enter algorithm type **Generic To Do Creation** (`F1-TDCREATE`) that creates a To Do entry based on parameter configuration. Refer to the algorithm type description for more information about how it determines the To Do type or To

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Do role and how to populate the appropriate message text onto the To Do. This algorithm may be used in conjunction with the Retry Logic (below).

If your implementation has a business rule that requires a To Do entry to be created when entering a given BO status and the logic provided by the algorithm type meets the needs of the business rule, this algorithm type may be used. Create an algorithm for the algorithm type, populate the algorithm parameters according to the business rules and plug the new algorithm into the appropriate business object status as an Enter algorithm.

Retry Logic

The algorithm type **Retry for To Dos** (`F1-TODORETRY`) is supplied for a special use case. It is a BO status monitor plug-in and may be used for a state that is a type of 'error' or 'waiting' state. It relies on the To Do entry creation logic to set a Retry Frequency. The algorithm transitions to the originating state to retry the logic. The idea is that the condition that caused the record to enter the 'error' or 'waiting' state may be resolved after some period of time has passed, allowing the record to progress in its lifecycle. Refer to the algorithm type description for more information about its logic.

To use this functionality, create an algorithm for this algorithm type, populate the algorithm parameters according to the business rules and plug the new algorithm into the appropriate business object status as a Monitor algorithm. The state should also have an algorithm for the **Generic To Do Creation** algorithm type plugged in as an Enter algorithm (or something equivalent) that sets the appropriate Retry Frequency.

To Do Completion

It is common that one or more To Do entries associate with a given record should be completed when exiting a state (if it is not already completed). The system supplies the algorithm type **Generic To Do Completion** (`F1-TODOCOMPL`) that may be used for this purpose. Note that the algorithm type functionality is not tied to any To Do creation logic. It may be used for any use case where To Do entries should be completed on exiting a state. Refer to the algorithm type description for more information about its functionality and how to prevent certain To Do entries from being automatically completed.

To use this functionality, create an algorithm for this algorithm type, populate the algorithm parameters according to the business rules and plug the new algorithm into the appropriate business object status as an Exit algorithm.

Submitting a Batch Job

The product provides a base algorithm type that submits a batch job when entering a BO state. This functionality allows for "event driven" batch submission where the event is the lifecycle transition for a certain record.

The algorithm type is **Create Batch Job Submission Entry for Batch Control** (`F1-SCHEDJOB`). The batch control code is a parameter for the algorithm. Refer to the algorithm type description for more information about its logic.

To use this functionality, create an algorithm for this algorithm type, populate the algorithm parameter with the batch control that should be submitted and plug the new algorithm into the appropriate business object status as an Enter algorithm.

Defining Status Reasons

Status Reasons are used to provide more information about why a business object transitioned to a given state. The status reason table provides a centralized place where status reasons can be defined across many different business objects and states.

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> **Note**
>
> Refer to Defining Reasons for Entering a State for overview information.

If a business object has one or more states that are configured to capture a status reason, you may configure the valid reasons by navigating to the status reason portal using **Admin**, and then **System**, and then **Status Reason**.

The topics in this section describe the base-package zones that appear on the Status Reason portal.

Business Objects with Status Reason List

This zone displays the business objects that have one or more status values that allow status reasons to be defined.

Click the broadcast icon to open other zones that contain more information about the business object's status reasons.

Status Reasons

The **Status Reasons** zone contains a list of the existing status reasons for the broadcasted business object.

Data Areas

The data area has no business purpose other than to provide a common schema location for re-used schema structures. It exists solely to help eliminate redundant element declaration. For example, if you have multiple schemas that share a common structure, you can set up a stand-alone data area schema for the common elements and then include it in each of the other schemas.

Be aware that a stand-alone data area can hold elements that are mapped to true fields. For example, you might have 50 different types of field activities and all might share a common set of elements to identify where and when the activity should take place. It would be wise to declare the elements that are common for all in a stand-alone data area and then include it in the 50 field activity business objects.

It's strongly recommended that you take advantage of stand-alone data areas to avoid redundant data definition!

> **Caution**
>
> **Dynamic inclusion!** When the system renders a schema, all schemas included within it are expanded real-time. This means that any change you make to a data area will take effect immediately within all schemas it is referenced within. Therefore, changing a schema that is referenced in a large number of schemas may be too large to be performed online. In this situation, the change should be performed in batch. Refer to "Update Object Schema (F1-SCMUP)" batch control for more information.

This section describes additional topics related to designing and working with data areas.

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Dynamic Extension

You may use a custom data to extend a base product data area. To extend another data area, reference that data area in the **Extended Data Area** field. By extending a data area you can add additional elements to a base product data area.

Here's an example of an extended data area:

- The product releases with data area A, which contains elements a, b, and c.
- Your implementation creates data area CM-A, which contains element z, and references data area A as the extended data area.
- At run time, everywhere data area A is included it will contain elements a, b, c, and z.
- Defining Data Areas

Defining Data Areas

Use this page to define basic information about a data area.

You can access the portal from the **Admin Menu**, and then **System**, and then **Data Area**. You are brought to a query portal with options for searching for a specific data area. Once a data area has been selected you are brought to the maintenance portal to view and maintain the selected record.

> ⚠ **Caution**
>
> Important! If you introduce a new data area, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page.

- **Data Area.** This zone provides information about the selected data area.
- **Extending Data Areas.** This zone lists all data areas extending the current data area. The zone appears if such data areas exist.
- **Schema Editor.** This zone describes the data area's schema and supports basic edits in plain text. Refer to the **Schema** tab below for additional schema editor information.

The following zones may appear as part of the portal's **Schema** tab page.

- **Schema Editor.** This zone allows you to edit the data area's schema using the Schema Designer tool. The purpose of the schema is to describe the data area's properties and map them to the underlying internal service fields .

> **NOT_SUPPORTED**
>
> Refer to Schema Syntax and UI Hint syntax for a complete list of the XML nodes and attributes available to you when you construct a schema.

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> **Tip**
>
> Click the **View Schema** hyperlink to view the data area's expanded schema definition. Doing this opens the schema viewer window.

The following zones may appear as part of the portal's **References** tab page.

- **Data Area References.** This zone list various configuration entities referencing the current data area or its schema.

Actions

The page supports the following special actions:

- **View Schema.** Click the hyperlink to view the data areas's expanded schema definition. Doing this opens the schema viewer window.

Business Services

A business service is used to expose a back-end service so that it may be invoked by a script or a zone or a map to retrieve information or perform functions, depending on the related service.

As with the business object, the business service's interface to the internal service is defined using its schema. The schema maps the business service's elements to the corresponding elements in the internal service program's XML document. Just as a business object can simplify the schema of its maintenance object by only defining elements that it needs and "flattening" entries in a child collection to be defined as a singular element, a business service schema may simplify its service XML in a similar way.

> **NOT_SUPPORTED**
>
> Refer to Schema Syntax for a complete list of the XML nodes and attributes available to you when you construct a schema.

Inbound web services and scripts support interaction with business services. You can also invoke a business service from a Java class.

- Defining Service Programs
- Defining Business Services

Defining Service Programs

This transaction defines services available in the system. These include user interface services as well as stand-alone services that perform a specific function. A service may be referenced by a business service. Use this transaction to view existing service and introduce a new stand-alone service to be made available to a Business Service.

You can access the portal from the **Admin Menu**, and then **System**, and then **Service Program**. You are brought to a query portal with options for searching for a specific service program. Once a service program has been selected you are brought to the maintenance portal to view and maintain the selected record.

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> **⚠ Caution**
>
> Important! When adding new service programs, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page.

- **Service Program.** This zone provides information about the selected service program.
- **Service Program References.** This zone list various configuration entities referencing the current service program.

Application Service is the application service that is used to provide security for the service. If the service is related to a maintenance object, the access modes for the application service should be the standard **Add**, **Change**, **Delete** and **Inquire**. For other services, the application service should have the **Execute** access mode.

Service Type indicates whether the service is a **Java Based Service** or a **Java (Converted) Service**. Note that services generated to support a portal in the system will not have a service type populated.

The **Programs** grid shows the list of program user interface components associated with the service. For a stand-alone service, this list is typically not applicable.

Defining Business Services

Use this page to define basic information about a Business Service.

You can access the portal from the **Admin Menu**, then **System**, then **Business Service**. You are brought to a query portal with options for searching for a specific business service. Once a business service has been selected you are brought to the maintenance portal to view and maintain the selected record.

> **⚠ Caution**
>
> Important! If you introduce a new business service, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page.

- **Business Service.** This zone provides information about the selected business service.
- **Schema Editor.** This zone describes the business service's schema and supports basic edits in plain text. Refer to the **Schema** tab below for additional schema editor information.

The following zones may appear as part of the portal's **Schema** tab page.

- **Schema Editor.** This zone allows you to edit the business service's schema using the Schema Designer tool. The purpose of the schema is to describe the business service's properties and map them to the underlying internal service fields.

> **ⓘ Note**
>
> Refer to Schema Syntax and UI Hint syntax for a complete list of the XML nodes and attributes available to you when you construct a schema.

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> **Tip**
>
> Click the **View Schema** hyperlink to view the business service's expanded schema definition. Doing this opens the schema viewer window.

The following zones may appear as part of the portal's **References** tab page.

- **Business Service References.** This zone list various configuration entities referencing the current business service or its schema.

Actions

The page supports the following special actions:

- **View Schema.** Click the hyperlink to view the business service's expanded schema definition. Doing this opens the schema viewer window.
- **Test.** Use this action to test your business service. Enter input values and save. The service is performed and output information is presented, but the system issues a roll-back so that the changes are not committed. Note that if your service uses the save-point dispatcher to perform any actions or if it issues a call to an external system, the roll-back does not apply to those actions. If the service issues an error the corresponding message is displayed. Note that the input and output testing user interface is dynamically rendered based on UIHints embedded in the business service's schema. As such, the user interface may be as elaborate or basic as the UIHints in that schema.

> **Note**
>
> This action is secured by a designated "Test a Service" application service and the "Generic Service Executor" application service and also requires security rights for creating a script, which is the alternative way for testing any service. It is recommended to allow access to this function in non-production environments only.

- Useful Services and Business Services

Useful Services and Business Services

The following section highlights some business services and services provided by the product that may be useful for implementations to use.

Data Explorer Service

The system provides a mechanism for performing an SQL select statement for use in scripting, Java plug-ins, or via a web service call. This is done by creating a zone using one of the data explorer zone types where the SQL is defined. Then, create a business service using the Data Explorer service (**FWLZDEXP**).

> **Note**
>
> There are numerous business services delivered with the base product that reference this service that may be used as a template.

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The following points highlight how to create your own business service for this service. Note that typically a separate business service exists for each zone.

- Enter a **Business Service** code and a **Description**. It is recommended to define the business service code to match the zone code so that it's easier to manage which business service invokes which zone.
- Select the **Service Name FWLZDEXP**.
- On the **Schema** tab, under the ***<schema>*** node, enter mapping for the fields that are required for the Data Explorer service:
  - The **Zone** should be mapped into service field ***ZONE_CD*** . Define the zone code as the default value.
  - For every **user filter** defined on the zone, create a schema mapping into the service field ***Fx_VALUE***, where "x" is the filter number (from the zone parameters).
  - For every **hidden filter** defined on the zone, create a mapping into the service field ***Hx_VALUE***, where "x" is the filter number (from the zone parameters).
  - The search results are returned as a list by the data explorer service. Each column value is in the service field ***COL_VALUE*** with an appropriate sequence number (***SEQNO***). The results can be flattened based on sequence number allowing for a logical element name to be defined.
  - Another useful field is ***ROW_CNT***, which provides the number of rows retrieved by your search.

The following is an example of the schema for a BS that receives a business object code and returns a list of status values and their descriptions that allow status reasons to be defined.

```
<schema>
     <zone mapField="ZONE_CD" default="F1-BOSTSLST"/>
     <bo mapField="H1_VALUE" />>
     <rowCount mapField="ROW_CNT"/>>
     <results type="list" mapList="DE">>
          <status dataType="string" mapField="COL_VALUE">
               <row mapList="DE_VAL">>
                    <SEQNO is="1" />>
               </row>>
          </status>>
          <description dataType="string" mapField="COL_VALUE">
               <row mapList="DE_VAL">>
                    <SEQNO is="2" />>
               </row>>
          </description>>
      </results>>
</schema>
```

Maintenance Object Log Service

Many maintenance objects support a log table that follows a pattern of column names and behavior. The system provides a service called Generic MO Log Service (F1MOLOGP) that may be used to perform common functions related to log entries:

- Read log entries. If you pass a certain MO, primary key and log sequence number, the service will return the details of that log entry. The product provides a generic business service that may be used for this purpose — Generic MO - Retrieve Log Details (F1–

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ReadMOLog). Alternatively, it is possible to create a business service for a given MO where the MO code is assigned to the MO element using the default syntax. This allows business functionality specific to that maintenance object to use the specific BS.

- Add log. The service may be used to add a log entry. If a user log is added, then the comments from the user are populated in the detailed description. System generated log entries typically supply a message category / message number along with other information such as the status, a specific log type and optionally a related object reference (via a characteristic). The product provides a generic business service that may be used for this purpose — Add Generic MO Log (F1–AddMOLog). Alternatively, it is possible to create a business service for a given MO where the MO code is assigned to the MO element using the default syntax. This allows business functionality specific to that maintenance object to use the specific BS.

Base Business Services

The following table highlights some business services provided by the product that may be useful for custom logic for an implementation.

> ⚠ **Caution**
>
> This is not intended to be a complete reference of Business Services. Refer to the business service page to find all the supported business services.

Business Object Related Services

Business Service Name	Description
F1-AutoTransitionBO	Performs monitoring algorithms associated with the current state of a given business object instance (which may result in subsequent state transitioning).
F1-CompareBusinessObjectData	Compares two versions of a given business object instance.
F1-DetermineBo	Determines the business object of a given instance of a maintenance object by executing the MO's Determine BO logic.
F1-GetRequiredFieldsForBOState	Returns the required fields for a given business object status.
F1-RetrieveBOOption	Returns BO option values for a given BO and option type.
F1-RetrieveBOStatusOption	Returns BO option values for a given BO, status and option type.
F1-RetrieveBOStatusOption	Retrieves a list of BOs for a given MO that are accessible for the current user.
F1-RetrieveBoStatusDescription	Return the description of a given BO status.
F1-RetrieveBusinessObjectLabel	Return the label appropriate for a given path (e.g. element) within a BO schema.
F1-RetrieveNextStates	Return a list of next possible states based on the input of a MO and its prime key, or a BO and one of its statuses.

Email Related Services

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Business Service Name	Description
F1-EmailService	Sends an email message in real time.
F1-RetrieveEmailAddress	Retrieves the email addresses of users belonging to a To Do Role.
F1-RetrieveEnvironmentURL	Retrieves the current environment URL information for the installation.

Tools for Maps and Scripting

Business Service Name	Description
F1-AddWarning	This business service may be used to log a warning by providing the message details. The system gathers all the warning and displays them to the user all at once.
F1-CheckOnlineConnection	Check if Connection is Online or Batch.
F1-CheckWarning	Used to check if any warnings have been accumulated. If warnings have been accumulated, any logic that cannot be rolled back (when the warnings are shown) should not be performed.
F1-DateMath	Performs various date and time math calculations. Refer to the BS description for more details.
F1-DateTimeFormattingService	Formats a given date / time based on the user's display profile settings.
F1-ExecuteScriptInNewSession	Executes a Service Script in a new processing session/transaction.
F1-GetFieldLabel	Retrieves the label for a given field.
F1-GetForeignKeyReference	Returns foreign key reference information for a given FK Reference and primary key, including info description, navigation option, and context menu.
F1-GetFKReferenceDetails	Returns foreign key reference information for a given MO and primary key, including FK reference code, info description, navigation option, search zone and context menu.
F1-GetLookupDescription	Returns lookup description for a lookup field value given the lookup field name.
F1-GetExtLookUpVal	Returns the list of values for a given extendable lookup BO.
F1-GetMonthInYearAbbreviation	Returns a 3-character month abbreviation for an input date in system format.
F1-NumberAmountFormatter	Formats a given amount or number based on the user's display profile settings. It also may receive input to adjust the scale and optionally apply currency settings.
F1-OutmsgDispatcher	Dispatches a real-time message giving the user the option of whether to persist the message on the database, and whether to trap errors that may take place during the call. Refer to Real Time Messages for more information.

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Business Service Name	Description
F1-OutmsgMediator	Alternative to F1-OutmsgDispatcher and may be a better option if the sender does not require an outbound message record to be instantiated. Refer to Real Time Messages for more information.
F1-RethrowError	Issues an application error using the input message category / number / parameters.
F1-RetrieveMODescription	Retrieves the description for a maintenance object.
F1-ReturnMessage	Returns the expanded message given a message category, number, parameters, and parameter types.
F1-SavePointDispatcher	Allows for a service script to be executed where exceptions are trapped and the transaction is rolled back to a save point set before the service script execution.

User Related Services

Business Service Name	Comments
F1-CheckApplicationSecurity	Checks a user's security for a given application service / access mode
F1-CheckUserAuthorization	Determine whether a given user is authorized for access based on the input application service, security code, and authorization level.
F1-DetermineIfUserCanApproveTD	Determine if the current user can approve a given To Do.

User Interface (UI) Options

Your implementation may create input forms and output maps that closely match your customer's business practice within the following user interface areas:

- Content presented in portal zones. For example, a map that displays the details of a business object or any other informational content. Refer to Map Zones for more information.
- An input form presented via Business Process Assistant (BPA) scripts for data entry and update purposes. For example, a form that captures business object information or prompts the user for additional information related to a task they perform.
- An input form presented as a panel within a process flow.

The HTML for these forms and maps may be provided using the following options:

- **UI Map.** Compose your HTML and store it as a UI map, which is a repository for an HTML document. The UI Map HTML gives you the ability to craft the display by any method that an HTML document can support, including JavaScript and full CSS functionality.
- **UI Hints.** With this technique you do not compose the HTML. Instead, the HTML is generated at run time based on a schema that describes the data being displayed and embeds user interface rendering instructions known as "UI Hints".
- Understanding UI Maps

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- Understanding UI Hints
- UI Hint Syntax
- Defining UI Maps

Understanding UI Maps

The preferred method for creating input and output HTML maps is by leveraging the schema-based HTML rendering technique known as UI Hints. For more complex requirements, you may craft an HTML that closely matches your customer's business practices and capture it as a User Interface (UI) map.

The User Interface (UI) map is a repository for a single HTML document paired with an XML schema where the schema defines the data that the HTML document displays and/or modifies. The UI Map HTML gives you the ability to craft the display by any method that an html document can support, including JavaScript and full CSS functionality.

The topics in this section describe concepts and guidance relevant to UI map configuration.

Output Maps and Input Forms

UI maps are typically crafted as output tables when used in conjunction with portal zones - please refer to Map Zones for more information. When referenced within BPA scripts or process flows, UI maps are typically crafted as forms for the capture and update of data.

Figure HTML Input Form Rendered (for BPA Script)

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Figure HTML to Display Customer Business Object

```
<html>
<head>
<title>Output Personal Information</title>
<link rel="stylesheet" type="text/css" href="cm_templates/cmStyles.css"/>
</head>
<body>

<table width="100%" border="0" cellpadding="2" style="margin-top:15px;" >

    <tr>
        <td/>
         <td/> <!-- locate the edit button on the bottom of the third column -->
        <td rowspan="99" style="vertical-align:bottom; margin-left:5px">
            <input type="button" value="edit" onClick="oraRunScript('HumanInfoU','personId');"/>
        </td>
    </tr>

    <tr>
        <td class="outputLabel">Name:</td>
        <td><span oraField="name" class="outputData"></span></td>
    </tr>
    <tr>
        <td class="outputLabel">Home Phone:</td>
        <td><span oraField="homePhone" class="outputData"></span></td>
    </tr>
    <tr>
        <td class="outputLabel">Business Phone:</td>
        <td><span oraField="businessPhone" class="outputData"></span></td>
    </tr>
    <tr>
        <td class="outputLabel">Cell Phone:</td>
        <td><span oraField="cellPhone" class="outputData"></span></td>
    </tr>
    <tr>
        <td class="outputLabel">FAX:</td>
        <td><span oraField="fax" class="outputData"></span></td>
    </tr>
    <tr>
        <td class="outputLabel">Social Security:</td>
        <td><span oraField="socialSecurity" class="outputData"></span></td>
    </tr>
    <tr>
        <td class="outputLabel">Drivers License:</td>
        <td><span oraField="driversLicense" class="outputData"></span></td>
    </tr>
    <tr>
        <td class="outputLabel">Email:</td>
        <td><span oraField="email" class="outputData"></span></td>
    </tr>

</table>

</body>

<xml>
<root>
    <name>Greer,Johan</name>
    <email>jurgen.greer@media.com</email>
    <socialSecurity>939-30-3939</socialSecurity>
    <driversLicense>C8392020</driversLicense>
    <homePhone>(838) 030-0303</homePhone>
    <cellPhone>(444) 444-4040</cellPhone>
    <businessPhone>(737) 393-3838</businessPhone>
    <fax>(373) 939-3939</fax>
    <personId>1239997654</personId>
</root>
</xml>
</html>
```


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Figure Customer HTML Rendered (Output Data for Zone)

UI Map Fragments

A UI map may represent a complete HTML map or a fragment that can be embedded in a complete map.

You may use a UI map fragment in the following use cases:

- To share and reuse the same HTML/JavaScript across multiple complete UI maps. The UI map fragment is referenced as part of the HTML definition of the complete UI maps.
- To embed complex HTML/JavaScript logic as part of a map that its HTML is otherwise rendered using UI Hints.
- To implement a filter map for a data explorer search zone where basic filter definition syntax does not handle your business requirements.

Configuration Tool Support

Configuration tool support for UI Maps hinges around the ability to inject and extract an XML document from the HTML. For more information on the specialized support for HTML and JavaScript functionality refer to UI Map Attributes and Functions.

- Ensuring Unique Element IDs for UI Maps

Ensuring Unique Element IDs for UI Maps

The following describes how to modify JavaScript code to ensure the proper rendering of unique element IDs for UI Maps.

The modification is required only for code that renders HTML using a getElementById() (or similar) function to generate list IDs and avoid account verification or related errors.

The following sample snippet contains the necessary modifications:

```
...
function getElementsFromList(namePrefix) {
    var ret = [];
    var elements = document.getElementsByTagName("INPUT");
    for(var i=0;i<elements.length;i++) {
        var elemID = elements[i].id;
        if((id) && (id.startsWith(namePrefix + '_')) {
            ret.push(elements[i]);
```


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```
        }
    }
...
return ret;
```

Since IDs aren't necessarily unique in generated UI Map IDs, the code shown above ensures uniqueness at runtime by appending an underscore and row number (e.g., myField_1, myField_2) for proper handling by Framework in the rendered HTML, while still allowing you to reference the unmodified IDs contained in the generated UI Map.

A switch in the spl.properties file also permits you to disable the generation of unique IDs for elements in a grid (as described below), though, for standards compliance reasons, it is highly recommended that this switch be left at is default value.

```
Property Name: spl.runtime.compatibility.uiMapDisableGenerateUniqueHtmlIDs
File Name: spl.properties (under web project in FW)
Default Value: false
Accepted Values: true or false
Description: This property controls the generation of unique IDs for all
input elements inside
a list. When this value is set to true it disables the generation of unique
IDs, thus
replicating the old behavior. When this property is set to false or this
property is missing
it enables the generation of unique IDs, thus enabling the list to be
standards-compliant.
```

Understanding UI Hints

A schema may be used to describe the structure of a business object or any other XML document. When applicable, the same schema may also embed user interface (UI) "hints" that are interpreted at run time and render the HTML needed to display or maintain that document. Refer to UI Hint Syntax for more information.

The main advantages of this technique are as follows:

- **Less error prone.** A tighter correlation between the data structure and its presentation layer keeps the latter up to date, for example:
  - Adding an element to the schema or removing an element from it result in a corresponding change to the presentation layer. Note that you can explicitly exclude elements from the presentation layer as needed.
  - The HTML widget that is most appropriate to present or input data for an element is determined by its data type as defined by the schema. For example, a date picker is used for an input date element. If the element's data type changes in the schema its presentation adjusts accordingly.
- **Faster to implement.** No HTML skills are needed. The schema definition along with its embedded UI hint instructions is used to render the HTML at run time. Eliminating the need of crafting HTML and maintaining it as a UI Map reduces implementation and maintenance costs.
- **Supports business object inheritance.** Incorporating the presentation layer into the business object schema allows each business object in a hierarchy to contribute their part to the complete HTML that displays the entity. In other words, the complete HTML used to

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display a subclassed business object is made of the HTML rendered by the included schema of its parent business object, followed by elements extended by the subclass.

The topics in this section describe concepts and guidance relevant to the UI Hints functionality.

Display vs. Input Modes

The same schema may be used to generate either a display version of its HTML map or an input map. In the display version, element values are presented as read-only, corresponding descriptions are shown instead of codes, and additional artifacts such as links are available for navigation to related pages. In the input version, the element is editable, using the appropriate HTML widget for its data type. For example, a foreign key element is rendered along with search components, and a date element incudes a date picker widget.

The type of map generated depends on the context in which it is used:

- The display map is generated when the schema is used to present content in a map zone.
- The input map is generated when the schema is used for data entry as part of a BPA script step or a process flow panel. Refer to Generate Edit Map Statements and process flows for more information.

By default, each element in the schema is assumed to be included in both the display and input presentation maps. UI hints allow an element to be excluded from presentation altogether, included only in the display map or included only in the input map.

Not Just Business Object Schemas

While mostly used to describe the display and maintenance maps of business objects, UI Hints may also be embedded as part of other schema based objects:

- You may use a data area to describe an input form and prompt the user to fill it in using a BPA script step or a process flow panel.
- You may embed UI hints in a business service or service script schema for the purpose of displaying the content prepared by the service in a portal zone. Refer to map zones for more information.
- You may embed UI hints in a service script's schema to prompt for user input before calling the script to perform a task and presenting results. Refer to Generate Edit Map Statements for more information.

Definition Order is Presentation Order

Elements are presented in the order they are defined in the expanded schema. For example, a subclassed business object that includes its parent business object followed by extension elements is presented with the parent portion of the HTML, followed by the extension fields.

Use UI Map Fragments for Complex HTML

The following items describe basic capabilities supported by the UI Hints functionality:

- Control which elements are presented in the display and input maps.
- Provide a title for the input map.
- Introduce sections around elements by injecting start and end section instructions. The order in which the elements are defined within a section is also their presentation order.
- Basic visibility rules are supported at the element and section level.

For more complex requirements around a specific element, you may craft the necessary HTML/JavaScript for the element, capture it as a UI Map Fragment, embed the fragment as

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part of the schema in the appropriate presentation order, and suppress the element from basic rendering for the corresponding input or display map.

> **Note**
>
> You may also use this technique to display elements in a different presentation location. For example, when a business object's display script needs to display additional elements that are not part of the business object's schema. In this situation, the script's schema introduces the elements as suppressed and the business object schema includes an embedded HTML UI map fragment to display them in the appropriate section. Note that this may only work when both the business object and script are owned by your organization.

Refer to UI Hint Syntax for more information.

UI Hint Syntax

Working Examples

For working examples of uiHint functionality, refer to the following business objects:

BOs with User Assigned Keys

The following examples illustrate the patterns used to enable uiHints on an object with a user specified key.

- `F1-OutcomeStyleLookup`. This extendable lookup BO does not require state transition, but does allow duplicate and delete actions.
- `F1-TodoSumEmailTyp`. This request type illustrates the hints required to support state transition on a display map.
- `F1-WebSvc`. This web service BO is a good example for management of complex JavaScript requirements. Both display and input maps have functionality that requires specialized javascript.

BO with System Generated Key

The following example illustrates the pattern used to enable uiHints on an object with a system generated key.

- `F1-GenericAttachment`. This attachment BO has a system assigned key, which entails the following special handling:
  - `F1-AttachmentMain`. This is the main section data area contains the elements common to all attachments, including the key, bo, and version. Because this data area is used to define the main section of the generated maps, the main section of the map can be extended by an implementation via data area extension functionality.
  - `F1-AttachmentActions`. This record actions map contains the standard actions, Edit and Delete, plus custom actions used only by attachments, View and Upload.
  - `F1-AttachmentIDFrag`. This record information map contains the primary key of the attachment.

Display Map Service Script

Display map service scripts can be fully supported via dynamic HTML generation. However, to help eliminate the need for a display service script, self-contained uiHint functionality has been

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developed to write the business object status and determine valid state transitions. So the two most common reasons to craft a display service script have been eliminated.

A typical reason to use a display pre-script is if you have an embedded map fragment that contains a business service schema. The display service script can be used to invoke the business service. Both the map fragment and the display service script must declare the business service schema to support this scenario.

> **Warning**
>
> The zone used to display the object's map must have a derivation script, like `F1-GncDsMpDZ` or `F1-GenDss`, that will invoke a display service script for the business object if it has been defined as a BO option - but not require an explicit display map BO option. In addition, the display service script's schema must be enabled for uiHint functionality - as the script's schema will be dynamically rendered by the zone - and not the BO schema.

- `F1-ExcelSpreadsheet`. This attachment BO has a display service script used to manipulate the attachment business object before displaying it:
- `F1-AttchDtlU`. This display map service script's schema has been defined with the uiHint namespace, and will have a display map generated for it.

Maintenance Pre-Processing Service Script

Maintenance pre-processing service scripts can be used with uiHints.

- `F1-ExcelSpreadsheet`. This attachment BO has a maintenance pre-processing service script used to manipulate the attachment business object before rendering the maintenance map:
- `F1-AttchPre`. This pre-processing service script's schema mimics a maintenance map schema with embedded boGroup and action elements. It will be invoked before the maintenance map is rendered.

Maintenance Post-Processing Service Script

Maintenance post-processing service scripts can be used with uiHints.

- `F1-ExcelSpreadsheet`. This attachment BO has a maintenance post-processing service script used to manipulate the attachment business object after rendering the maintenance map:
- `F1-AttchPost`. This post-processing service script's schema mimics a maintenance map schema with embedded boGroup and action elements. It will be invoked after the maintenance map is rendered.

Technical Notes

The following prerequisites are required to support dynamic HTML generation:

Schema Requirements

To support automated UI generation, the business object schema must contain the following:

- <schema **xmlns:uiHint="http://oracle.com/ouafUIHints"**>. The schema node must name the uiHint namespace.
- **isPrimeKey="true".** Every element of the business object schema that is part of the primary key must be identified.

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Maintenance Script Requirements

The maintenance script for the MO must be enabled for dynamic generation.

> **⚠ Caution**
>
> The business object maintenance BPA script must be declared as an MO Option for uiHint maintenance functionality to work!

If the script performs `F1-BOProc` then it is likely no special functionality is needed. However, if the maintenance script contains its own call to `F1-GetValOpt` then the following statement is required prior to that call:

```
move 'false' to "F1-GetBOOpts/input/maintenanceMapRequired";
performScript 'F1-GetValOpt';
```

After the call to `F1-GetValOpt` the following logic must be included to dynamically declare the map schema if the business object does not have a maintenance map of its own:

```
 // Perform Main Processing
if ("F1-GetBOOpts/output/maintenanceMap = $BLANK")
  declareBOWithBOGroup "$bo" as 'map_schema';
else
  declareMap "F1-GetBOOpts/output/maintenanceMap" as 'map_schema';
end-if;
```

Format an Input Map Title

> **ⓘ Note**
>
> Throughout this topic the term "field" to refer to both the generic concept of displaying and capturing data in a 'field' as well as referring to the meta-data object supplied in the product to define Fields. When referring to the latter, the term "MD Field" (meta-data Field) is used.

A uiHint element can be used to build a title for a maintenance map. The title will only print on the maintenance map, not on the display map. It will be printed as the first line in the map, centered, with a heading style.

Syntax	Description	Examples
`<uiHint:title mdField=""/>`	Displays the label of a referenced MD field as the title.	`<schema xmlns:uiHint="http://oracle.com/ouafUIHints"> <uiHint:title mdField="STATUS_RSN_LBL"/> ... </schema>`

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Syntax	Description	Examples
`<uiHint:title text=" "/>`	Displays the indicated text as the title. (Do not use this mechanism when multiple languages are supported.	`<schema xmlns:uiHint="http://oracle.com/ouafUIHints"> <uiHint:title text="Status Reason"/> ... </schema>`

Create a Section

The uiHint namespace supports the definition of a UI map section. Note that sections are currently created in generated UI Maps when the schema has a group or list node with a label or mdField. The functionality described here enables the creation of a section without requiring a labeled group or list node within the schema. Every section must be bounded by **startSection** and **endSection** element pair.

Syntax	Supporting Attributes	Description
`<uiHint:startSection .../>`	`sectionColumn="left | right | fullWidth | float"`	The default is that the section will be the full width in display maps. To override that setting, specify if you want a half-width section to appear in either the left (**left**) or right (**right**) column or to float (**float**). Sections that are marked as 'float' will display half-width and be aligned according to whether prior sections are displayed or conditionally hidden. For example, if a left-aligned section is followed by a floating section, the floating section will appear in the right column if the left section is populated but will display in the left column if the left section is hidden / collapsed.
	`editColumn="left | right | fullWidth | float"`	By default a section appears as full width in maintenance maps. To override that setting, specify if you want a half-width section to appear in either the left (**left**) or right (**right**) column or to float (**float**). The behavior is the analogous to the **sectionColumn** behavior.
	`sectionOpen="false"`	By default a section is open on initial display. Specify this attribute to initially display the section as closed (collapsed).
	`mdField=" "`	Specify the name of a MD field whose label should be used as the section heading.
	`label=" "`	Specify the explicit text to use as the section heading.
	`visibleOn="displayMap | inputMap"`	By default a section appears on both the display and the input maps. Use this attribute to limit the display of the section to either the display map (**displayMap**) or input map (**inputMap**).

The syntax for the end section attribute is `<uiHint:endSection/>`

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Examples:

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
    <uiHint:startSection label="Main" sectionColumn="left"/>
    ...
    <uiHint:endSection/>
</schema>


<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
    <uiHint:startSection mdField="F1-ADD-INFO" sectionColumn="fullWidth"
editColumn="float" sectionOpen="false" visibleOn="displayMap"/>
    ...
    <uiHint:endSection/>
</schema>
```

> **Note**
>
> The sectionColumn, editColumn and sectionOpen attributes are available for group and list nodes as well.

Include a Map Fragment

You can specify a UI map fragment to inject HTML into a generated map using the **includeMap** element name. This allows for you to support more sophisticated behavior on your user interface. For any element that is included for rendering in the map fragment, be sure to suppress the element in its schema definition, otherwise HTML will automatically be generated for the element.

Syntax	Supporting Attributes	Description
`<uiHint:includeMap ../>`	`map=" "`	Specify the name of the map.
	`visibleOn="displayMap | inputMap"`	By default the details from the map fragment appear on both the display and the input maps. Use this attribute to limit the display of the section.

Example:

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
  ...
  <uiHint:includeMap map="StandardActionButtons" visibleOn="displayMap"/>
  ...
</schema>
```


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> **Note**
>
> **Important note on the map fragment schema:** If a map fragment contains a schema, then the fragment schema structure will be injected into the dynamically generated schema when the business object is rendered for input. Technically, the fragment schema will be inserted after the boGroup structure within the map's schema. This method may be used to support the implementation of maintenance pre and post script processing for a business object and oraInvokeBS function calls within embedded JavaScript.

If JavaScript is required within an XHTML UI Map fragment, it is necessary to bound it within a **![CDATA[ ]]** tag to ensure a valid XML document. Note that the tags themselves may need to be commented out to promote compatibility with older browsers. For example:

```
<script type="text/javascript">
/* <![CDATA[ */
//
//javascript
//
/* ]]> */
</script>
```

Flush the cache: For performance reasons, the Framework automatically caches business object schemas, data areas, and UI maps. When you update a business object, the cache is automatically flushed. However, if the business object includes either a data area or embedded UI map fragment, the cache must be manually flushed in order for your changes to be recognized. Refer to Server Cache for more information.

Build A Dropdown

Syntax is provided to build a dropdown list in an edit map. The dropdown may be built using data returned from a service script, a business service or a table.

Syntax	Description
`uiHint:select="ss: "`	Specify the name of the service script after the colon.
`uiHint:select="bs: "`	Specify the name of the business service after the colon.
`uiHint:select="table: "`	Specify the name of the table after the colon.

When specifying a service script or a business service, extra mapping information is needed to pass data to and from the service.

Syntax	Values	Description
`uiHint:selectIn=" "`	serviceXPath:element	Used to pass the value of another element into the service (mapping to the service's XPath).
	serviceXPath:'Literal'	Used to pass a constant or literal to the service (mapping to the service's XPath).

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Syntax	Values	Description
`uiHint:selectOut="valuePath: ; descPath: "`	See examples below.	Used to indicate which element in the service's output holds the values and which one holds the descriptions.

Examples:

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
    <boStatus mapField="BO_STATUS_CD" uiHint:select="bs:F1-BOStateReasonList"
    uiHint:selectIn="boStatusBO:boStatusBO"
uiHint:selectOut="valuePath:results/status;
    descPath:results/description"/>
    ...
    <algorithm mdField="ALG_CD" uiHint:select="bs:F1-
RetrieveSysEvtAlgorithms"
     uiHint:selectIn="algorithmEntity:'F1AA';"
uiHint:selectOut="valuePath:results/algorithm;
     descPath:results/description"/>
    ...
    <outboundMsgType mdField="OUTMSG_TYPE_CD" required="true" fkRef="F1-
OMTYP" uiHint:select="table:F1_OUTMSG_TYPE"/>
</schema>
```

Conditionally Hide Elements

The **displayNone** attribute is used to suppress elements on the map based on conditions.

Syntax	Values	Description
`uiHint:displayNone=`	"'XPath','value','!=' | '='"	Used to conditionally hide this element based on the value of another element (referenced using its XPath). Enter a value of `' '` to interrogate a blank value. By default the operator is `'='`. This may be overridden using `'!='`.
	"function name, **true** | **false**"	Used to indicate a JavaScript function, which must return a Boolean.

> **Warning**
>
> Embedded spaces are not supported within the comma separated string values of this attribute.
>
> This setting may be used on group nodes, list nodes, and elements - except for elements within a list. Elements within a list cannot be hidden conditionally.

The following example illustrates that two elements (currency reference and lookup) that will be hidden or displayed based on the value of the data type element. Note that this example also

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illustrates Trigger Dependent Behavior because the data type element's value may change and if it does, the condition for hiding the subsequent elements should be re-evaluated.

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
    ...
    <dataType mdField="F1_SE_DATA_TYPE" dataType="lookup"
lookup="F1_SE_DATA_TYPE"
     uiHint:dependents="currencyRef;lookup; "/>
     <currencyRef mdField="F1_SE_CURR_REF_LBL"
uiHint:displayNone="'dataType','F1MO','!='"/>
     <lookup mdField="F1_SE_LOOKUP_LBL" fkRef="F1-LKUPF"
uiHint:displayNone="'dataType','F1LP','!='"/>
     ...
</schema>
```

The following example illustrates referring to a function where the function receives parameters:

```
<uiHint:startSection mdField="F1_SE_DEFAULT_SECT"
    uiHint:displayNone="isApplicableForSchemaType(item,'F1MP'),true"/>
```

Conditionally Protect Elements

The protect attribute is used to protect elements on the map based on other factors.

Syntax	Values	Description
`uiHint:protect=`	"'XPath','value','!=' | '='"	Used to conditionally protect this element based on the value of another element (referenced using its XPath). Enter a value of ' ' to interrogate a blank value. By default the operator is `'='`. This may be overridden using `'!='`.
	"function name, **true** | **false**"	Used to indicate a JavaScript function, which must return a Boolean.
	"'**action**','A' | 'C','!=' | '='"	Use the `'action'` setting to protect the element based on the current action. For example, certain elements may only be specified when adding a record. Any subsequent changes to the record should protect the element from being changed. When using this option, the valid values for the *'value'* are `A` (add) and `C` (change).

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> **Warning**
>
> Embedded spaces are not supported within the comma separated string values of this attribute.
>
> The protect UI Hint may be used on group nodes, list nodes, and elements - except for elements within a list. Elements within a list cannot be protected conditionally.

The following UI Hint will protect the statistics category when the action is 'C'.

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
     ...
     <statisticsCategory dataType="lookup" mapField="STAT_CATEGORY_FLG"
    lookup="STAT_CATEGORY_FLG" uiHint:protect="'action','C','='"/>
     ...
    </schema>
```

Trigger Dependent Behavior

The dependents attribute is used to trigger behavior on a child element when a parent element is changed.

Syntax	Values
`uiHint:dependents=" "`	A list of one or more dependent elements separated by semicolons.

The following example illustrates that the dropdown list of one element is driven by the value of another element. In this example, when the Country changes, the list of States to choose from should change to only show the states for the indicated country.

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
  <country label="Country" uiHint:select="table:CI_COUNTRY"
uiHint:dependents="state"/>
  <state label="State" uiHint:select="ss:CM-RetrieveCountryStates"
   uiHint:selectIn="input/country:country;"
uiHint:selectOut="valuePath:output/state/stateCode;
   descPath:output/state/stateDesc"/>
    ...
</schema>
```

> **Note**
>
> Dependent targets may only name elements, not group or list nodes.
>
> Do not modify the "id" attribute value of dependent and parent element. Data population in dependent is done based on the "id" attribute value.

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Control Rendering Target

By default all elements that are not suppressed are visible on both the display map and the input map. Use the **visibleOn** attribute to limit the inclusion of an element to either the display or input map.

Syntax	Values
`uiHint:visibleOn=`	`"displayMap"` `"inputMap"`

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
  ...
  <uiHint:includeMap map="StandardActionButtons" visibleOn="displayMap"
  ...
</schema>
```

Generate a Text Area

By default, a standard text box is rendered in an input map for any string element. If the field is larger and you wish to have a bigger text area (with a scroll bar), use the **textArea** attribute.

Syntax
`uiHint:textArea="true"`

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
   ...
  <message label="Message" uiHint:textArea="true"/>
  ...
</schema>
```

Modify FK Reference Defaults

By default, when an element with **fkRef** is displayed, an info string, context menu, navigation, and search are enabled (if the FK reference has been configured accordingly). Syntax is provided to allow you to selectively turn off any of these features.

Syntax
`uiHint:fkRef="info:false;context:false;navigation:false;search:false;"`

Only the feature that you wish to turn off needs to be specified. The following example illustrates turning off the navigation capability, meaning the text will not be rendered as hypertext.

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
   ...
   <attachmentID fkRef="F1-ATTCH" primeKey="true" suppress="input"
uiHint:fkRef="navigation:false;"/>
```


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```
   ...
</schema>
```

> **NOT_SUPPORTED**
>
> Refer to FK Reference Formatting in the UI Map Attributes section for more information on each FK reference setting.

Suppress Automatic Number Formatting

By default numeric fields (`dataType="number"`) are formatted as numbers. An attribute is provided to instead apply alphanumeric formatting.

Note: If **dataType** is not specified explicitly, it is be derived from **mdField** or **mapField**.

Syntax
`uiHint:alphaFormat="true|false"`

By default, its value is **false** (and therefore can be left out altogether).

Examples:

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
     ...
     <numberCount mdField="" dataType="number" uiHint:alphaFormat="true"/>
        ...
    </schema>
```

Auto Capitalize the Input Data

The uiHint provides syntax to automatically capitalize input data.

Syntax
`uiHint:capitalize="true|false"`

By default, its value is **false** (and therefore can be left out altogether).

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
     <toDoTypeCd mdField="TD_TYPE_CD" uiHint:capitalize='true'
isPrimeKey="true"/>
</schema>
```

> **Note**
>
> This attribute is ignored if `uiHint:textArea="true"` is configured.

The attribute is only available in the schema designer when the **isPrimeKey** is set to **true**. The attribute may be added to any string element when using the source viewer.

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Override Row Header for Accessibility Purposes

When generating the HTML for a list, the default is to assign scope="row" to the non-suppressed primary key elements, if any, or the first non-suppressed element in the list. This uiHint provides syntax to override the defaults when they are not the appropriate elements to be used by a screen reader.

Syntax
`uiHint:rowHeader="true|false"`

```
<iwsAnnotationTypeParameter mdField="F1_ANN_TYPE_PARMS_LBL" type="list"
mapChild="F1_IWS_ANN_TYPE_PARM">
        <sequence dataType="number" mapField="SEQ_NUM"
uiHint:rowHeader="false"/>
        <parameterName mapField="PARM_NAME" uiHint:rowHeader="true"
dataType="string"/>
        <parameterValue mapField="PARM_VALUE" dataType="string"/>
        <isRequired dataType="lookupBO" mapField="REQUIRED_SW" lookupBO="F1-
BooleanValues"/>
        <javaPackage mapField="JAVA_PACKAGE" dataType="string"/>
        <version suppress="true" dataType="number" mapField="VERSION"/>
        <description mapField="DESCR" dataType="string"/>
        <longDescription mapField="DESCRLONG" uiHint:textArea="true"
dataType="string"/>
        <owner suppress="input" dataType="lookup" mapField="OWNER_FLG"
lookup="OWNER_FLG"/>
    </iwsAnnotationTypeParameter>
```

The attribute is only applicable to elements in a list.

Defining UI Maps

Use this page to define basic information about a user interface (UI) Map.

You can access the portal from the **Admin Menu**, and then **System**, and then **UI Map**. You are brought to a query portal with options for searching for a specific UI Map. Once a UI Map has been selected you are brought to the maintenance portal to view and maintain the selected record.

> ⚠ **Caution**
>
> Important! If you introduce a new UI Map, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

Refer to Understanding UI Maps for more information.

Use **UI Map Type** to indicate the map type. The system recommends using a **Complete XHTML Document** (the default) or **XHTML Fragment**. The values **Complete HTML Document** and **HTML Fragment** remain for backward compatibility but are not recommended.

The following zones may appear as part of the portal's **Main** tab page.

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- **UI Map.** This zone provides information about the selected UI Map.
- **HTML Editor.** This zone allows you to edit the HTML document of the map.

> **Note**
>
> Refer to UI Map Attributes and Functions and UI Map Standards for more information about HTML definition syntax. These topics describe good ways to produce simple HTML, however, they are not an HTML reference. Note that you can use a variety of HTML editors to compose your HTML, which you can then cut and paste into your UI map.

> **Note**
>
> **Providing Help.** A tool tip can be used to display additional help information to the user. This applies to section elements as well as individual elements on a map. Refer to UI Map Attributes and Functions for more information on how to enable and provide UI map help.

- **HTML Override Editor.** This zone allows you to provide an override HTML document for a base product map.

The following zones may appear as part of the portal's **Schema** tab page.

- **Schema Editor.** This zone allows you to edit the UI Map's schema using the Schema Designer tool. The purpose of the schema is to describe the UI Map's properties.

> **NOT_SUPPORTED**
>
> Refer to Schema Syntax and UI Hint syntax for a complete list of the XML nodes and attributes available to you when you construct a schema.

> **Tip**
>
> Click the **View Schema** hyperlink to view the UI Map's expanded schema definition. Doing this opens the schema viewer window.

The following zones may appear as part of the portal's **References** tab page.

- **UI Map References.** This zone list various configuration entities referencing the current UI Map, its HTML or its schema.

Actions

The page supports the following special actions:

- **View Schema.** Click the hyperlink to view the UI Map's expanded schema definition. Doing this opens the schema viewer window.
- **Test UI Map.** Use the hyperlink to render your HTML in a test window. This action also exercises the proprietary functionality that binds an XML element with an HTML element so you can get immediate feedback on your HTML syntax.
- UI Map Attributes and Functions

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- UI Map Standards

UI Map Attributes and Functions

> **Note**
>
> Use the UI Map Query's Additional Information option to review HTML examples provided by the product.

Bind XML to HTML

Only two different attributes are required to bind a UI Map's XML to its HTML. Both of these attributes require an XML document embedded within the HTML, where the XML is bounded by <xml> nodes.

> **Warning**
>
> You must embed a pair of <xml></xml> tags within your HTML document for binding to occur.

Linking a Field

Syntax	Values	Description
oraField=" "	Field element XPath	This attribute is used to link an HTML element directly with an XML element, where the XML element is defined within the UI Map's XML schema. The attribute can be used with any *rendering* HTML element, such as: , , and <input>.

- HTML for input element:

```
<html>
<body>
<table>
   <tr>
      <td>Address:</td>
      <td><input type="text" oraField="address"/></td>
   </tr>
   <tr>
      <td>City:</td>
      <td><input type="text" oraField="city"/></td>
   </tr>
   <tr>
      <td>State:</td>
      <td><input type="text" oraField="state"/></td>
   </tr>
   <tr>
      <td>Zip:</td>
      <td><input type="text" oraField="zip"/></td>
```


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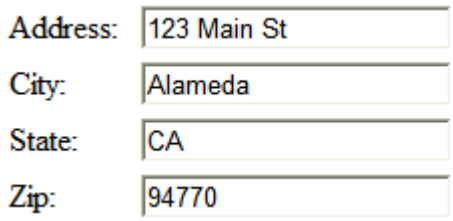
```
   </tr>
</table>
</body>
<xml>
   <root>
      <address>123 Main St</address>
      <city>Alameda</city>
      <state>CA</state>
      <zip>94770</zip>
   </root>
</xml>
</html>
```

Rendered HTML



- HTML for span and div elements:

```
<html>
<body>

<div oraField="address"></div>
<span oraField="city"></span>
<span>,</span>
<span oraField="state"></span>
<span oraField="zip"></span>
<span oraField="country"></span>

</body>
<xml>
   <root>
      <address>123 Main St</address>
      <city>Alameda</city>
      <state>CA</state>
      <zip>94770</zip>
   </root>
</xml>
</html>
```

HTML rendered:

123 Main St
Alameda, CA 94770

Linking a List

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This attribute is used to link an HTML table with an XML list, where the XML list is defined within the UI Map's XML schema. The purpose of the element is to trigger the framework to replicate the table's HTML for each occurrence of the list.

Syntax	Values	Description
oraList=" "	List element XPath	This attribute is used to link an HTML table with an XML list, where the XML list is defined within the UI Map's XML schema. The purpose of the element is to trigger the framework to replicate the table's HTML for each occurrence of the list.

> **Note**
>
> The oraField attributes embedded within the list must contain XPath navigation relative to the list. See below for an example.

```
<html>
<head><title>Bind xml list element</title></head>
<body>
<table oraList="payment">
   <thead>
      <tr>
         <th><span>Pay Date</span></th>
         <th><span>Amount</span></th>
        </tr>
        <tr/>
    </thead>
    <tr>
      <td>
         <span oraField="date" oraType="date"></span>
      </td>
      <td align="right">
         <span oraField="amount" oraType="money"></span>
      </td>
   </tr>
</table>
</body>
<xml>
<root>
    <payment>
        <date>2008-01-01</date>
        <amount>44.28</amount>
    </payment>
    <payment>
        <date>2008-02-01</date>
        <amount>32.87</amount>
    </payment>
    <payment>
        <date>2008-03-01</date>
        <amount>21.76</amount>
    </payment>
</root>
```


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```
</xml>
</html>
```

HTML rendered:

Pay Date	Amount
01-01-2008	$44.28
02-01-2008	$32.87
03-01-2008	$21.76

Build a Dropdown List

The following attributes are provided to build an HTML ‘select’ element, also called a dropdown, based on various sources.

Source	Syntax	Values	Examples

Lookup	`oraSelect="lookup: ;"`	Lookup field	`...`
			`<td>House Type:</td>`
			`<td>`
			`<select oraField="houseType" oraSelect="lookup:HOUSE_TYPE;" >`
			`</select>`
			`</td>`

Extendable Lookup	`oraSelect="lookupBO: ;"`	BO code	`...`
			`<td>UI Device Display Type:</td>`
			`<td>`
			`<select oraField="uiDeviceType" oraSelect="lookupBO: F1-DeviceDisplayTypes;"></select>`
			`</td>`

Characteristic Type (pre-defined)	`oraSelect="charType: ;"`	Characteristic Type code	`...`
			`<td>Usage:</td>`
			`<td>`
			`<select oraField="statusReasonUsage" oraSelect="charType:F1-SRUSG;"></select>`
			`</td>`
			`...`

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Source	Syntax	Values	Examples

Control Table	`oraSelect="table: ;"`	Table name	`...`
			`<td>Currency: </td>`
			`<td>`
			`<select oraField="currency" oraSelect="table:CI_CURRENCY_CD;">`
			`</select>`
			`</td>`
			`...`

Note

This attribute only works with tables that have a

Source	Syntax	Values	Examples
		ndardcontroltablestructurewhereretherereisarelatedlangugeta	

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Source	Syntax	Values	Examples
		b l e t h a t i n c l u d e s t h a t i n c l u d e s t h e c o l u m n **D** **E** **S** **C** **R** o r D E S C R 1 0 0 a s i t	

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Source	Syntax	Values	Examples
		sdescriptioncolumn.Gotothe Fieldmaintenancepageforeachfiel	

Source	Syntax	Values	Examples

dtoseewhattablescontainthefields.

Warning

TheoraSelect

Source	Syntax	Values	Examples
		function will only work if less than 500 values are provided.	

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Source	Syntax	Values	Examples

Page Service	`oraSelect="service: ;"`	Page Service name	`...`
			`<td>Country:</td>`
			`<td>`
			`<select oraField="country" oraSelect="service:CIPTCNTW;">`
			`</select>`
			`</td>`
			`...`

Embedded List	Used to build a select dropdown based on a list within the map's XML. `oraSelect="valuePath: ;descPath: "`	After the valuePath, indicate the XPath of the element that holds the values. After the descPath, indicate the XPath of the element that holds the descriptions.	`<html>`
			`<body>`
			`<table summary="" border="0" cellpadding="1" cellspacing="1">`
			`<tr>`
			`<td>Select: </td>`
			`<td><select oraSelect= "valuePath:list/value; descPath:list/desc" oraField="target"></ select></td>`
			`</tr>`
			`</table>`
			`</body>`
			`<xml>`
			`<root>`
			`<target>10</target>`
			`<list>`
			`<value>10</value>`
			`<desc>Ten</desc>`
			`</list>`
			`<list>`
			`<value>20</value>`
			`<desc>Twenty</desc>`
			`</list>`
			`<list>`
			`<value>40</value>`
			`<desc>Forty</desc>`
			`</list>`
			`</root>`
			`</xml>`
			`</html>`

Service Script	`oraSelect="ss: ; "`	Service Script code	See below for additional syntax needed when using this function.
Business Service	`oraSelect="bs: ; "`	Business Service code	See below for additional syntax needed when using this function.

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When specifying a service script or a business service, extra mapping information is needed to pass data to and from the service.

Syntax	Values	Description
oraSelectIn=" ;"	serviceXPath:element;	Used to pass the value of another element into the service (mapping to the service's XPath).
	serviceXPath:'Literal';	Used to pass a constant or literal to the service (mapping to the service's XPath).
oraSelectOut= "valuePath: ; descPath: "	See examples below	Used to indicate which element in the service's output holds the values and which one holds the descriptions.

Example using a business service:

```
...
<td>External System: </td>
<td>
   <select oraField="externalSystem"
    oraSelect="bs:F1-RetrieveExternalSystems"
    oraSelectIn="outboundMsgType:boGroup/parameters/outboundMsgType;"
    oraSelectOut="valuePath:results/externalSystem;
    descPath:results/description">
   </select>
</td>
...
```

This method for building dropdowns is often used when there is a dependency between elements and the list of valid values in a dropdown (for the child element) is based on another element in the map (the parent element). When the parent element is changed, it may be required to refresh the child element. This behavior can be implemented using the function called within an **onChange** event in the map. The syntax is **oraHandleDependentElements('dependent element');**. Multiple target elements (dependents) can be named.

The following example is related to the above business service example where the list of external systems is specific for a given outbound message type, which is passed in as input. The snippet below shows the configuration for the outbound message type element to trigger a refresh of the external system’s dropdown list.

```
...
<div>
   <label oraLabel="boGroup/parameters/outboundMsgType"></label>
      <span>
         <select oraSelect="table:F1_OUTMSG_TYPE"
          oraField="boGroup/parameters/outboundMsgType"
          onChange="oraHandleDependentElements('boGroup/parameters/
externalSystem');">
         </select>
      </span>
</div>
...
```


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Format Input and Output Fields

The following attributes are designed to apply data type formatting for input and output fields.

Automatic Formatting

Syntax
`oraSchemaDataTypes="false"`

This attribute is used to trigger automatic formatting in the rendered HTML document. The automated formatting will occur according to the data type attributes defined in the UI map's schema. For details on specific data type formatting, please refer to the oraType attribute descriptions below.

> **Warning**
>
> The attribute **oraSchemaDataTypes="true"** will be automatically injected into the UI map's HTML! If you do not wish to apply the schema's data types to the rendered HTML then you must specify this attribute in the body node with a value of false. The attribute **<body oraSchemaDataTypes="false">** is required to avoid automatic formatting!

- UI Map schema:

```
<schema>
    <schemaDate dataType="date"/>
    <schemaDateTime dataType="dateTime"/>
    <schemaFkRef fkRef="F1-MOTBL"/>
    <schemaLookup dataType="lookup" lookup="ACCESS_MODE"/>
    <schemaMoney dataType="money"/>
    <schemaNumber dataType="number"/>
    <schemaTime dataType="time"/>
</schema>
```

- UI Map HTML:

```
<html>
<body oraSchemaDataTypes="true">
<table border="1" cellpadding="1" cellspacing="1">
   <tr><th>dataType</th><th>input result</th><th> display-only result</
th></tr>
   <tr>
      <td>date</td>
      <td><input oraField="schemaDate"/></td>
      <td><span oraField="schemaDate"></span></td>
   </tr>
   <tr>
      <td>dateTime</td>
      <td><input oraField="schemaDateTime"/></td>
      <td><span oraField="schemaDateTime"></span></td>
   </tr>
   <tr>
```


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```
      <td>fkRef</td>
      <td><input oraField="schemaFkRef"/></td>
      <td><span oraField="schemaFkRef"></span></td>
   </tr>
   <tr>
      <td>lookup</td>
      <td><input oraField="schemaLookup"/></td>
      <td><span oraField="schemaLookup"></span></td>
   </tr>
   <tr>
      <td>money</td>
      <td><input oraField="schemaMoney"/></td>
      <td><span oraField="schemaMoney"></span></td>
   </tr>
   <tr>
      <td>number</td>
      <td><input oraField="schemaNumber"/></td>
      <td><span oraField="schemaNumber"></span></td>
   </tr>
   <tr>
      <td>time</td>
      <td><input oraField="schemaTime"/></td>
      <td><span oraField="schemaTime"></span></td>
   </tr>
</table>

</body>
<xml>
<root>
   <schemaDate>2007-11-02</schemaDate>
   <schemaDateTime>2007-11-02-23.45.00</schemaDateTime>
   <schemaFkRef>CI_MD_TBL</schemaFkRef>
   <schemaLookup>A</schemaLookup>
   <schemaMoney>1000000</schemaMoney>
   <schemaNumber>5661976.11548</schemaNumber>
   <schemaTime>23.45.00</schemaTime>
</root>
</xml>
</html>
```

HTML rendered.

dataType	input result	display-only result
date	11-02-2007	11-02-2007
dateTime	11-02-2007 11:45:00PM	11-02-2007 11:45:00PM
fkRef	CI_MD_TBL Table	Table
lookup	A	Add
money	$1,000,000.00	$1,000,000.00
number	5,661,976	5,661,976
time	11:45:00PM	11:45:00PM

Date and Time Formatting

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Syntax	Valid Values	Description
`oraType="date"`		This function is used to display a date according to the user's display profile. For input fields, the setting formats the data when the user tabs out of the field.
`oraType="time"`		This function is used to display a time according to the user's display profile. For input fields, the setting formats the data when the user tabs out of the field.
`oraType="dateTime; time:suppress"`		This function is used to display a timestamp according to the user's display profile. If this function is used for an input element, it is broken into two pieces, one for date and one for time. Optionally, the time portion of the date time element can be suppressed using the attribute value 'time:suppress'.
`oraType="dateTime; stdTime:true;"`		This function is used to render a date / time element that is stored in standard time according to the daylight savings time schedule of the 'base' time zone. The 'base' time zone is specified on the Installation table and represents the database time zone. For input elements with this setting, all time entered is assumed to correspond with the daylight savings time schedule of the base time zone. If a time is entered that cannot be unambiguously translated to standard time, then the user will be required to provide a time zone label to indicate whether daylight savings time, or standard time, has been entered.
`oraType="dateTime; stdTimeRef:;"`	Reference an XPath after the colon.	This function is used to render a date / time element according to the daylight savings time schedule of a time zone whose XPath is referenced. Note that the time processed is assumed to have been stored in the standard time of the referenced time zone - so only daylight savings time shifting will execute - not time zone shifting.
`oraType="dateTime; legalTime:true;"`		This function is used to render a date / time element that is stored in legal time of the 'base' time zone. The 'base' time zone is specified on the Installation table and represents the database time zone.
`oraType="dateTime; legalTimeRef: ;"`	Reference an XPath after the colon.	This function is used to render a date / time element according to the daylight savings time schedule of a time zone whose XPath is referenced. Note that the time processed is assumed to have been stored in the legal time of the referenced time zone.
`oraType="dateTime; … ; displayRef:;"`	Reference an XPath after the colon.	This function is used to display a date/time element that is explicitly defined as stored in standard or legal time (using either stdTime | stdRef | legalTime | legalRef) from its storage time zone to the referenced time zone in legal time before display and vice versa, from the display time zone to the storage time zone on save.

```
<html>
<body oraSchemaDataTypes="true">
<table border="1" cellpadding="1" cellspacing="1">
   <tr><th>dataType</th><th>input result</th><th> display-only result</
th></tr>
   <tr>
      <td>date</td>
```


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```
      <td><input oraField="schemaDate" oraType="date;"/></td>
      <td><span oraField="schemaDate" oraType="date;"></span></td>
   </tr>
   <tr>
      <td>time</td>
      <td><input oraField="schemaTime" oraType="time;"/></td>
      <td><span oraField="schemaTime" oraType="time;"></span></td>
   </tr>
   <tr>
      <td>dateTime</td>
      <td><input oraField="schemaDateTime" oraType="dateTime;"/></td>
      <td><span oraField="schemaDateTime" oraType="dateTime;"></span></td>
   </tr>
   <tr>
      <td>dateTimeSuppress</td>
      <td><input oraField="schemaDateTimeSup" oraType="dateTime;
time:suppress"/></td>
      <td><span oraField="schemaDateTimeSup" oraType="dateTime;
time:suppress"></span></td>
   </tr>
   <tr>
     <td>Base Time Zone (Standard)</td>
     <td><input oraField="schemaDateTimeStd" oraType="dateTime;
stdTime:true;"/></td>
     <td><span oraField="schemaDateTimeStd" oraType="dateTime;
stdTime:true;"></span></td>
   </tr>
   <tr>
     <td>Base Time Zone (Legal)</td>
     <td><input oraField="schemaDateTimeLgl" oraType="dateTime;
legalTime:true;"/></td>
     <td><span oraField="schemaDateTimeLgl" oraType="dateTime;
legalTime:true;"></span></td>
   </tr>
   <tr>
     <td>Referenced Time Zone (Standard)</td>
     <td><input oraField="schemaDateTimeStdRef" oraType="dateTime;
stdTimeRef:timeZone;"/></td>
     <td><span oraField="schemaDateTimeStdRef" oraType="dateTime;
stdTimeRef:timeZone;"></span></td>
   </tr>
   <tr>
     <td>Referenced Time Zone (Legal)</td>
     <td><input oraField="schemaDateTimeLglRef" oraType="dateTime;
legalTimeRef:timeZone;"/></td>
     <td><span oraField="schemaDateTimeLglRef" oraType="dateTime;
legalTimeRef:timeZone;"></span></td>
   </tr>
   <tr>
     <td>Stored in Base Time Zone (Standard) - displayed in another Time
Zone</td>
     <td><input oraField="schemaDateTimeStdDisp" oraType="dateTime;
stdTime:true; displayRef:timeZoneDisp;"/></td>
     <td><span oraField="schemaDateTimeStdDisp" oraType="dateTime;
stdTime:true; displayRef:timeZoneDisp;"></span></td>
   </tr>
```


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```
   <tr>
     <td>Stored in Base Time Zone (Legal) - displayed in another Time
Zone</td>
     <td><input oraField="schemaDateTimeLglDisp" oraType="dateTime;
legalTime:true; displayRef:timeZoneDisp"/></td>
     <td><span oraField="schemaDateTimeLglDisp" oraType="dateTime;
legalTime:true; displayRef:timeZoneDisp"></span></td>
   </tr>
   <tr>
     <td>Stored in a Referenced Time Zone (Standard) - displayed in another
Time Zone</td>
     <td><input oraField="schemaDateTimeStdRefDisp" oraType="dateTime;
stdTimeRef:timeZone; displayRef:timeZoneDisp"/></td>
     <td><span oraField="schemaDateTimeStdRefDisp" oraType="dateTime;
stdTimeRef:timeZone; displayRef:timeZoneDisp"></span></td>
   </tr>
   <tr>
     <td>Stored in a Referenced Time Zone (Legal) - displayed in another Time
Zone</td>
     <td><input oraField="schemaDateTimeLglRefDisp" oraType="dateTime;
legalTimeRef:timeZone; displayRef:timeZoneDisp"/></td>
     <td><span oraField="schemaDateTimeLglRefDisp" oraType="dateTime;
legalTimeRef:timeZone; displayRef:timeZoneDisp"></span></td>
   </tr>

  </table>

</body>
<xml>
<root>
   <timeZone>US-EASTERN</timeZone>
   <timeZoneDisp>US-CENTRAL</timeZoneDisp>
   <schemaDate>2007-11-02</schemaDate>
   <schemaTime>23.45.00</schemaTime>
   <schemaDateTime>2007-11-02-23.45.00</schemaDateTime>
   <schemaDateTimeSup>2007-11-02-23.45.00</schemaDateTimeSup>
   <schemaDateTimeStd>2007-11-02-23.45.00</schemaDateTimeStd>
   <schemaDateTimeStdRef>2007-11-02-23.45.00</schemaDateTimeStdRef>
   <schemaDateTimeLgl>2007-11-02-23.45.00</schemaDateTimeLgl>
   <schemaDateTimeLglRef>2007-11-02-23.45.00</schemaDateTimeLglRef>
   <schemaDateTimeStdDisp>2007-11-02-23.45.00</schemaDateTimeStdDisp>
   <schemaDateTimeStdRefDisp>2007-11-02-23.45.00</schemaDateTimeStdRefDisp>
   <schemaDateTimeLglDisp>2007-11-02-23.45.00</schemaDateTimeLglDisp>
   <schemaDateTimeLglRefDisp>2007-11-02-23.45.00</schemaDateTimeLglRefDisp>
</root>
</xml>
</html>
```

HTML rendered.

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dataType	input result	display-only result
date	11-02-2009	11-02-2009
time	12:28:54AM	12:28:54AM
dateTime	11-02-2009 12:28:54AM	11-02-2009 12:28:54AM
dateTimeSuppress	11-02-2009	11-02-2009
Base Time Zone (Standard) - Duplicate hour	11-01-2009 1:28:54AM PDT	11-01-2009 1:28:54AM PDT
Base Time Zone (Standard)	11-02-2009 12:28:54AM PST	11-02-2009 12:28:54AM PST
Base Time Zone (Legal)	11-02-2009 12:28:54AM PST	11-02-2009 12:28:54AM PST
Referenced Time Zone (Standard)	11-02-2009 12:28:54AM EST	11-02-2009 12:28:54AM EST
Referenced Time Zone (Legal)	11-02-2009 12:28:54AM EST	11-02-2009 12:28:54AM EST
Stored in Base Time Zone (Standard) - displayed in another Time Zone	11-02-2009 2:28:54AM CST	11-02-2009 2:28:54AM CST
Stored in Base Time Zone (Legal) - displayed in another Time Zone	11-02-2009 2:28:54AM CST	11-02-2009 2:28:54AM CST
Stored in a Referenced Time Zone (Standard) - displayed in another Time Zone	11-01-2009 11:28:54PM CST	11-01-2009 11:28:54PM CST
Stored in a Referenced Time Zone (Legal) - displayed in another Time Zone	11-01-2009 11:28:54PM CST	11-01-2009 11:28:54PM CST

When an element is associated with a time zone the corresponding time zone name is displayed along with the value. This is specifically useful in the example referenced as "Base Time Zone (Standard) - Duplicate hour". The time 1:28 is ambiguous without a time zone label. Legally, November 1, 2009 1:28 AM occurs twice because daylight savings time (DST) is removed at 2:00 AM. The time zone name indicates whether the first or second hour is specified for the time zone.

Duration Formatting

Syntax

```
oraType="duration"
```

This function is used to display time duration. For an input element, the value entered by the user is translated from minutes to hour and minutes as appropriate. For example, an entered value of '90', is converted to '00:01:30' when tabbing out of the input field.

```
<html>
<body>
<table summary="" border="0" cellpadding="1" cellspacing="1">
   <tr>
      <td>Duration: </td>
      <td><span oraField="duration" oraType="duration"></span></td>
   </tr>
   <tr>
      <td>Duration: </td>
      <td><input oraField="duration" oraType="duration"/></td>
   </tr>
</table>
</body>
<xml>
<root>
   <duration>90</duration>
</root>
</xml>
</html>
```

HTML rendered.

Duration: 00:01:30

Duration: 00:01:30

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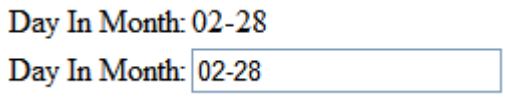
Day in Month Formatting

Syntax
`oraType="dayInMonth"`

This function is used to display a concatenated day and month.

```
<html>
<body>
<table summary="" border="0" cellpadding="1" cellspacing="1">
   <tr>
      <td>Day In Month: </td>
      <td><span oraField="dayMonth" oraType="dayInMonth"></span></td>
   </tr>
   <tr>
      <td>Day In Month: </td>
      <td><input oraField="dayMonth" oraType="dayInMonth"/></td>
   </tr>
</table>
</body>
<xml>
<root>
   <dayMonth>0228</dayMonth>
</root>
</xml>
</html>
```

HTML rendered.



Month In Year Formatting

Syntax
`oraType="monthInYear"`

This function is used to display a concatenated month and year.

```
<html>
<body>
<table summary="" border="0" cellpadding="1" cellspacing="1">
   <tr>
      <td>Month In Year: </td>
      <td><span oraField="month" oraType="monthInYear"></span></td>
   </tr>
   <tr>
      <td>Month In Year: </td>
      <td><input oraField="month" oraType="monthInYear"/></td>
   </tr>
</table>
</body>
```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```
<xml>
<root>
   <month>200811</month>
</root>
</xml>
</html>
```

HTML rendered.

Monetary Formatting

This function is used to display a number as a monetary amount. See the table for configuration options with respect to the currency. For input elements, an error is issued if a non-numeric value is entered.

Syntax	Description
`oraType="money: "`	Directly specify a currency code after the colon.
`oraType="money;currencyRef: "`	Reference an XPath (after the colon) for an element that references a currency code.
`oraType="money"`	If no currency or currency reference is specified, the installation currency is used.

> **Note**
>
> You must specify the stylesheet reference cisDisabled in the map's header for right alignment. The stylesheet controls how the field will be rendered. If you want to alter the rendering you must override the oraMoney style.

```
<html>
<head>
    <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>Amount, currency specified:</td>
      <td><span oraType="money:EUR" oraField="totalAmt"></span></td>
   </tr>
   <tr>
      <td>Amount, default currency:</td>
      <td><span oraType="money" oraField="totalAmt"></span></td>
   </tr>
   <tr>
      <td>Amount, default input:</td>
      <td><input oraType="money" oraField="totalAmt"/></td>
   </tr>
   <tr>
      <td>Amount, currency reference:</td>
      <td><input oraType="money;currencyRef:cur" oraField="totalAmt"/></td>
```


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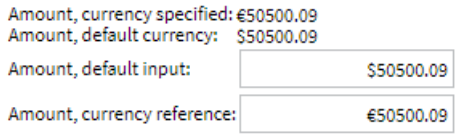
```
   </tr>
</table>
</body>
<xml>
<root>
   <totalAmt>50500.09</totalAmt>
   <cur>EUR</cur>
</root>
</xml>
</html>
```

HTML rendered



Number Formatting

This function is used to display a number or validate an input value. For input elements, the system will return an error if a non-numeric value is entered.

Syntax
`oraType="number"`

> **Note**
>
> You must specify the stylesheet reference cisDisabled in the map's header for right alignment. The stylesheet controls how the field will be rendered. If you want to alter the rendering you must override the oraNumber style.

```
<html>
<head>
    <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>Count:</td>
      <td><span oraType="number" oraField="count"></span></td>
   </tr>
   <tr>
      <td>Count, input:</td>
      <td><input oraType="number" oraField="count"/></td>
   </tr>
</table>
</body>
<xml>
<root>
   <count>989</count>
</root>
```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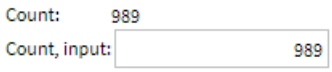
```
</xml>
</html>
```

HTML rendered.



FK Reference Formatting

By default, when an element with an **fkRef** oraType is displayed, an info string, context menu, navigation, and search are enabled (if the FK reference has been configured accordingly). Syntax is provided to allow you to selectively turn off any of these features.

Note that you can enable the foreign key hyperlink separately as well, refer to Embed Framework Navigation for more information. The various attributes used to control foreign key reference functionality are as follows. Note that in every case, the default value is **true**. A value of **false** should be used to disable the feature.

Syntax
`oraType="fkRef:true|false; info:true|false; context:true|false; navigation:true|false; search:true|false"`

- **fkRef**. A value of 'true' enables all of the following foreign key reference processing. Use a value of 'false' to disable automatic FK Reference processing.
- **info**. A value of 'true' renders an information string on the UI map, if applicable.
- **context**. A value of 'true' renders a context menu to appear before the foreign key reference element, if applicable.
- **navigation**. A value of 'true' causes the information string to be rendered as a hyperlink, if applicable. Clicking the hyperlink navigates to the appropriate page.
- **search**. A value of 'true' displays a search icon that launches the search zone if applicable.

> **Note**
>
> Foreign key navigation and context menu functionality is only available for UI maps presented in a portal zone. UI Maps presented during BPA script processing cannot support navigation options. Search functionality is only available for input HTML elements.

- UI Map schema:

```
<schema>
  <bo fkRef="F1-BOMO"/>
</schema>
```

- UI Map HTML:

```
<html>
<body>
```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```
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>Business Object</td>
      <td><span oraField="bo" oraType="fkRef:true; info:true;
context:true; navigation:true;"></span></td>
   </tr>
</table>
</body>
<xml>
<root>
   <bo>F1-COUNTRY</bo>
</root>
</xml>
</html>
```

- HTML rendered.

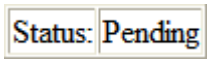
Lookup Formatting

This function is used to display the description of a lookup value.

Syntax	Valid Values
`oraType="lookup: "`	Lookup field name after the colon.

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>Status:</td>
      <td><span oraField="status" oraType="lookup:BATCH_JOB_STAT_FLG"></
span></td>
   </tr>
</table>
</body>
<xml>
<root>
   <status>PD</status>
</root>
</xml>
</html>
```

HTML rendered.



Extendable Lookup Formatting

This function is used to display the description of an extendable lookup value.

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Syntax	Valid Values
`oraType="lookupBO: "`	Business Object code name after the colon.

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>Value:</td>
      <td><span oraField="status" oraType="lookupBO:F1-DeviceDisplayTypes"></
span></td>
   </tr>
</table>
</body>
<xml>
<root>
    <status>oraTablet</status>
</root>
</xml>
</html>
```

HTML rendered.

Value:	Tablet size

Characteristic Type Formatting

This function is used to display the description of a predefined characteristic value.

Syntax	Valid Values
`oraType="charType: "`	Characteristic Type code after the colon.

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
    <tr>
        <td>Skill:</td>
        <td><span oraType="charType:CM-SKILL" oraField="skill"></span></td>
    </tr>
</table>
</body>
<xml>
<root>
    <skill>10</skill>
</root>
</xml>
</html>
```

HTML rendered.

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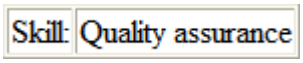

Control Table Formatting

This function is used to display the description of a control table that has an associated language table.

Syntax	Valid Values
`oraType="table: "`	Table code after the colon.

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>Currency:</td>
      <td><span oraType="table:CI_CURRENCY_CD" oraField="curr"></span></td>
   </tr>
</table>
</body>
<xml>
<root>
   <curr>USD</curr>
</root>
</xml>
</html>
```

HTML rendered.

Add / Remove Grid Formatting

Syntax	Description
`oraType="addGridRow"`	The addGridRow function is used to build "insert row" dialog into the UI map. • An 'add' image is displayed. • Clicking the image inserts a new row in the grid. • If the list is empty, by default, an empty grid row is automatically be added. This means that the user will always see at least one grid row when this attribute is used.
`oraType="deleteGridRow"`	The deleteGridRow function is used to build "delete row" dialog into the UI map. • A 'delete' image is displayed. • Clicking the image removes the adjacent row from the grid.

> **Note**
>
> Because add and delete dialogs are relevant only inside a table, these attributes must be specified within a <td> element.

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> **Warning**
>
> These attributes are designed to work with the business object action of 'replace' rather than 'update'. Therefore, if the map contains a grid, the business object action of 'replace' must be used to update the business object. Refer to BO Replace Action for more information.

Example:

```
<html>
<head>
<title>Demonstrate Grid Add and Grid Delete OraTypes</title>
    <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body>
<table oraList="listEntry">
   <thead>
      <tr>
         <th/>
         <th/>
         <th><span>Date</span></th>
         <th><span>Amount</span></th>
      </tr>
      <tr/>
   </thead>
   <tr>
      <td oraType="addGridRow"></td>
      <td oraType="deleteGridRow"></td>
      <td>
         <input oraField="date" oraType="date"></input>
      </td>
      <td align="right">
         <input oraField="amount" oraType="money"></input>
      </td>
   </tr>
</table>
</body>
<xml>
<root>
   <listEntry>
      <date>2008-01-01</date>
      <amount>44.28</amount>
   </listEntry>
   <listEntry>
      <date>2008-02-01</date>
      <amount>32.87</amount>
   </listEntry>
   <listEntry>
      <date>2008-03-01</date>
      <amount>21.76</amount>
   </listEntry>
</root>
</xml>
</html>
```


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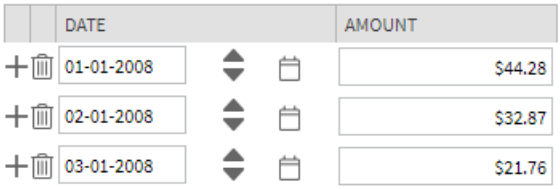
HTML rendered.



Unformatted Elements

This function is used to display the contents of an element that contains 'raw' data as defined for the schema element being rendered.

Syntax
`oraType="raw"`

- UI Map schema:

```
<schema>
    <rawStuff type="raw"/>
</schema>
```

- UI Map HTML:

```
<html>
<head>
   <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>Raw Stuff:</td>
      <td><span oraType="raw" oraField="rawStuff"></span></td>
   </tr>
</table>
</body>
<xml>
<root>
   <rawStuff>
      <ele1>text in element 1</ele1>
      <group1>
         <ele2>text inside element 2, group 1</ele2>
         <ele3>text inside element 3, group 1</ele3>
      </group1>
   </rawStuff>
</root>
</xml>
</html>
```

HTML rendered.

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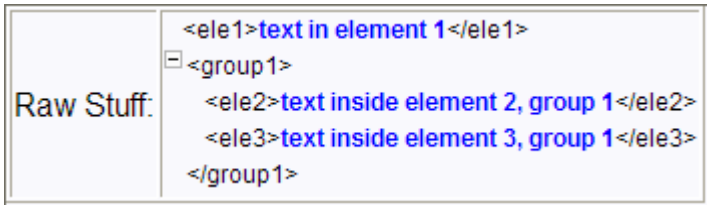

String Formatting

This function is used to display the contents of an element, as XML pretty-print, when the element contains escaped XML.

Syntax
`oraType="xmlString"`

> **Note**
>
> It is not required, but the pretty print of the rendered XML is enhanced if you specify the stylesheet reference cisDisabled in the map's header.

Example:

```
<html>
<head>
   <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>XML Stuff:</td>
      <td><span oraType="xmlString" oraField="xmlStuff"></span></td>
      </tr>
</table>
</body>
<xml>
<root>
   <xmlStuff>
      <ele1>text in element 1</ele1>
      <group1>
         <ele2>text inside element 2, group 1</ele2>
         <ele3>text inside element 3, group 1</ele3>
      </group1>
   </xmlStuff>
</root>
</xml>
</html>
```

HTML rendered.

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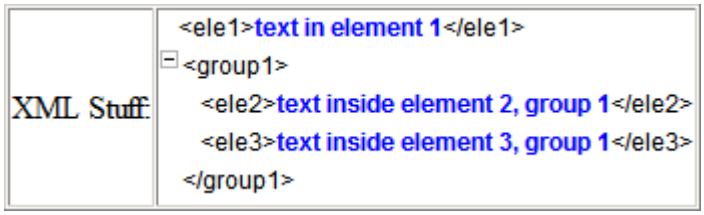

HTML rendered without oraType="xmlString"

XML Stuff:	<ele1>text in element 1</ele1><group1><ele2>text inside element 2, group 1</ele2><ele3>text inside element 3, group 1</ele3></group1>

HTML Formatting

This function is used to display the contents of an element as HTML as opposed to plain text. An element defined as oraType="fkref" is automatically rendered as HTML.

Syntax
`oraType="html"`

> **Warning**
>
> To avoid execution of malicious HTML not all HTML tags are supported. The list of supported tags is defined in the "F1-HTMLWhiteList" managed content definition.
>
> If unsupported HTML is detected the entire element is escaped and rendered as plain text. It is therefore recommended to properly escape any source string that contributes to the final HTML element if it is not expected to contain valid HTML. This way only the offending string is escaped and not the entire element.
>
> If the HTML element is composed in scripting refer to the 'escape' function described in the Edit Data Syntax for more information. Use the WebStringUtilities.asHTML java API for escaping text composed in Java.

```
<html>
<head>
   <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body>
<table summary="" border="0" cellpadding="1" cellspacing="1">
   <tr>
   <td>Info :</td>
   <td><span oraType="html" oraField="info"></span></td>
   </tr>
</table>
</body>
<xml>
<root>
   <info><b>text in bold</b></info>
</root>
</xml>
</html>
```


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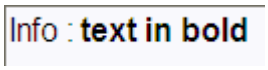
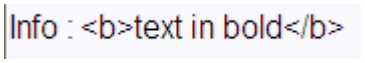
HTML rendered.



HTML rendered without oraType="html"



Display Labels

Derive Label from an Element

This attribute is used to obtain a language sensitive label for a , <td>, or <input> HTML element.

Syntax	Valid Values
`oraLabel=" "`	XPath of an element in the UI map schema. The element must reference either the `mapField=` , `mdField=` , or `label=` attribute.

> **Note**
>
> You can also define a field directly in your HTML for label definition, refer to Deriving Label from a Field for more information.

> **Note**
>
> If the schema contains multiple attributes, the oraLabel attribute will pick the label to render according to the following hierarchy: The label attribute overrides the mdField attribute, which in turn will override the mapField attribute.

- UI Map schema:

```
<schema>
   <user mapField="USER_ID"/>
   <info type="group" mapXML="CLOB">
      <city label="Metro Area"/>
      <age mdField="AGE_LBL"/>
   </info>
</schema>
```

- HTML:

```
<html>
<head><title oraMdLabel="BUS_LBL"></title></head>
<body>
```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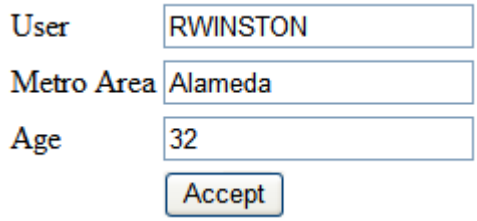
```
<table>
   <tr>
      <td oraLabel="user"></td>
      <td><input oraField="user"/></td>
   </tr>
   <tr>
      <td oraLabel="info/city"></td>
      <td><input oraField="info/city"/></td>
   </tr>
   <tr>
      <td oraLabel="info/age"></td>
      <td><input oraField="info/age"/></td>
   </tr>
   <tr>
      <td/>
      <td><input type="button" oraMdLabel="ACCEPT_LBL"/></td>
   </tr>
</table>
</body>
<xml>
<root>
   <user>RWINSTON</user>
   <info>
      <city>Alameda</city>
      <age>32</age>
   </info>
</root>
</xml>
</html>
```

HTML rendered:



Deriving Label from a Field

This attribute is used to obtain a language sensitive label for a , <td>, <input>, or <title> HTML element. The label text is derived from the field referenced.

Syntax	Valid Values
`oraMdLabel=" "`	MD Field code.

> **Note**
>
> You can also define labels derived from the map's schema definition, refer to Derive Label from an Element for more information.

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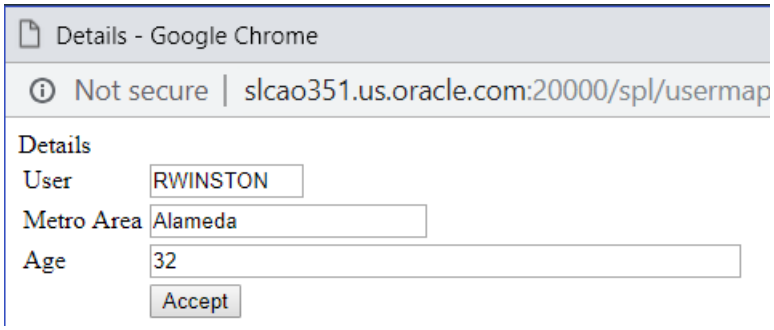
- HTML:

```
<html>
<head><title oraMdLabel="F1_DETAILS_LBL"></title></head>
<body>
<table>
   <tr>
      <td oraLabel="user"></td>
      <td><input oraField="user"/></td>
   </tr>
   <tr>
      <td oraLabel="info/city"></td>
      <td><input oraField="info/city"/></td>
   </tr>
   <tr>
      <td oraLabel="info/age"></td>
      <td><input oraField="info/age"/></td>
   </tr>
   <tr>
      <td/>
      <td><input type="button" oraMdLabel="ACCEPT_LBL"/></td>
   </tr>
</table>
</body>
<xml>
<root>
   <user>RWINSTON</user>
   <info>
      <city>Alameda</city>
      <age>32</age>
   </info>
</root>
</xml>
</html>
```

HTML rendered:



Enable UI Map Help

The Display Labels section describes ways to derive the label for an element using an underlying MD Field. In addition, if the same MD field contains help text, the system will automatically generate a tool tip adjacent to the element label. Clicking the tool tip allows the user to view the help text.

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It is possible to change the rendering of the tool tip. Refer to Custom Look And Feel Options for more information

Search Using a Pop-Up Explorer Zone

Search Option

This attribute is used to enable search zone functionality for input HTML elements.

Syntax	Valid Values
`oraSearch=" "`	Zone code.

> **Note**
>
> The oraSearch attribute is similar to the oraType attribute, because it will be 'automatically' included into HTML via the oraSchemaDataTypes attribute. This means that coding the oraSearch attribute into UI Map HTML is only required if a search zone has not been specified in the schema, or in the schema element's FK reference.

- Example of defining the search in the HTML. UI Map's Schema:

```
<schema>
   <uiMap/>
</schema>
```

UI Map's HTML

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>UI Map with Search </td>
      <td><input oraField="uiMap" oraSearch="F1-UISRCH"></td>
   </tr>
</table>
</body>
<xml>
<root>
   <uiMap/>
</root>
</xml>
</html>
```

- Example of defining the search in the schema. UI Map's Schema:

```
<schema>
   <uiMap search="F1-UISRCH"/>
</schema>
```


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UI Map's HTML

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>UI Map with Search </td>
      <td><input oraField="uiMap"></td>
   </tr>
</table>
</body>
<xml>
<root>
   <uiMap/>
</root>
</xml>
</html>
```

- Example where the FK reference defines the search zone. UI Map's Schema:

```
<schema>
   <uiMap fkRef="F1-UISRC"/>
</schema>
```

UI Map's HTML

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>UI Map with Search </td>
      <td><input oraField="uiMap"></td>
   </tr>
</table>
</body>
<xml>
<root>
   <uiMap/>
</root>
</xml>
</html>
```

In all cases, the HTML rendered is the same.

Initializing Search Fields

This optional attribute is used to initialize search zone filters. Multiple filters may be initialized. This attribute can only be used in conjunction with the oraSearch attribute.

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Syntax	Valid Values	Field Value Options	Comments
`oraSearchField=" "`	One or more pairs of field name and field value separated by colon. Each pair is separated by a semi-colon. `oraSearchField="fieldName:fieldValue: ..."` The field name is used to identify the zone filter to initialize when the search is launched. The field name must match the value of the searchField mnemonic specified on a search zone user filter or hidden filter parameter.	No value	If you do not specify a field value, then the value of the input element containing the oraSearchField attribute will be used.
		XPath	Indicate the XPath to the schema element that contains the value to use.
		'literal'	Indicate a literal value to supply.

> **Note**
>
> If you do not specify an oraSearchField attribute and the schema element has a search enabled fkRef specified, the framework automatically builds an oraSearchField where the field name is equal to the FK reference's key (MD) fields.

> **Warning**
>
> The pop-up explorer zone can be invoked one of two ways: By clicking on the search button, or by hitting the enter key from the field to the left of the button. If you click on the button then no search field information will be passed to the zone. Search field information is only used to initialize zone filter values when enter is pressed.

Two filter values are initialized as shown in the following example:

```
<schema>
   <bo/>
   <uiMap/>
</schema>


<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>UI Map with Search </td>
      <td><input oraField="uiMap" oraSearch="F1-UISRCH"
oraSearchField="MAP_CD; BUS_OBJ_CD:bo;"></td>
    </tr>
</table>
</body>
```


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```
<xml>
<root>
   <bo/>
   <uiMap/>
</root>
</xml>
</html>
```

Mapping Returned Search Fields

This optional attribute is used to direct values returned by the search zone. Multiple fields may be specified. This attribute can only be used in conjunction with the oraSearch attribute.

Syntax	Valid Values	Field Value Options	Comments
`oraSearchOut=" "`	One or more pairs of field name and field value separated by colon. Each pair is separated by a semi-colon. `oraSearchOut="field name:xpath target; ..."` The field name is used to identify the search result returned from the query zone. The field name must match the ELEMENT_NAME mnemonic defined within the explorer zone's search results parameter.	No value XPath	If you do not specify a field value, then the input element containing the oraSearchField attribute receives the returned value. Indicate the XPath to the schema element that should receive the returned value.

> **Note**
>
> If you do not specify an oraSearchOut attribute, the framework will build a default where the field name will be set equal to the oraSearchField's field name.

Two values are returned in the following example:

```
<schema>
   <bo/>
   <mo/>
</schema>


<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
   <tr>
      <td>BO Search </td>
      <td><input oraField="bo" oraSearch="Z1-BOSRCH"
oraSearchOut="BUS_OBJ_CD; MO_CD:mo;"></td>
```


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```
   </tr>
</table>
</body>
<xml>
<root>
   <bo/>
   <mo/>
</root>
</xml>
</html>
```

Display Errors

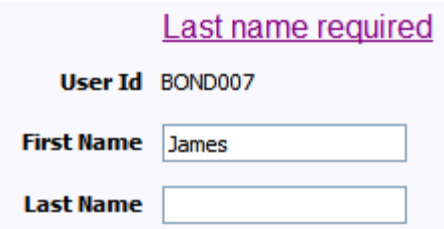
Display Error Variables

One of the following error variables may be displayed.

Syntax
`oraErrorVar="ERRMSG-TEXT"`
`oraErrorVar="ERRMSG-LONG"`
`oraErrorVar="ERRMSG-CATEGORY"`
`oraErrorVar="ERRMSG-NUMBER"`

```
...
<table width="100%" cellpadding="12">
   <tr class="oraErrorText">
      <td>
         <a href="" onclick="oraShowErrorAlert(); return false;">
            <span  class="oraErrorText" oraErrorVar="ERRMSG-TEXT"></span>
         </a>
      </td>
   </tr>
</table>
...
```

HTML rendered



Highlight a Field in Error

> **Note**
>
> For more information on throwing an error, refer to the Terminate Statement in the Edit Data Syntax.

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Syntax	Comments
`oraError="automate :true|false; prefix: "`	Specifying `automate:true` automatically enables highlighting of the element in error when issuing an error. Note that **true** is the default and doesn't need to be specified. Specify `automate:false` to turn off field highlighting. The system uses a match on the element name referenced in the error to the element names in the UI map. If the elements in the schema are within an XPath that may not match what is referenced by the error, use `prefix:XPath` to specify that.

> **Note**
>
> The stylesheet reference cisDisabled must be specified for reference of the oraError style. The stylesheet controls how the field in error will be rendered. If you want to alter the rendering you must override the oraError style.

The following HTML example shows that the elements in the map are defined within a group called **boGroup**. The element name returned by the error will not include this group so in order for the field highlighting to work properly the `prefix:` attribute must indicate the group name.

```
<html>
<head>
   <title>User Zone Input</title>
   <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body oraError="automate:true; prefix:boGroup">
<table width="100%" cellpadding="12">
   <tr class="oraErrorText">
      <td>
         <a href="" onclick="oraShowErrorAlert(); return false;">
            <span  class="oraErrorText" oraErrorVar="ERRMSG-TEXT"></span>
         </a>
      </td>
   </tr>
</table>
<table width="100%" border="0" cellpadding="4">
   <tr style="padding-top:30px;">
      <td align="right" class="label">User Id</td>
      <td>
         <span oraField="boGroup/userId" class="normal"/>
      </td>
   </tr>
   <tr>
      <td align="right" class="label">First Name</td>
      <td>
         <input oraField="boGroup/firstName" class="normal"/>
      </td>
```


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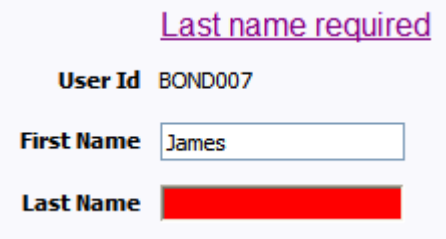
```
   </tr>
   <tr>
      <td align="right" class="label">Last Name</td>
      <td>
         <input oraField="boGroup/lastName" class="normal"/>
      </td>
   </tr>
</table>
</body>
<xml>
<root>
   <boGroup>
      <userId>BOND007</userId>
      <firstName>James</firstName>
      <lastName></lastName>
   </boGroup>
</root>
</xml>
</html>
```

HTML rendered, where the error element thrown is equal to 'lastName':



Overriding the Error Element Name

In the rare occasion where the element name returned by the error doesn't match the element name in the map, you can add an explicit attribute to indicate the error element name.

Syntax	Valid Values	Comments
`oraErrorElement=`	"element name"	The element name referenced here must exactly match the name of the error element assigned when the error was thrown. More than one HTML field can be referenced by the same error element name.

> **Note**
>
> The stylesheet reference cisDisabled must be specified for reference of the oraError style. The stylesheet controls how the field in error will be rendered. If you want to alter the rendering you must override the oraError style.

This illustrates a scenario where the element name associated with the error differs from the element name on the map.

```
<html>
<head>
   <title>User Zone Input</title>
   <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
```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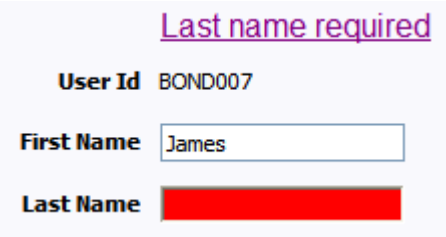
```
</head>
<body>
<table width="100%" cellpadding="12">
   <tr class="oraErrorText">
      <td>
         <a href="" onclick="oraShowErrorAlert(); return false;">
            <span  class="oraErrorText" oraErrorVar="ERRMSG-TEXT"></span>
         </a>
      </td>
   </tr>
</table>
<table width="100%" border="0" cellpadding="4">
   <tr style="padding-top:30px;">
      <td align="right" class="label">User Id</td>
      <td>
         <span oraField="userId" class="normal"/>
      </td>
   </tr>
   <tr>
      <td align="right" class="label">First Name</td>
      <td>
         <input oraField="firstName" class="normal"
oraErrorElement="firstName"/>
      </td>
   </tr>
   <tr>
      <td align="right" class="label">Last Name</td>
      <td>
         <input oraField="familyName" class="normal"
oraErrorElement="lastName"/>
      </td>
   </tr>
</table>
</body>
<xml>
<root>
   <userId>BOND007</userId>
   <firstName>James</firstName>
   <familyName></familyName>
</root>
</xml>
</html>
```

HTML rendered.



Display Error Pop-Up

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When the error text is displayed, this function may be used to pop-up the standard error dialog (which displays more information) when a user clicks the error message.

Syntax

```
oraShowErrorAlert(); return false;
```

```
<html>
<head>
   <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body>
<table width="100%" cellpadding="12">
   <tr class="oraErrorText">
      <td>
         <a href="" onclick="oraShowErrorAlert(); return false;">
            <span  class="oraErrorText" oraErrorVar="ERRMSG-TEXT"></span>
         </a>
      </td>
   </tr>
</table>
<table>
   <tr>
      <td >Address:</td>
      <td><input type="text" oraField="address"/></td>
   </tr>
   <tr>
      <td>City:</td>
      <td><input type="text" oraField="city"/></td>
   </tr>
   <tr>
      <td>State:</td>
      <td><input type="text" oraField="state"/></td>
   </tr>
   <tr>
      <td>Zip:</td>
      <td><input type="text" oraField="zip"/></td>
   </tr>
   <tr>
      <td/>
      <td style="padding-top=15px;">
         <oraInclude map="F1-SaveCancelButtons"/>
      </td>
   </tr>
</table>
</body>
<xml>
<root>
   <address>123 Main St</address>
   <city>Alameda</city>
   <state>CA</state>
   <zip>94770</zip>
</root>
</xml>
</html>
```


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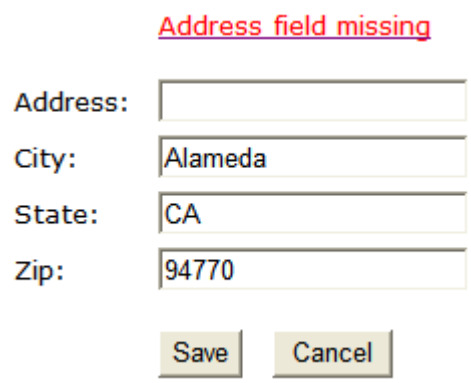
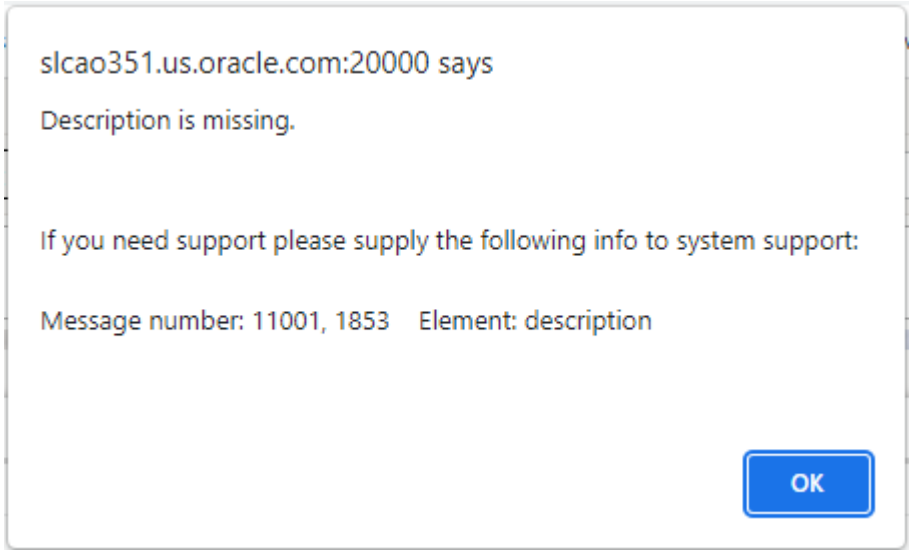
HTML rendered.



Standard error pop-up dialog launched via click on error message:



Fire JavaScript for Browser Events

Working with the JavaScript Framework

There are many JavaScript events that can be used within the HTML/Javascript environment. These include events such as onLoad, onBlur, onChange, etc. The UI Map Framework also makes use of some of these events. It is important that any UI Map you develop works with the framework in order to obtain consistent results (events may not always be executed in the same order at all times!).

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Warning

The following describes the recommended approach for safely handling loading and processing field updates in your UI Maps.

If JavaScript is required within an XHTML UI Map or fragment, it will be necessary to bound it within a `![CDATA[ ]]` tag to ensure a valid XML document. Note that the tags themselves may need to be commented out to promote compatibility with older browsers. For example:

```
<script type="text/javascript">
/* <![CDATA[ */

//
// javascript
//

/* ]]> */

</script>
```

Element Change Event

Syntax	Valid Values
`oraChange=" "`	A JavaScript function.

At the time of UI Map load, if there is an event handler already attached to an HTML element, the framework removes it and attaches a combined event handler. The combined handler calls any **framework handler first** and then calls the other (custom) handlers.

Warning

Note that the function must not be used to execute logic that will modify the associated field data value again - or an endless loop will occur.

In the following example the **oraInvokeBS** function is executed when the button is clicked.

```
<html>
  <head>
    <title>oraInvokeBS test</title>
  </head>
  <body>
    <table>
      <tr>
        <td>User Id:</td>
        <td>
          <input oraField= "xmlGroup/userId"/>
          <input type="button" value="Search"
oraChange="oraInvokeBS('UserSearch','xmlGroup');"/>
```


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```
          </td>
        </tr>
        <tr>
          <td/>
          <td>Search Results</td>
        </tr>
        <tr>
          <td/>
          <td>
            <table oraList="xmlGroup/searchList">
              <tr>
                <td><span oraField="userId"></span>
                </td>
              </tr>
            </table>
          </td>
        </tr>
      </table>
    </body>
    <xml>
      <root>
        <xmlGroup>
          <userId/>
          <searchList>
              <userId></userId>
          </searchList>
        </xmlGroup>
      </root>
    </xml>
</html>
```

Page Load Event

Syntax	Valid Values
`oraLoad=" "`	A JavaScript function.

Warning

When executing oraLoad within a fragment UI map, and you need to execute a JavaScript function during page load (where the function invokes a business object, business service, or service script) you can use the special syntax "`oraLoad[$SEQUENCEID]`". For other special syntax used for map fragments, refer to theConstruct Portal Zone Map Fragments section.

- In the following example, the oraDisplayNone function is executed during page load:

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
    <tr>
        <td oraLoad="oraDisplayNone(item,'userId','')">User Id:
```


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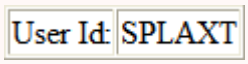
```
    </td>
            <td><span oraField="userId"></span></td>
        </tr>
    </table>
    </body>
    <xml>
    <root>
        <userId>SPLAXT</userId>
    </root>
    </xml>
    </html>
```

- HTML rendered



After Page Load Event

Syntax	Valid Values
`oraAfterLoad=""`	A JavaScript function.

In the following example the oraGetValueFromScript function is executed after page load.

```
<div>
  <label for="boGroup_parameters_externalSystem" oraLabel="boGroup/
parameters/externalSystem">
  </label>
    <span>
      <select oraSelect="bs:F1-RetrieveExternalSystems"
class="oraInput"
        id="boGroup_parameters_externalSystem" oraField="boGroup/
parameters/externalSystem"
        oraSelectOut="valuePath:results/externalSystem;
descPath:results/description"
        oraSelectIn="outboundMsgType:boGroup/parameters/
outboundMsgType"
        oraAfterLoad

="oraGetValueFromScript(document.getElementById('boGroup_parameters_ext
ernalSystem');">
      </select>
    </span>

</div>
```

Hide Elements

Hide Using a Function

The system provides multiple techniques for hiding an HTML element.

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Syntax	Valid Values	Comments
`oraDisplayNone(item );`	(item, 'XPath', 'value', 'operator')	Used to hide an element based on the value of another element (referenced using its XPath). Enter a value of ' ' to interrogate a blank value. By default the operator is `'='`. This may be set instead to another operator such as `'!='`, `'>'`, or `'<'`.
	(item, function name,**true** | **false**)	Used to indicate a JavaScript function, which must return a Boolean.
`oraIsSuppress="true"`		Use this option for fields that need to be hidden always and not dependent on something else. Set this attribute on the HTML element (div element).

- Example where the User Id label is hidden when no User Id value exists.

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
    <tr>
        <td oraLoad="oraDisplayNone(item,'userId','')">User Id: </td>
        <td><span oraField="userId"></span></td>
    </tr>
</table>
</body>
<xml>
<root>
    <userId></userId>
</root>
</xml>
</html>
```

- Example where the Save button is hidden when the user does not have security access to the action of change ('C') for the application service 'F1-DFLTS'.

```
<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
    <tr>
   <td oraLoad="oraDisplayNone(item, oraHasSecurity('F1-DFLTS', 'C'),
false );">
      <input name="Save" type="button" onclick="oraInvokeBO('CM-
IndividualTaxpayer', null, 'replace')"/>
   </td>
    </tr>
</table>
</body>
```


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```
<xml>
<root>
    <userId></userId>
</root>
</xml>
</html>
```

Check User's Security Access

The system provides two functions to check a user's security access to a given application service and access mode. These are commonly used for hiding elements.

Syntax	Parameters
`oraHasSecurity( )`	'Application Service code' 'Access Mode'
`oraHasSecurityPath('x','y')`	'Application Service XPath' 'Access Mode XPath'

See the previous section for an example of the `oraHasSecurity` function. The following shows an example where the status button is hidden when the user does not have security access to the access mode 'ACT' of the application service 'FORMTST'.

```
<html>
<body>
<table>
    <tr>
   <td oraLoad="oraDisplayNone(item, oraHasSecurityPath('appService',
'accessMode'), false );">
      <input oraField="statusLabel" type="button"
onclick="oraRunScript('UpdateState','status');"/>
   </td>
    </tr>
</table>
</body>
<xml>
<root>
    <status>ACTIVATE</status>
<statusLabel>Activate</statusLabel>
<appService>FORMTST</appService>
    <accessMode>ACT</accessMode>
</root>
</xml>
</html>
```

Invoke Schema Based Services

The system provides functions for invoking a business object, business service or service script.

Invoke BO Function

This function is used to perform a BO interaction directly from the UI map's HTML. It returns a 'true' or a 'false' depending on whether the invocation encounters an error.

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Syntax	Parameters	Comments
`oraInvokeBO( )`	'BO Name'	
	'XPath' or **null**	Identifies a group element via XPath. If you specify the word **null**, then the entire embedded XML object will be passed.
	'action'	Indicate the action to use. Valid values are **add**, **delete**, **read**, **update**, **replace**, **fastAdd** and **fastUpdate**.

NOT_SUPPORTED

Refer to BO Actions for more information about the various BO actions.

Example with the statement invoked in a JavaScript function.

```
function invokeBO {
     if (!oraInvokeBO('F1-User','xmlGroup','read')) {
          oraShowErrorAlert();
          return;
}
}
```

Example with the statement invoked within onClick.

```
<input type="button"  class="oraButton" oraMdLabel="DISPLAY_LBL"
onClick="oraInvokeBO('F1-User');"/>
```

Invoke BS Function

This function is used to perform a business service interaction directly from the UI map's HTML. It returns a 'true' or a 'false' depending on whether the invocation encounters an error.

Syntax	Parameters	Comments
`oraInvokeBS( )`	'BS Name'	
	'XPath' or **null**	Identifies a group element via XPath. If you specify the word **null**, then the entire embedded XML object will be passed.

Example with the statement coded within a JavaScript function.

```
function invokeBS {
     if (!oraInvokeBS('F1-UserSearch','xmlGroup')) {
          oraShowErrorAlert();
          return;
  }
}
```


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Example with the statement invoked via onClick.

```
<input type="button"  class="oraButton" oraMdLabel="DISPLAY_LBL"
onClick="oraInvokeBS('F1-RetrieveInfo');"/>
```

Invoke SS Function

This function is used to perform a service script interaction directly from the UI map's HTML. It returns a 'true' or a 'false' depending on whether the invocation encounters an error.

Syntax	Parameters	Comments
`oraInvokeSS( )`	'Service Script Name' 'XPath' or **null**	Identifies a group element via XPath. If you specify the word **null**, then the document belonging to the parent node will be passed. If the parent node is not enough, then the entire document can always be passed using the following syntax: `oraInvokeSS('service script', null, null, [$SEQUENCEID])`

Example with the statement invoked within a JavaScript function:

```
function invokeSS {
     if (!oraInvokeSS('F1-GetUsers','xmlGroup')) {
          oraShowErrorAlert();
          return;
}
}
```

Example with the statement invoked within onClick.

```
<input type="button"  class="oraButton" oraMdLabel="DISPLAY_LBL"
onClick="oraInvokeSS('F1-GetUserInfo');"/>
```

Refresh a Rendered Map or Portal Page

Refresh Map

This function is used to 'Refresh' only the map zone issuing the command.

Syntax
`oraRefreshMap;`

```
...
    <tr>
        <td/>
        <td><input type="button" onclick="oraRefreshMap();"
value="Refresh"/></td>
```


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```
    </tr>
...
```

Refresh Page

This function is used to refresh all zones in the portal.

Syntax
`oraRefreshPage;`

```
...
    <tr>
        <td/>
        <td><input type="button" onclick="oraRefreshPage();"
value="Refresh"/></td>
    </tr>
...
```

Embed Framework Navigation

Navigate using Navigation Option

This function is used to navigate to another page using the information defined on a navigation option.

Syntax	Parameters
`oraNavigate( );`	'Navigation Option code' 'Key XPath'

> **Warning**
>
> This function is only intended for a UI map defined within a portal zone. It should not be used within a UI map launched by a BPA script.

The following example exhibits two possible uses of this function: as a URL and as a button. Note that the UI Map schema must contain a fkRef attribute. Refer to FK Reference Formatting for more information.

```
<schema>
    <userId fkRef="CI_USER"/>
</schema>


<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
    <tr>
       <td>User Link: </td>
       <td><a href="" onclick="oraNavigate('userMaint','userId'); return
false;">
         <span oraField="userId" oraType="fkRef:CI_USER"></span></a>
```


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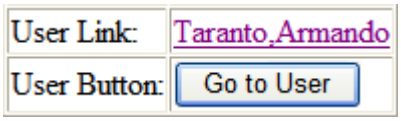
```
      </td>
    </tr>
    <tr>
        <td>User Button: </td>
        <td><input type="submit" onclick="oraNavigate('userMaint','userId')"
          value="Go to User"/></td>
    </tr>
</table>
</body>
<xml>
<root>
    <userId>SPLAXT</userId>
</root>
</xml>
</html>
```

HTML rendered.



Launch a View Details Drawer

Launch a drawer to view additional details for a specific context.

This function is used for a specific element to launch a side panel Drawer to present related extended information. The launched drawer references a panel name defined by the current portal and that may include one or more zones.

A drawer may be launched from a display zone or a row in a data explorer zone.

> **Warning**
>
> This function is only intended for a UI map defined within a portal zone. It should not be used within a UI map launched by a BPA script. Launching a drawer is also not supported from the Sidebar nor the Assistant portals.

Syntax	Parameters in UI Map	Parameters in Data Explorer	Comments
Add the following attribute to an HTML element `viewDetails="..."`	`detailPanelName:LITERAL | x[xpath] | c[CONTEXTNAME];`	`detailPanelName:LITERAL | Cx ;`	You must supply a reference to either a panel name defined for the current portal or a zone that is not defined on the portal.

> **Note**
>
> When referencing a panel name, the

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Syntax	Parameters in UI Map	Parameters in Data Explorer	Comments
	`detailZoneCode:LITERAL | x[xpath] | c[CONTEXTNAME];`	`detailZoneCode:LITERAL | Cx ;`	drawer width is explicitly defined on the portal for that panel. When referencing a zone, drawer width is determined by the zone's width. Use a 1/3 width for a small drawer, a 2/3 width for a medium drawer, and a full width for a large drawer. From a UI map, the panel name or zone may be specified as a literal without any quotes, as an xpath to an element in the schema or a reference to a global or portal context name. From a data explorer column the non-literal reference may be to another column.

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Syntax	Parameters in UI Map	Parameters in Data Explorer	Comments
	`CONTEXTNAME: LITERAL | x[xpath] | c[CONTEXTNAME];` The context name can also be a reference to an element `x[xpath]`	`CONTEXTNAME: LITERAL | Cx;`	Optionally provide values to one or more portal context names that should be set before the drawer is launched. From a UI map, the value may be specified as a literal, an xpath, or a context name. From a data explorer column the non-literal reference may be to another column.
	`showPanelIcon :true|false;`		By default, including the "view details" attribute on an HTML element also renders a designated icon for launching the drawer. When the launching of the drawer should be made from the HTML element itself, use this parameter to request that the icon is not shown. For example, you can turn the icon off when launching the drawer should be from a "View more information" link element.

This attribute can be added to most standard HTML elements (, , etc.) and the new icon, if not disabled, will be presented after the specified element. The following examples shows how to launch a drawer with and without the standard icon and how to provide values of various types.

```
<span oraField="user" id="user" viewDetails="detailPanelName:VIEWDET;
USERID:x[user];"/>
<span oraMdField="MORE_DETAIL" viewDetails="detailPanelName:x[panelName];
showPanelIcon:false; UOM:c[UOM];"/>
<span oraField="user" id="user" viewDetails="detailZoneCode:DETLSZN;
USERID:x[user];"/>
```

Launch a drawer via a function

The system also provides a function **oraViewDetails** that may be used to launch a drawer. This supports cases where the portal name or the context name needs to be derived. It also supports the case where an object may not have a drawer defined. It may be that if a drawer is defined then launch it, otherwise, navigate to a related page. The syntax is the same as the viewDetails syntax for a UI map. Refer to the UI map F1-LaunchDrawer for an example.

Launch BPA Script

Syntax	Parameters	Comments
`oraRunScript( );`	'BPA script code'.	
	'XPath Element'	One or more element values may be passed into the BPA where it may be referenced as temporary variables.

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> **Warning**
>
> This function is only applicable to UI maps displayed in portal zones. UI maps launched within a running BPA script cannot directly launch another BPA script from the UI map's HTML. Instead, return a value from the UI map and execute a Perform Script or Transfer Control step type.

> **Note**
>
> It is incumbent on the script author to pull information out of temporary storage in the initial steps of the script.

In the following example, a temporary variable named 'personId' is created with value '1234567890' and the BPA script named 'Edit Address' is launched.

```
<html>
<body>
<table>
   <tr>
      <td>
         <div oraField="address"></div>
         <span oraField="city"></span>
         <span>,</span>
         <span oraField="state"></span>
         <span oraField="zip"></span>
         <span oraField="country"></span>
         <a href="" onClick="oraRunScript('Edit
Address','personId');">edit</a>
      </td>
   </tr>
</table>
</body>
<xml>
<root>
   <personId>1234567890</personId>
   <address>123 Main St</address>
   <city>Alameda</city>
   <state>CA</state>
   <zip>94770</zip>
</root>
</xml>
</html>
```

HTML rendered.

123 Main St
Alameda, CA 94770 edit

Launch BPA Script With Values

This function is used to launch a BPA, providing name/value pairs to push into temporary storage. Multiple values can be passed. The BPA script can then reference the temporary variables by name.

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Syntax	Parameters	Comments
`oraRunScriptWithValues( );`	'BPA script code'. 'XPath Element Name':value	 One or more pairs of element names and values.

> **Note**
>
> You would use this JavaScript function, instead of oraRunScript, if you need to push values to the BPA script that are not located in the UI Map's XML structure.

In the example below, a JavaScript function named 'editUser()' is responsible for launching the BPA script named 'UserEdit'. The temporary variable named 'userId' will be created with value 'CMURRAY'.

```
<html>
<head>
<script type="text/javascript">

function editUser() {
    var values = {'userId': 'CMURRAY'};
    oraRunScriptWithValues('UserEdit', values);
    return;
}

</script>
</head>
<body>
...
</body>
</html>
```

Exit UI Map with Bound Values

This function is used to exit a UI Map. When you quit the map you can specify a value to return to the script and, in addition, whether to return updated XML.

Syntax	Parameters	Comments
`oraSubmitMap( );`	'Return Value' Boolean value	 Indicates if the updated XML should be returned. Default is **true**.

In the following example, the Save button will return updated information, the Cancel button will not.

```
<html>
<body>
<table>
   <tr>
      <td/>
      <td style="padding-bottom:15px;">
         <a href="" onclick="oraShowErrorAlert(); return false;">
```


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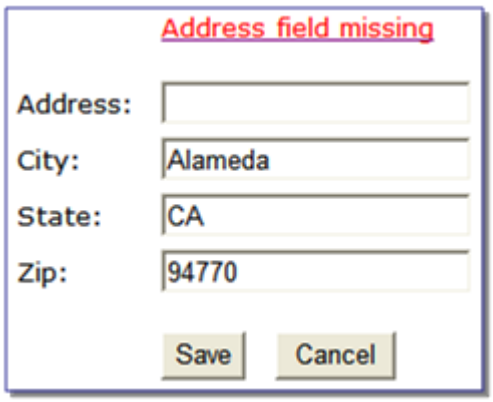
```
         <span oraErrorVar="ERRMSG-TEXT"></span></a>
      </td>
   </tr>
   <tr>
      <td >Address:</td>
      <td><input type="text" oraField="address"/></td>
   </tr>
   <tr>
      <td>City:</td>
      <td><input type="text" oraField="city"/></td>
   </tr>
   <tr>
      <td>State:</td>
      <td><input type="text" oraField="state"/></td>
   </tr>
   <tr>
      <td>Zip:</td>
      <td><input type="text" oraField="zip"/></td>
   </tr>
   <tr>
      <td/>
      <td style="padding-top=15px;">
         <input type="button" value="Save" onClick="oraSubmitMap('SAVE');"/>
         <input type="button" value="Cancel"
onClick="oraSubmitMap('CANCEL',false);"/>
      </td>
   </tr>
</table>
</body>
<xml>
<root>
   <address>123 Main St</address>
   <city>Alameda</city>
   <state>CA</state>
   <zip>94770</zip>
</root>
</xml>
</html>
```

Save and Cancel buttons rendered:



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Include a Map Fragment

This function is used to embed a map fragment within another UI map. Note that it is possible to use the include node within a map or a map fragment.

Syntax	Parameters	Comments
`<oraInclude map=' ' prefixPath=' '/>`	map='UI Map Code' prefixPath='Xpath'	Optionally specify an xpath prefix to be appended onto every included oraField, oraLabel, oraList, oraSelect valuePath and descPath, oraDownloadData, and oraUploadData attribute value defined within the included UI map fragment's HTML.

> **Note**
>
> This functionality only applies to XPath attribute values when those values do not appear beneath an oraList attribute. Any XPath value within a table containing an oraList attribute will not be affected by a prefixPath.

- An example of a map fragment with two buttons, named 'F1-SaveCancelButtons'.

```
<input onClick ="oraSubmitMap('SAVE');" oraMdLabel="SAVE_BTN_LBL"
class="oraButton"
type="button"/>
<input onClick ="oraSubmitMap('CANCEL',false);" oraMdLabel="CANCEL_LBL"
class="oraButton"
type="button"/>
```

- An example of a map that includes the map fragment named 'F1-SaveCancelButtons'.

```
...
<tr>
   <td colspan="2" align="center">
<oraInclude map="F1-SaveCancelButtons"/>
   </td>
</tr>
...
```

Include a Web Component

A web component is a custom HTML element that produces a specific user interface feature. Each supported web component typically has one or more defined HTML attributes that affect how the web component functions and how it appears. The more complex web components may have a corresponding system configuration object that defines the behavior and information displayed by the resulting user interface element. For example the web component

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that produces a "tree" of information has a Tree configuration table, which defines the details about how to retrieve information for the tree and how to display each node.

Common Attributes

Some common attributes that may be used for each web component are:

- A reference to the specific instance of the configuration object that governs the details to produce.
- The ability to pass in context data as name and value pairs.
- A 'mode' that support showing a preview of the feature

Some attributes support a **single value** that is referenced. For these types of attributes, the value may be provided using one of the following references:

- Literal value. The value can be referenced directly. Example:

  ```
  treename="F1-Tree"
  ```

- XPath Reference. XPath references must use the explicit syntax `x[value]`. Example:

  ```
  treename="x[migrationTree]"
  ```

- Global or Portal context reference. These references must use the explicit syntax `c[value]`.

  ```
  treename="c[TREE_NAME]"
  ```

- Field label reference. These references must use the explicit syntax `md[value]`.

  ```
  text=md[F1_ADD_LBL]"
  ```

- Field help text reference. These references must use the explicit syntax `mdh[value]`.

  ```
  text=mdh[F1_OPERATIONS_LBL]"
  ```

For **complex attributes** that support one or more name / value pairs, the syntax for defining the names and values follows the same rules as above for literal values, XPath references and context. Colons (":") should be used to separate the name from the value and semi-colons (";") separate each pair.

```
context="FIELD_NAME1:x[value1];FIELD_NAME2:F1AB;x[fieldName3]:c[FIELD_NAME3];"
```

A given web component may have additional HTML attributes specific to its functionality.

> **Note**
>
> Any UI map that defines a web component must include the F1-OJETLIBSR map fragment within the "body" tag.

```
<body>
<oraInclude map="F1-OJETLIBSR"/>
```


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```
..
</body>
```

> **Note**
>
> Standard HTML attributes may also be provided (e.g ID=".." and style=".."). These are defined as normal. It should be noted that the web components themselves may control some styling aspects directly and thus override any style settings provided on the HTML web component. For example, the Contextual Insights configuration provides settings for text color that would override any color defined in the HTML.

The following sections describe each supported web component.

Trees

Refer to Trees for more information about tree configuration.

Syntax	Parameters	Comments
`<ou-tree...></ou-tree>`	`treename="singleValue"`	You must supply a reference to the name of the tree object that defines the configuration of the tree to display. This attribute expects a single value that follows the syntax described in the single value section above.
	`context="..."`	Optionally pass in one or more name / value pairs. The syntax follows the example shown in the complex attributes information above.

The following example uses an explicit reference to a tree and does not pass any context. The particular tree relies on global context, which the tree node algorithm has access to.

```
<ou-tree treename="C1-PremiseTree"></ou-tree>
```

Contextual Insight

Refer to Contextual Insights for information about the configuration related to defining contextual insights.

Syntax	Parameters	Comments
`<ou-insights ...></ou-insights>`	`insightType="singleValue"`	Use this attribute to specify an insight type to display. Either this attribute or the insight class attribute must be supplied. This attribute expects a single value that follows the syntax described in the single value section above.
	`insightClass="singleValue"`	Use an insight class to display all the insight types for the insight group related to this class. This attribute expects a single value that follows the syntax described in the single value section above.
	`context="..."`	Optionally pass in one or more name / value pairs. The syntax follows the example shown in the complex attributes information above.

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Syntax	Parameters	Comments
	`mode="preview"`	Optionally pass in a mode of **preview** to indicate to the underlying insight algorithm that prepares the data that the insight is being called in preview mode, with no context available. Ideally the algorithm returns sample information.
	`class=" "`	Optionally provide a CSS helper class to control aspects of the rendered insight. Supported values: `class="card-full-width"` - Applicable for card insights. Use this option class to ensure that the width for a card insight adjusts to the width of the zone that contains it. Card insights that don't set this parameter use a fixed width.

The following example is from the insight preview map where the insight type is the one in context. No context data is needed and the mode is 'preview'.

```
<ou-insights insightType="x[insightType]" mode="preview"></ou-insights>
```

The following example uses an insight class and passes in context values from XPath elements with explicitly defined context names.

```
<ou-insights insightClass="C1CI"
context="PER_ID:x[personId];ACCT_ID:x[accountId];PREM_ID:x[premiseId];"></ou-
insights>
```

Visualization Widgets

This web component may be used to render various types of visualization widgets such as cards and badges.

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Syntax	Parameters	Comments
`<ou-visualization .. .></ou-visualization>`	`type="LITERAL | x[xpath]"`	You must specify the type of widget to render. The valid literal values are: • **`badge`** - a non-clickable badge widget • **`card`** - A card provides a quick view on an issue or a task. At a minimum, it includes a primary text describing the highlighted topic. It may also include optional components: secondary and tertiary lines of text, a badge, a over-line text adjacent to the badge, an icon and action buttons. • **`message`**- a message text along with an optional icon. The type may be specified by a reference to an element that contains one of the valid values.

	`color="`
	`badge:x[xpath]|LITERAL;`
	`icon:x[xpath]|LITERAL;"`
		Complex attribute that sets the color option to use for various aspects of the widget.
		Note that the reference is not a color option and not a specific color.
		The **`badge:`** attribute is applicable to a **badge** and a **card**.
		The **`icon:`** attribute is applicable to a **card** and a **message**.

	`imgRef="x[xpath]| LITERAL"`	References an icon defined as a Display Icon. Applicable to a **card** and a **message**.
	`imgSize="x[xpath]| LITERAL"`	May be used to override the standard size of the icon. Valid values are: s (small), m (medium) and l (large). Applicable to a **card** and a **message**.

	`text="`
	`badge:x[xpath]|LITERAL;`
	`overline:x[xpath]| LITERAL;`
	`main:x[xpath]|LITERAL;`
	`secondary:x[xpath]| LITERAL;`
	`tertiary:x[xpath]| LITERAL;`
		Applicable to all types of visualization widgets.
		`badge:` is text to use on a badge.
		`main:` is the main text to use on the widget.
		`secondary:` and `tertiary:` are optional 2nd and 3rd text lines on a **card**.
		`overline:` is text next to the badge on a **card**.

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Syntax	Parameters	Comments
	`actions="x[xpath]"`	This is an xpath reference to a list element describing actions that may be available to the user as part of the widget. Applicable to a **card** widget. The list element must be defined as follows: `<somelist type="list"> <includeDA name="F1-ActionDetails"/> </somelist>`

The following is an example of a badge.

```
<ou-visualization type="badge" text="badge:x[text];"
color="badge:x[colorOption];"></ou-visualization>
```

The following is an example of a card with only a primary text.

```
<ou-visualization type="card" text="main:x[main];"></ou-visualization>
```

The following is an example of a card with more components.

```
<ou-visualization type="card"
text="badge:x[text];main:x[mainText];secondary:x[secondaryText]"
color="badge:x[badgeColor];icon:x[iconColor]" imgRef="x[icon]"
actions:x[actions]></ou-visualization>
```

The following is an example of a message with an icon.

```
<ou-visualization type="message" text="main:x[mainText];"
color="icon:x[iconColor]" imgRef="x[icon]"></ou-visualization>
```

Note the following when designing your actions and populating the actions list:

- An action may be of the following types:
  - Navigate to page. The 'action key' in the action's list entry is the navigation option to navigate to.
  - Launch a BPA script. The 'action key' in the action's list entry is the script to launch.
  - Launch a view details panel in a drawer. The 'action key' is the panel name defined on the current portal.
  - Launch a Knowledge Article. The 'action key' is the knowledge article name as defined in the Knowledge Management Articles extendable lookup.
- Context details may be provided for any action as needed.
- By default, actions are rendered as buttons, except for the action to launch a knowledge article that is rendered as the knowledge book icon.

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- An action may optionally be associated with a role:
  - One action may be set with a **primary** role to highlight it as the main action. This is applicable to redwood view mode only.
  - If the card itself is clickable then one of the actions needs to be set with the **card** role. This action is excluded from the list of buttons.

Knowledge Article

This web component may be used to associate a UI location with a knowledge article.

Refer to Knowledge Articles for information about knowledge article configuration.

Syntax	Parameters	Comments
`<ou-km-link ... ></ou-km-link>`	`kmCode="LITERAL"`	Reference the knowledge article code defined in the **Knowledge Management Articles** extendable lookup.

The following is an example of a knowledge icon added to a UI map.

```
<ou-km-link kmCode="extendableLookupCode"></ou-km-link>
```

Button

The button web component provides support for the standard set of button formats used within the system.

Syntax	Parameters	Comments
`<ou-button...></ou-button>`	`type="singleValue"`	You must define the type of button to display. This attribute expects a single value that follows the syntax described in the single value section above. The valid type values are: • `image` - image only • `text` - text only • `imageText` - image followed by text • `menu` - text plus a dropdown caret to open the menu • `imageMenu` - image plus a dropdown caret to open the menu If no type attribute is supplied, a 'broken button' image will be displayed.
	`img="singleValue"`	Define the path of the image to display. Either this attribute or the image reference attribute must be supplied for a button type that includes an image. This attribute expects a single value that follows the syntax described in the single value section above. Note that for SVG images, if the reference includes only the SVG file name with no path, the path is assumed to be the Framework SVG repository.

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Syntax	Parameters	Comments
	`imgRef=”singleValue”`	Define the display icon reference of the image to be used. Either this attribute or the image attribute must be supplied for a button type that includes an image. This attribute expects a single value that follows the syntax described in the single value section above.
	`text="..."`	Define the various text elements needed by the button. The syntax follows the example shown in the complex attributes information above. The valid text element name values are: • `label` - the label text to be used for the button • `tooltip` - the hover text to be used for the button • `aria-label` - the ARIA label for the button
	`menu=”singleValue”`	Define the menu to be used with the button. This attribute must be supplied for a button type that includes a menu control. This attribute expects a single value that follows the syntax described in the single value section above.
	`disabled=”singleValue”`	This is a standard HTML attribute. A value of "true" or just the presence of the text "disabled" will result in an initially disabled button.
	`security="..."`	Optionally define the security settings for the button. The button will be hidden if the user does not have the appropriate security access. The syntax follows the example shown in the complex attributes information above. The valid security element name values are: • `service` - the application service whose security access governs access to the button • `accessMode` - the specific access mode for the service that determines a more granular level of access to the button

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Syntax	Parameters	Comments
	`clickAction="..."`	Optionally define the action to be taken when the button is ‘clicked’. The syntax follows the example shown in the complex attributes information above. There are specific ‘name’ values for the attribute as follows: • `action` - the action to be taken. Valid values are ‘BPA’ and ‘NAVIGATE’ • `script` - the script to be performed when the action is ‘BPA’ • `navopt` - the navigation option to be used when the action is ‘NAVIGATE’ The attribute may also include other name/value pairs that define information to be passed into the script or used as navigation context fields. In addition to the security attribute settings, the system will check that the user has access to the script or navigation path before performing the action. The standard HTML ‘onClick’ attribute may still be used. if the HTML includes an ‘onClick’attribute as well as the ‘clickAction’, the ‘onClick’ attribute will take precedence

The following is an example of a simple button with text.

```
<ou-button type="text" text="label:md[F1_BOOKMARK_LBL];"></ou-button>
```

The following is an example of an icon button using a display icon.

```
<ou-button type="image" imgRef="F1CMNT"></ou-button>
```

The following is an example of an image menu button.

```
<ou-button type="imageMenu" imgRef="F1STTGS" menu="CI_CONTEXTSCRIPT"
text="tooltip:md[F1INSTY_VIS_LBL];></ou-button>
```

The following is an example of text button that navigates to another page.

```
<ou-button type="text" text="label:md[ALG_CD];tooltip:md[GOTO_ALG]"
clickAction="action:NAVIGATE; navopt:f1algqTabMenu; ALG_CD:x[algorithm];></ou-
button>
```

Decorator

The decorator web component may be used to render an icon for decoration purposes only. This is not an actionable item.

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Syntax	Parameters	Comments
<ou-decorator...></ou-decorator>	img=”singleValue”	Refer to ou-button syntax.
	imgRef=”singleValue”	Refer to ou-button syntax.

The following is an example of a decorator icon using a display icon.

```
<ou-decorator imgRef="F1CMNT"></ou-decorator
```

Show Schema Default on Add

Default values within in the UI map's schema will be displayed on a UI map's input fields if an embedded <action> node has a value of 'ADD' or blank.

Syntax
<action>ADD</action>
<action> </action>

The schema default for the <description> element will be displayed:

```
<schema>
    <action/>
    <boGroup type="group">
        <key/>
        <description default="enter description here"/>
    </boGroup>
</schema>


<html>
<body>
<table summary="" border="1" cellpadding="1" cellspacing="1">
    <tr>
        <td>Description   </td>
        <td><input oraField="boGroup/description"></td>
    </tr>
</table>
</body>
<xml>
<root>
    <action>ADD</action>
    <boGroup>
        <key/>
        <description/>
    </boGroup>
</root>
</xml>
</html>
```

HTML rendered.

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Configure a Chart

In addition to integrating charts with zones, the system supports using the same attributes within the UI Map HTML to configure a graphical representation of an XML list. The designer can control the type, size, position, and contents of the chart using these attributes. For details of the attributes and syntax, refer to Data Explorer Graph Configuration.

Graph Examples

- Sample of a pie chart configuration:

```
<html>
<head>
<title>Pie Chart</title>
</head>
<body>

<div style="width:100%; height:290px;"
    oraChart="type:pie;"
    oraChartSeries1="list:set; labelPath:date; amount:amount; "
    oraChartBroadcast="BILL_ID:billId;">
</div>

</body>

<xml>
<root>
  <set>
<date>05-02-2003</date>
<amount>163.24</amount>
<billId>592211649441</billId>
  </set>
  <set>
<date>06-02-2003</date>
<amount>97.29</amount>
<billId>592211649442</billId>
  </set>
  <set>
<date>07-02-2003</date>
<amount>54.38</amount>
<billId>592211649443</billId>
  </set>
</root>
</xml>
</html>
```

- A pie chart rendered for a single series:

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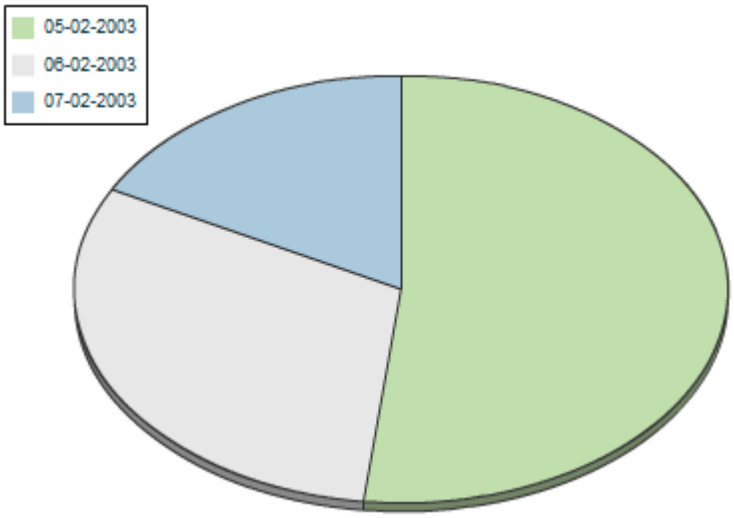

- Sample of a line, cluster, or stacked graph configuration - each with two series:

```
<html>
<head>
<title>Stacked Chart</title>
</head>
<body>

<div style="width:100%; height=300px;"
    oraChart="type:line;"
oraChartSeries1="list:set; xaxis:date; label:Charge; amount:amount; "
oraChartSeries2="list:set; xaxis:date; label:Balance; amount:balance; "
    oraChartBroadcast="BILL_ID:billId;">
</div>

<div style="width:100%; height=300px;"
oraChart="type:cluster;"
oraChartSeries1="list:set; xaxis:date; label:Charge; amount:amount; "
oraChartSeries2="list:set; xaxis:date; label:Balance; amount:balance; "
oraChartBroadcast="BILL_ID:billId;">
</div>

<div style="width:100%; height=300px;"
oraChart="type:stacked;"
oraChartSeries1="list:set; xaxis:date; label:Charge; amount:amount; "
oraChartSeries2="list:set; xaxis:date; label:Balance; amount:balance; "
oraChartBroadcast="BILL_ID:billId;">
</div>

</body>

<xml>
<root>
  <set>
<date>05-02-2003</date>
<amount>163.24</amount>
<balance>163.24</balance>
<billId>592211649441</billId>
```


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```
  </set>
  <set>
<date>06-02-2003</date>
<amount>97.29</amount>
<balance>260.53</balance>
<billId>592211649442</billId>
  </set>
  <set>
<date>07-02-2003</date>
<amount>54.38</amount>
<balance>314.91</balance>
<billId>592211649443</billId>
  </set>
</root>
</xml>
</html>
```

- Three types of chart rendered for two series each: line, cluster, and stacked.

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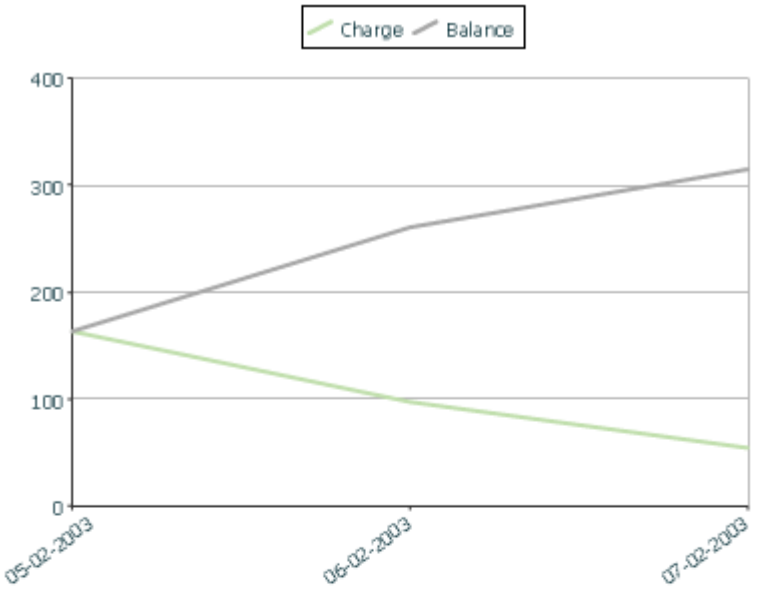

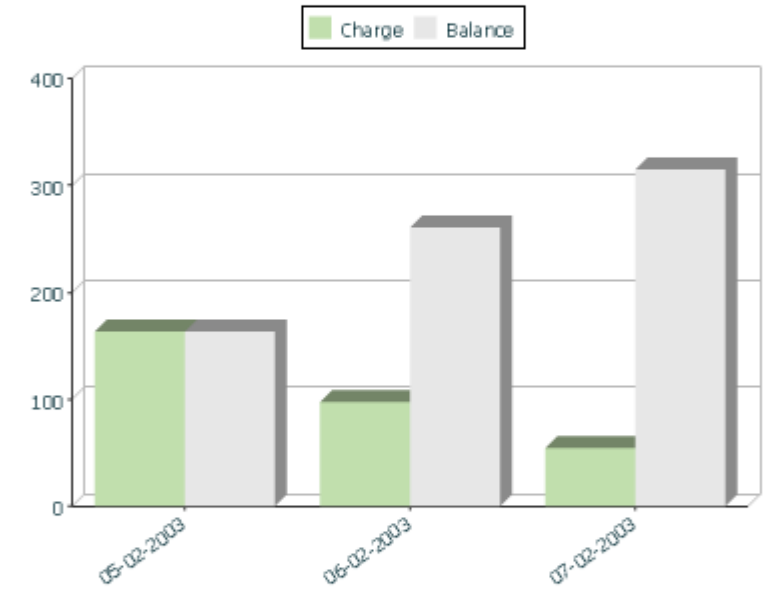

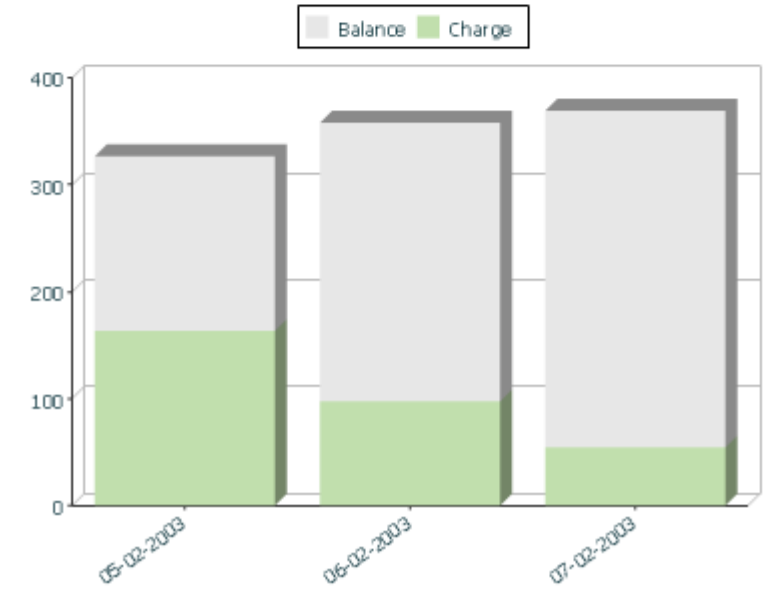

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Upload and Download a CSV File

The following HTML attributes can be used to manage both an upload and a download between a list defined within the map's schema and a CSV (comma separated value) file. Note that this technique is only recommended for a small to medium volume of data, for example no more than several hundred rows. For higher volumes, it is recommended to use batch upload / download functionality instead.

The syntax is `oraUploadData="type:embed;path:list xpath;useLabels:true;showCount:true"`

Upload configuration requires you to name a CSV file to be uploaded, and an XML list as target. By convention, each CSV row will create a separate list instance. Each comma-separated field in the file will be uploaded as a separate element in the list. To embed an upload dialog within a map, the **oraUploadData** attribute must be associated with a container element such as a div, td, or span.

The optional `useLabels:true` value indicates that while parsing the upload CSV file, the headers are expected to be labels

> **Note**
>
> If you do not specify the `useLabels:true` value and the XML target element name is "camelCase" then the corresponding spreadsheet header should be title case with a space between words, e.g.;"Camel Case". Letters and special characters are not considered a different word, for example Address1 must be uploaded into the target XML element address1.

Specifying the optional `showCount:true` value will display the number of records uploaded.

> **Caution**
>
> If you are using a grid in conjunction with the **oraUploadData** function, then you must maintain the grid's list with a 'replace' business object action. Refer to BO Replace Action for more information.

Sample of `oraUploadData="embed"` within a div element.

```
<html>
<head>
    <title>File Upload</title>
</head>
<body>

    <div oraUploadData="type:embed;path:myList"> </div>

</body>

<xml>
<root>
    <myList>
<id>838383930</id>
        <name>Janice Smith</name>
```


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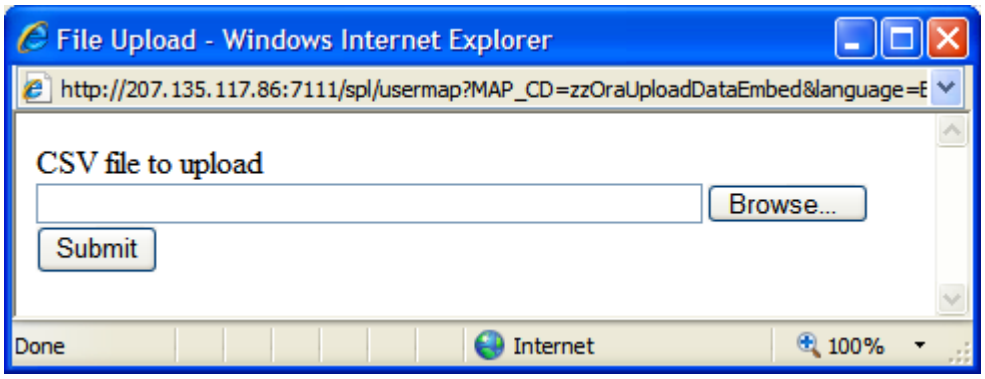
```
    </myList>
    <myList>
<id>737773730</id>
        <name>Bill McCollum</name>
    </myList>
</root>
</xml>
</html>
```

This file upload dialog will be embedded into the body of the page where the oraUploadData is defined.



oraUploadData="type:popup;path:list xpath;useLabels:true;showOk:true;showCount:true"

Upload configuration requires you to name a CSV file to be uploaded, and an XML list as target. By convention, each CSV row will create a separate list instance. Each comma-separated field in the file will be uploaded as a separate element in the list. To upload a CSV file using a pop-up dialog, the oraUploadData attribute must be associated with an input element such as a button, text link, or image.

The optional useLabels:true value is used to indicate that while parsing the upload CSV file, the headers are expected to be labels

> **Note**
>
> If you do not specify the useLabels:true value and the XML target element name is "camelCase" then the corresponding spreadsheet header should be title case with a space between words, e.g., "Camel Case". Letters and special characters are not considered a different word, for example Address1 must be uploaded into the target XML element address1.

Specifying the optional showOk:true value will display an "Ok" button once the upload finishes. The popup will stay open until the button is pressed. Additionally, specifying the showCount:true value will display number of records uploaded.

> **Caution**
>
> If you are using a grid in conjunction with the **oraUploadData** function, then you must maintain the grid's list with a 'replace' business object action. Refer to BO Replace Action for more information.

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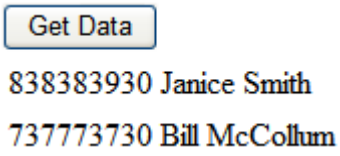
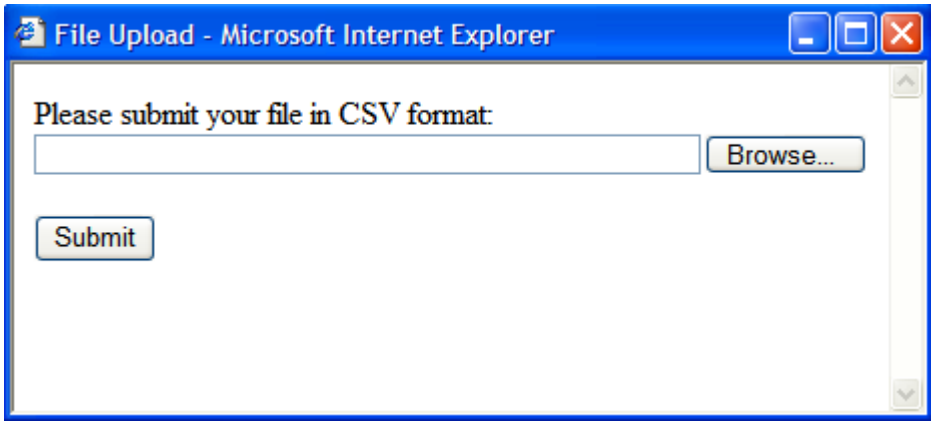
Sample of oraUploadData="popup" associated with a button:

```
<html>
<head>
    <title>File Upload</title>
</head>
<body>
   <input type="button" name="submitButton"
oraUploadData="type:popup;path:myList;" value='Get Data'>
   <table oraList="myList">
      <tr/>
      <tr>
         <td><span oraField="id"/></td>
         <td><span oraField="name"/></td>
      </tr>
   </table>
</body>
<xml>
<root>
   <myList>
      <id>838383930</id>
      <name>Janice Smith</name>
   </myList>
   <myList>
      <id>737773730</id>
      <name>Bill McCollum</name>
   </myList>
</root>
</xml>
</html>
```

HTML Rendered:



Pressing the "Get Data" button will launch a standard file upload dialogue (provided by Framework) as shown below.



oraDownloadData="list xpath"

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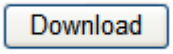
Download configuration requires you to name an XML list to be downloaded. By convention, each list instance will represent a separate row in the created file. By default every element of the list will be comma separated in the file.

> **Note**
>
> The number formatting is based on the user profile setting. For localities where the decimal symbol is a comma, an implementation may configure a property setting (spl.csv.delimiter.useFromDisplayProfile=true) to cause the system to use a semicolon as the delimiter that separates the elements rather than a comma.

Sample of oraDownloadData.

```
<html>
<head>
<title>File Download</title></head>
<body>
<input type="button" name="downloadButton" oraDownloadData="myList"
value="Download"/>
</body>
<xml>
<root>
   <myList>
      <id>881-990987</id>
      <name>John Mayweather</name>
   </myList>
   <myList>
      <id>229-765467</id>
      <name>Anna Mayweather</name>
   </myList>
   <myList>
      <id>943-890432</id>
      <name>Andrew Brewster</name>
   </myList>
</root>
</xml>
</html>
```

HTML Rendered:



Pressing the "Download" button will launch a standard file download dialogue (provided by Framework) as shown below.

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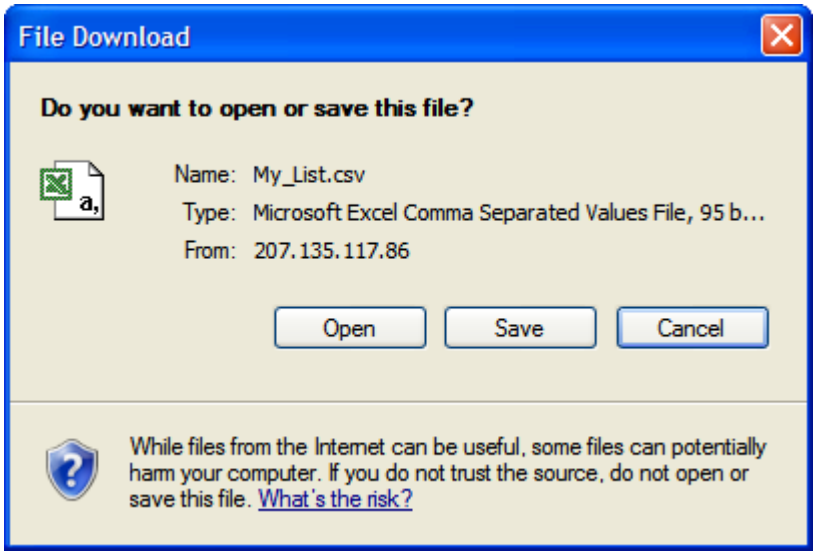
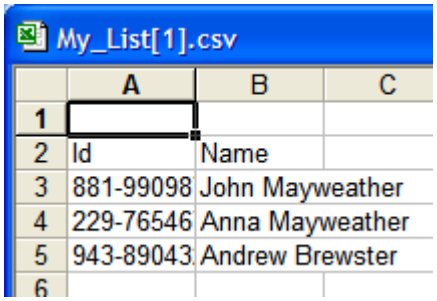


A successful download will result in a CSV file:



To download data from a sub list use the attribute oraDownloadDataInList instead of oraDownloadData. The attribute oraDownloadDataInList will have the sub list name. The XPath of the sub list is used to pick data of the specific row from the parent list. Thus only the specific sub list is downloaded.

oraDownloadDataUseLabels="true"

The oraDownloadDataUseLabels attribute can be used in conjunction with the oraDownloadData attribute described above. Specify oraDownloadDataUseLabels if you want the generated CSV file to use the element labels for columns headers rather than element names.

Construct Portal Zone Map Fragments

Portal zones can reference a UI map for the filter area. This UI map is not a complete HTML document, but is instead configured as a UI Map fragment. When constructing a zone map fragment you can reference the following substitution variables. Note that these variables will be dynamically populated at run time with information particular to the map's zone within the portal:

Variable	Replacement Logic
[$ZONEDESCRIPTION]	Zone's description text.
[$SEQUENCEID]	Zone's sequence ID.
[$ZONENAME]	Zone's name.
[$HELPTEXT]	Zone's help text.

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[$ZONEPARAMNAME]	Zone parameter's value (or blank if it has not been specified).

Warning

- These maps make use of the oraInclude tag to incorporate HTML fragments for the framework actions. Refer to the zone type parameters for the UI Map fragments you should include in your HTML.
- If you wish to have the "help text" icon appear next to your zone description, you should have id="title_[$SEQUENCEID]" on the <td> that contains your description.
- If it is necessary to encapsulate JavaScript within a UI Map fragment, it will be necessary to bound the JavaScript within a `![CDATA[ ]]` tag to ensure a valid XML document. Note that the tags themselves may need to be commented out to promote compatibility with older browsers. For example:

```
<script type="text/javascript">

/*<![CDATA[ */

//
//javascript
//
/*]]> */
</script>
```

Note

If you wish to preserve the values of a filter input field, within a filter map fragment, for the framework 'Go Back' and 'Go Forward' functionality, you must associate the input field (text box, select, etc.) with a unique HTML id. Input field values associated with a unique id will be captured in the framework's 'memento'. The 'memento' is used to rebuild the input map when the portal zone is navigated to using the 'Go Back' or 'Go Forward' functionality.

Note

Many specialized functions exist to manipulate zone behavior, for example:

- `oraGetZoneSequence(zoneName)`. Uses the zone's code to retrieve its sequence number.
- `oraIsZoneCollapsed(sequenceId)`. Uses the zone's sequence to determine if collapsed.
- `oraHandleCollapse(seq)`. Collapse a zone.
- `oraHandleExpand(seq,refresh)`. Expand and/or refresh a zone.

All of these, and many more functions, are located within the JavaScript library userMapSupport.js described below.

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> **Note**
>
> When executing oraLoad within a fragment UI map, and you need to execute a JavaScript function during page load (where the function invokes a business object, business service, or service script) you can use the special syntax "oraLoad[$SEQUENCEID]". Refer to the Load Page Event section for more information.

Example of oraLoad[$SEQUENCEID] used within a function:

```
<script type="text/javascript">
function oraLoad[$SEQUENCEID]() {
checkRebateClaimStatus();
}

function checkRebateClaimStatus() {
    var work = id(''analyticsFilterText[$SEQUENCEID]'',
document).cells[0].innerText.split('' '');
    var rebateClaimId = work[work.length - 3];
    id(''rebateClaimId'', document).value = rebateClaimId;
oraInvokeSS(''C1-CheckRCSt'',''checkRebateClaimStatus'', false);
    var statusIndicator = id(''statusInd'', document).value;
    if (statusIndicator == ''C1PE'' || statusIndicator == ''C1ID'') {
       id(''addRebateClaimLine'', document).style.display = '''';
    } else {
id(''addRebateClaimLine'', document).style.display = ''none'';
    }
}
</script>
```

Invoking a Business Object

The oraInvokeBO function may be used within a zone filter map. It is similar to the command described in Invoke BO Function which allows for a business object to be invoked within the UI map's HTML. Refer to that section for a description of the first three parameters.

Syntax	Parameters	Comments
`oraInvokeBO( )`	'BO Name' 'XPath' or **null** 'action'	
	`null`	This must be specified as the fourth argument.
	`[$SEQUENCEID]`	This must be specified as the fifth argument.
	`false`	Specify `false`. The 'true' option is no longer applicable.

Example:

```
oraInvokeBO('CM-User','xmlGroup','read', null, [$SEQUENCEID], false)
```

Invoking a Business Service

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The oraInvokeBS function may be used within a zone filter map. It is similar to the command described in Invoke BS Function which allows for a business service to be invoked within the UI map's HTML. Refer to that section for a description of the first two parameters.

Syntax	Parameters	Comments
`oraInvokeBS( )`	'BO Name'	
	'XPath' or **null**	
	`null`	This must be specified as the fourth argument.
	`[$SEQUENCEID]`	This must be specified as the fifth argument.
	`false`	Specify `false`. The 'true' option is no longer applicable.

Example:

```
oraInvokeBS('CM-UserSearch','xmlGroup', null, [$SEQUENCEID], false)
```

Invoking a Service Script

The oraInvokeSS function may be used within a zone filter map. It is similar to the command described in Invoke SS Function which allows for a service script to be invoked within the UI map's HTML. Refer to that section for a description of the first two parameters.

Syntax	Parameters	Comments
`oraInvokeSS( )`	'Service Script Name'	
	'XPath' or **null**	
	`null`	This must be specified as the fourth argument.
	`[$SEQUENCEID]`	This must be specified as the fifth argument.
	`false`	Specify `false`. The 'true' option is no longer applicable.

Example:

```
oraInvokeSS('UserSearch','xmlGroup', null, [$SEQUENCEID], false)
```

Detecting Unsaved Changes

Use this function to return a Boolean set to true if there are unsaved changes. The system will interrogate the function when the user attempts to navigate and issue a warning accordingly. This function is only needed if a UI map is using custom javascript to manage elements such that the system is not able to detect whether changes have been made. Also note that it's the responsibility of the UI map javascript to manage the values in the Boolean used for this function.

```
function hasUnsavedChanges(){
       return isDirtyFlag;
   }
```

Hiding Portal Tabs

The product provides the ability to use JavaScript to hide a tab on the current portal based on some condition using the oraAuthorizeTab JavaScript API. This API accepts a function as a parameter and turns off the tab index indicated.

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For example, the UI Map may have a function to turn off one or more tab indexes.:

```
function overrideTabIndex(index){
    if (index == 2) return false;
    if (index == 3) return false;
  }
```

The JavaScript is referenced “on load”:

```
<body class="oraZoneMap"
onLoad="oraAuthorizeTab(overrideTabIndex);">
```

Required JavaScript Libraries

All of the functionality described in this document depends on a pair of JavaScript libraries. If you are writing and executing your maps entirely within the UI map rendering framework - you do not need to manually insert the following libraries - the framework will insert them for you when the UI Map is rendered.

> **Warning**
>
> When executing HTML outside of the framework you must include the following references explicitly within your HTML. In addition, the tool you use to render the HTML must have access to a physical copy of privateUserMapSupport.js for bind support.

```
src="privateUserMapSupport.js"
```

Your HTML document must reference this library to execute binding in a stand-alone environment.

> **Warning**
>
> Referencing functions within this JavaScript library is dangerous - because these functions are owned by framework and they may be changed during version upgrade or via the normal patch process.

```
<script type="text/javascript" src="privateUserMapSupport.js"></script>
```

```
src="userMapSupport.js"
```

To take advantage of optional toolset features, you must reference this library.

> **Note**
>
> You can reference the functions within this JavaScript library to write custom functions within the UI map..

```
<script type="text/javascript" src="userMapSupport.js"></script>
```


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```
onload="oraInitializeUserMap();"
```

To execute binding in a stand-alone environment, you must embed the following onload function into the <body> node.

```
<body onload="oraInitializeUserMap();">
```

UI Map Standards

Basic UI Map Templates

All UI Maps share the same basic structure regardless of placement (page area, zone, pop-up) or usage (display only, input).

Sample XML

All information in this document is based upon the following XML structure.

```
<xml>
    <root>
        <address>123 Main St</address>
        <city>Alameda</city>
        <state>CA</state>
        <zip>94770</zip>
        <contactInformation>
            <type>Home Phone</type>
            <number>510-555-2287</number>
        </contactInformation>
        <contactInformation>
            <type>Cell Phone</type>
            <number>510-555-4285</number>
        </contactInformation>
    </root>
</xml>
```

Display Only UI Map

```
<html>
<head>
    <title oraMdLabel="ADDRESS_LBL"></title>
    <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body class="oraZoneMap">
<table cellspacing="4" width="100%">
    <colgroup>
        <col class="oraLabel oraTableLabel" />
        <col class="oraNormal oraTableData" />
    </colgroup>
    <tr>
        <td oraLabel="address"></td>
        <td oraField="address"></td>
    </tr>
    <tr>
        <td oraLabel="city"></td>
        <td oraField="city"></td>
```


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```
    </tr>
    <tr>
        <td oraLabel="state"></td>
        <td oraField="state"></td>
    </tr>
    <tr>
        <td class="oraSectionEnd" oraLabel="zip"></td>
        <td class="oraSectionEnd" oraField="zip"></td>
    </tr>
    <tr>
        <td colspan="2" class="oraSectionHeader"
oraMdLabel="CONTACT_LBL"></td>
    </tr>
    <tr>
        <td colspan="2" class="oraSectionStart oraEmbeddedTable">
            <table oraList="contactInformation" cellspacing="2">
                <thead >
                    <tr>
                        <th class="oraGridColumnHeader" nowrap="nowrap">
                            <span oraLabel="contactInformation/type></span>
                        </th>
                        <th class="oraGridColumnHeader" nowrap="nowrap">
                            <span oraLabel="contactInformation/number"></span>
                        </th>
                    </tr>
                </thead >
                <tbody>
                    <tr>
                        <td class="oraNormalAlt oraDisplayCell">
                            <span oraField="type"></span>
                        </td>
                        <td class="oraNormal oraDisplayCell">
                            <span oraField="number"></span>
                        </td>
                    </tr>
                </tbody>
            </table>
        </td>
    </tr>
</table>
</body>
<xml>
    <root>
        <address>123 Main St</address>
        <city>Alameda</city>
        <state>CA</state>
        <zip>94770</zip>
        <contactInformation>
            <type>Home Phone</type>
            <number>510-555-2287</number>
        </contactInformation>
        <contactInformation>
            <type>Cell Phone</type>
            <number>510-555-4285</number>
        </contactInformation>
    </root>
```


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```
</xml>
</html>
```

Input UI Map

```
<html>
<head>
    <title oraMdLabel="ADDRESS_LBL"></title>
    <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
</head>
<body>
<table width="100%" cellpadding="12">
  <tr class="oraErrorText">
    <td><a href="" onclick="oraShowErrorAlert(); return false;">
      <span  class="oraErrorText" oraErrorVar="ERRMSG-TEXT"></span></a>
    </td>
  </tr>
</table>
<table cellspacing="4" width="100%">
    <colgroup>
        <col class="oraLabel oraTableLabel" />
        <col class="oraNormal oraTableData" />
    </colgroup>
    <tr>
        <td oraLabel="address"></td>
        <td><input type="text" oraField="address"/></td>
    </tr>
    <tr>
        <td oraLabel="city"></td>
        <td><input type="text" oraField="city"/></td>
    </tr>
    <tr>
        <td oraLabel="state"></td>
        <td><input type="text" oraField="state"/></td>
    </tr>
    <tr>
        <td oraLabel="zip"></td>
        <td><input type="text" oraField="zip"/></td>
    </tr>
    <tr>
        <td colspan="2" class="oraSectionHeader"
oraMdLabel="CONTACT_LBL"></td>
    </tr>
    <tr>
        <td colspan="2" class="oraSectionStart oraEmbeddedTable">
            <table oraList="contactInformation" cellspacing="2">
                <thead >
                    <tr>
                        <th class="oraGridColumnHeaderButton"></th>
                        <th class="oraGridColumnHeaderButton"></th>
                        <th class="oraGridColumnHeader" nowrap="nowrap">
                            <span oraLabel="contactInformation/type></span>
                        </th>
                        <th class="oraGridColumnHeader" nowrap="nowrap">
                            <span oraLabel="contactInformation/number"></span>
```


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```
                        </th>
                    </tr>
                </thead >
                <tbody>
                    <tr>
                        <td oraType="addGridRow"></td>
                        <td oraType="deleteGridRow"></td>
                        <td>
                            <input type="text" oraField="type"/>
                        </td>
                        <td>
                            <input type="text" oraField="number"/>
                        </td>
                    </tr>
                </tbody>
            </table>
        </td>
    </tr>
    <tr>
      <td colspan="2" class="oraSectionStart oraEmbeddedTable">
        <table cellspacing="2">
          <tr>
            <td>
              <input class="oraButton" oraMdLabel="C1_SAVE_LBL" type="button"
                onClick="oraSubmitMap('OK');"/>
            </td>
            <td>
              <input class="oraButton" oraMdLabel="CANCEL_LBL" type="button"
               onClick="oraSubmitMap('CANCEL',false);"/>
            </td>
          </tr>
        </table>
      </td>
    </tr>
</table>
</body>
<xml>
    <root>
        <address>123 Main St</address>
        <city>Alameda</city>
        <state>CA</state>
        <zip>94770</zip>
        <contactInformation>
            <type>Home Phone</type>
            <number>510-555-2287</number>
        </contactInformation>
        <contactInformation>
            <type>Cell Phone</type>
            <number>510-555-4285</number>
        </contactInformation>
    </root>
</xml>
</html>
```


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Basic HTML and Styles

The basic templates introduced the standard HTML and styles used for UI Maps. These standards are described individually in the following sections.

Stylesheets

The styles to apply the standard look to the maps are all contained in stylesheets. These stylesheets should be included in all UI Maps.

```
...
            <link rel="stylesheet" type="text/css" href="cisDisabled.css"/>
...
```

Title

Each UI Map should have a <title> tag.

```
...
            <title oraMdLabel="ADDRESS_LBL"></title>
...
```

This will give the UI Map a descriptive title.

- If the UI Map is presented in a "pop-up", the title will be in the window title bar.
- If the UI Map is presented in the page area, the title will be added as a tag to the UI Map and will appear at the top of the UI Map.
- If the UI Map is presented as a zone map, it will be ignored. The <title> tag should still be included in the HTML as standard.

Zone Maps

When the map is presented in a zone as part of a portal, the UI Map should have a border so that the information is "contained" within the zone.

```
...
            <body class="oraZoneMap">
...
```

Page Area Maps vs Pop-Up Maps

The presentation of the UI Maps can vary from design to design. The following standards have been applied to decide when to use a Page Area UI Map and when to use a Pop-Up Map:

- If there are multiple UI Maps in the sequence, always use the Page Area.
- If the UI Map has many input fields, always use a Page Area.
- If the UI Map is a "confirmation" type dialog or only has one or two input fields, use a Pop-Up.

> **Note**
>
> The difference between "just a few input fields" and "many input fields" can be discretionary. The final decision should rest with the dialog designer.

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Error Messages

Input maps have a ability to present error messages to the User.

```
...
<table width="100%" cellpadding="12">
     <tr class="oraErrorText">
         <td><a href="" onclick="oraShowErrorAlert(); return false;">
        <span class="oraErrorText" oraErrorVar="ERRMSG-TEXT"></span></a></td>
     </tr>
</table>
...
```

This HTML structure provides the provides the necessary elements and functions to display errors to the User. It should be directly after the <body> tag. When there is no error, nothing will be visible on the UI Map. It will be made visible if an error occurs and the UI Map is re-presented to the User. Clicking on the link (when visible) will result in a pop-up alert appearing with the long error message text.

Standard Layout and Styles

The information is presented on the UI Map by using a <table> to organize the information in rows and columns.

```
...
<table cellspacing="4" width="100%">
<colgroup>
<col class="oraLabel oraTableLabel" />
             <col class="oraNormal oraTableData" />
             </colgroup>
...
```

The <colgroup> and <col> tags allow for the application of classes to the columns (the label is in the first column and the data is in the second column.). Using these tags mean that the class attribute (to apply styles) does not need to be defined on every <td>.

Grids (Tables of Data)

A UI Map could contain information that is best presented as a grid. These are referred to as "Embedded Tables". The embedded table can be used to display information or input information.

Example Embedded Table HTML

The embedded table will be included within a row (<tr>) of the basic layout:

```
...
<tr>
    <td colspan="2" class="oraEmbeddedTable">
        <table oraList="contactInformation" cellspacing="2">
            <thead >
                <tr>
                    <th class="oraGridColumnHeader" nowrap="nowrap">
                        <span oraLabel="contactInformation/type></span>
                    </th>
                    <th class="oraGridColumnHeader" nowrap="nowrap">
                        <span oraLabel="contactInformation/number"></span>
```


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```
                    </th>
                </tr>
            </thead >
            <tbody>
                <tr>
                    <td class="oraNormalAlt oraDisplayCell">
                        <span oraField="type"></span>
                    </td>
                    <td class="oraNormal oraDisplayCell">
                        <span oraField="number"></span>
                    </td>
                </tr>
            </tbody>
        </table>
    </td>
</tr>
...
<xml>
    <root>
        <address> 123 Main St</address>
        <city>Alameda</city>
        <state>CA</state>
        <zip>94770</zip>
        <contactInformation>
            <type>Home Phone</type>
            <number>510-555-2287</number>
        </contactInformation>
        <contactInformation>
            <type>Cell Phone</type>
            <number>510-555-4285</number>
        </contactInformation>
    </root>
</xml>
```

Embedding the Table

The embedded table is included within the overall table structure. The colspan attribute ensures that the embedded table can span the standard two columns of the overall layout table.

```
...
<tr>
    <td colspan="2" class="oraEmbeddedTable">
    ...
    ...
    ...
    </td>
</tr>
...
```

Embedded Table Structure

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The embedded table is very similar to the basic layout table.

```
...
<table oraList="contactInformation" cellspacing="2">
<thead>
          ...
          ...
</thead>
<tbody>
          ...
          ...
</tbody>
</table>
...
```

- The <table> tag has a slightly smaller cellspacing and it defines the "list" element contained in the XML that will be used to provide the data.
- The <thead> element is used to give the embedded table headings for the columns.
- The <tbody> element is the element that will be repeated for each referenced "list" element in the XML. In the previous example, there are two "contactInformation" list elements, so the displayed embedded table will have two rows.

Column Headings

Embedded tables should have headings for the displayed columns. The <thead> tag defines these.

```
...
<thead>
    <tr>
        <th class="oraGridColumnHeader" nowrap="nowrap">
            <span oraLabel="contactInformation/type></span>
        </th>
        <th class="oraGridColumnHeader" nowrap="nowrap">
            <span oraLabel="contactInformation/number"></span>
        </th>
    </tr>
</thead>
...
```

The "nowrap" attribute prevent the column heading from taking multiples lines. If multiples lines are required, the "nowrap" may be removed.

Input Fields

Embedded tables may be used for input as well as display only. The framework provides a convenient control to assist in the creation of editable embedded tables.

```
...
<tr>
    <td colspan="2" class="oraEmbeddedTable">
        <table oraList="contactInformation" cellspacing="2">
            <thead >
                <tr>
                    <th class="oraGridColumnHeaderButton"></th>
```


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```
                    <th class="oraGridColumnHeaderButton"></th>
                    <th class="oraGridColumnHeader" nowrap="nowrap">
                        <span oraLabel="contactInformation/type></span>
                    </th>
                    <th class="oraGridColumnHeader" nowrap="nowrap">
                        <span oraLabel="contactInformation/number"></span>
                    </th>
                </tr>
            </thead >
            <tbody>
                <tr>
                    <td oraType="addGridRow"></td>
                    <td oraType="deleteGridRow"></td>
                    <td>
                        <input type="text" oraField="type"/>
                    </td>
                    <td>
                        <input type="text" oraField="number"/>
                    </td>
                </tr>
            </tbody>
        </table>
    </td>
</tr>
...
```

There are two new columns added to the input embedded table.

- oraType="addGridRow" will add a "+" button to the row. This will allow the User to add an additional row to the existing grid.
- oraType="deleteGridRow" will add a "-" button to the row. This will allow the User to delete an existing row from the grid.

> **Note**
>
> The <thead> tag also requires these two new columns to be added.

These controls are, as standard, placed at the beginning of the row in the order shown. Either of the controls may be omitted if required (if, for example, Users are not permitted to delete information).

The presence of either of these controls will activate the "empty list" process. This means that if the XML has no data for the "list" specified, the input grid will display with an empty row ready for the input of new information.

Action Buttons

Example Action Button HTML

Action buttons are used to perform some specified function from the UI Map. The actions are as varied as the information being displayed/updated. Below are two common examples:

- Save. Normally used on an Input UI Map to allow a User to save any changes they have made.

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- Cancel. Normally used on an Input UI Map to allow a User to cancel changes in progress.

```
...
<tr>
  <td colspan="2" class=" oraEmbeddedTable">
    <table cellspacing="2">
      <tr>
        <td>
          <input class="oraButton" oraMdLabel="C1_SAVE_LBL" type="button"
              onClick="oraSubmitMap('OK');"/>
        </td>
        <td>
          <input class="oraButton" oraMdLabel="CANCEL_LBL" type="button"
                          onClick="oraSubmitMap('CANCEL',false);"/>
        </td>
      </tr>
    </table>
  </td>
</tr>
...
```

Button Standards

The following points highlight some standards related to buttons.

- Buttons are included as an embedded table.
- Buttons should be grouped together. They should not be placed in different areas of the UI Map.
- The location of the buttons depends mainly on the type of UI Map.
  - Display Only UI Maps should have a Record Actions section in the upper right section of the UI map.
  - Input UI Maps should have the buttons at the foot of the UI Map (after all input fields).

Available Styles

Styles are all contained in the referenced CSS stylesheets. They are applied by the HTML "class" attribute. The actual style settings used are not documented here as they may be adjusted. This section only specifies when a particular style should be used.

> **Note**
>
> The "class" attribute may reference more than one style (class="oraLabel oraSectionEnd")

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Style	Comments	Example
oraButton	Applied to <input> elements where the type is button.	... <input class="**oraButton**" oraMdLabel="CANCEL_LBL" type="button" onClick="oraSubmitMap('CANCEL',false);"/> ...
oraDisplayCell	Applied to the <td> tag of an embedded table. It defines how the table cell looks (not the data contained inside the cell).	... <td class="**oraDisplayCell**"> </td> ...
oraEmbeddedTable	Applied to the <td> tag that will contain the embedded table.	... <tr> <td colspan="2" class=" oraEmbeddedTable"> <table cellspacing="2"> ... ... </table> </td> </tr> ...

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Style	Comments	Example
`oraError`	This style is applied to elements that are identified as "error elements". Refer to Display Errors for more information.	

Note

This style is not normally applied directly in the

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Style	Comments	Example
		UIMapHTML
oraErrorText	This style is applied to the elements concerned with error messages.	... <table width="100%" cellpadding="12"> <tr class="oraErrorText"> <td> </td> </tr> </table> ...
oraGridColumnHeader	This style is applied to the <td> tags that define column headers within embedded table.	... <thead > <tr> <th class="oraGridColumnHeaderButton"></th> <th class="oraGridColumnHeaderButton"></th> <th class="**oraGridColumnHeader**" nowrap="nowrap"> </th> <th class="**oraGridColumnHeader**" nowrap="nowrap"> </th> </tr> </thead > ...

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Style	Comments	Example
`oraGridColumnHeaderButton`	This style is applied to the <td> tags that define the column headers for the "+" and "-" buttons used on editable embedded tables.	``` ... <thead > <tr> <th class="**oraGridColumnHeaderButton**"> </th> <th class="**oraGridColumnHeaderButton**"> </th> <th class="oraGridColumnHeader" nowrap="nowrap"> </th> <th class="oraGridColumnHeader" nowrap="nowrap"> </th> </tr> </thead > ... ```

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Style	Comments	Example
`oraInput`	This style is applied to input fields: • <input type="text"> • <input type="checkbox"> • <select> • <textarea>	``` ... <input type="text" class="oraInput" oraField="address"/> ... ```

> **Note**
>
> This can normally be omitted as input styles are

Style	Comments	Example
		appliedautomaticallywhenoraSchemaDataTypes="true".

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Style	Comments	Example

`oraInputMoney`	This style is applied to input fields:
	• <input type="text">
	• <select> (rare)
	• <textarea> (not recommended)
		`...`
		`<input type="text" class="oraInputMoney"`
		`oraField="amount"/>`
		`...`

Note

This can normally be omitted as input styles are

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Style	Comments	Example

```
eappliedautomaticallywhenoraSchemaDataTypes="true".
```


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Style	Comments	Example
`oraInputNumber`	This style is applied to input fields: • <input type="text"> • <select> (rare) • <textarea> (not recommended)	``` ... <input type="text" class="oraInputNumber" oraField="count"/> ... ```

> **Note**
>
> This can normally be omitted as input styles ar

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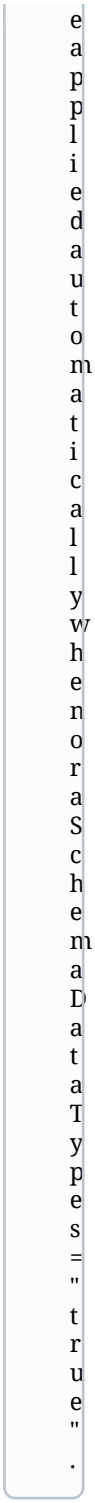
Style	Comments	Example
		

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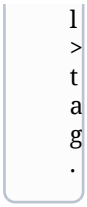
Style	Comments	Example
`oraLabel`	This style is applied to standard label fields that are right aligned.	``` ... <td class="oraLabel" oraLabel="address"></td> ... ```

> **Note**
>
> This can normally be omitted as it is applied by the <co

Style	Comments	Example
		

`oraLabelAlt`	This style is applied to standard label fields only if it is desired to have the label aligned to the left.	`...`
		`<td class="`**`oraLabelAlt`**`"`
		`  oraLabel="address"></td>`
		`...`

`oraLabelCenter`	This style is applied to standard label fields only if it is desired to have the label aligned in the center of the cell.	`...`
		`<td class="`**`oraLabelCenter`**`"`
		`  oraLabel="address"></td>`
		`...`

`oraLink`	This style is applied to foreign key references (links). This is automatically added by the UI Map framework but can also be used manually if desired.	`...`
		`<td class="oraLabel">`
		`  <a href="www.google.com"`
		`  class="oraLink">Google</a></td>`
		`...`

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Style	Comments	Example
oraNormal	This style is applied to standard data fields (display only) that are left aligned.	``` ... <td class="oraNormal" oraField="address"></td> ... ```

> **Note**
>
> This can normally be omitted as it is applied by the <c

Style	Comments	Example
		ol>tag.
oraNormalAlt	This style is applied to standard data fields (display only) only if it is desired to have the data aligned to the right.	... <td class=" **oraNormalAlt**" oraField="address"></td> ...
oraNormalCenter	This style is applied to standard data fields (display only) only if it is desired to have the data aligned in the center of the cell.	... <td class=" **oraNormalCenter**" oraField="address"></td> ...

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Style	Comments	Example

`oraPageTitle`	This style is applied to the element that contains the page title.	`...`
		`<span class=" oraPageTitle"`
		`  oraMdField="PAGE_TITLE_LBL"></span>`
		`...`

> **Note**
>
> This style is not normally applied directly in the UI M

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Style	Comments	Example
		apHTML.TheiscreatedbytheUIMapframeworkwhenthe UIMap

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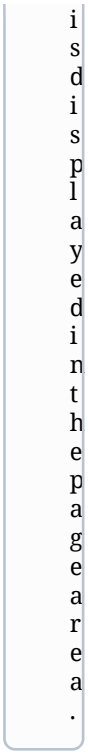
Style	Comments	Example
		

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Style	Comments	Example

`oraSectionEnd`	This style is applied to the <td> tags at the end of a "section" (group of elements). It provides some space to separate the section from the following information.	```
		...
		<tr>
		  <td class="oraSectionEnd"
		  oraLabel="zip">
		  </td>
		  <td class="oraSectionEnd"
		  oraField="zip">
		  </td>
		</tr>
		...
		``

> **Note**
>
> The style must be applied to both <td> tags orth

Style	Comments	Example
		label may be misaligned with the data/input.

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Style	Comments	Example

`oraSectionHeader`	This style is applied to the <td> tag used to give a heading for a section within the information being displayed. It does not provide spacing before or after itself. The oraSectionStart and oraSectionEnd classes are used for this.	```
		...
		<tr>
		  <td class="oraSectionHeader"
		  colspan="2"
		  oraMdField="DATA_SECTION_LBL"></td>
		</tr>
		...
		``

Note

These section headers should span both the

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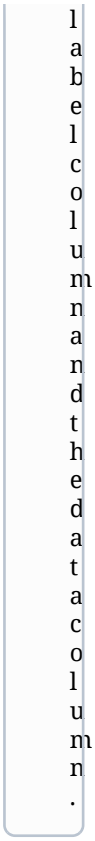
Style	Comments	Example
		

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Style	Comments	Example

`oraSectionStart`	This style is applied to the <td> tags at the start of a "section" (group of elements). It provides some space to separate the section from the previous information (often a section header).	```
		...
		<tr>
		  <td class="oraSectionStart"
		   oraLabel="zip"></td>
		  <td class="oraSectionStart"
		   oraField="zip"></td>
		</tr>
		...
		``

Note

The style must be applied to both <td> tags or

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Style	Comments	Example
		the label may be mis aligned with the data/input.
oraTableData	This style is applied to the <col> tag for the data column of the main table (second column). It is used to provide a percentage width for the horizontal space to be used for the information.	... <colgroup> <col class="oraLabel oraTableLabel"/> <col class="oraNormal **oraTableData**"/> </colgroup> ...

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Style	Comments	Example
oraTableLabel	This style is applied to the <col> tag for the label column of the main table (first column). It is used to provide a percentage width for the horizontal space to be used for the labels.	... <colgroup> <col class="oraLabel **oraTableLabel**" /> <col class="oraNormal oraTableData"/> </colgroup> ...
oraTinyText	This style is typically applied directly beneath an <input> tag to provide information or a hint to the user concerning information relevant to the input. For example, name or address format.	... <tr> <td oraLabel="address"></td> <td> <input type="text" oraField="address"/> </td> </tr> ...
oraZoneMap	This style is used applied when the UI Map is to be displayed as a zone on a portal.	... <body class="oraZoneMap"> ...
ou-align-items-after-text	Tree nodes may be designed to have their node text directly followed by icons and badges. In some use cases there is a need to align those icons and badges in a column after the text. This is especially true for "narrow" trees where the text tends to wrap. This style aligns tree node icons and badges to the right in a column down the tree.	<ou-tree treename="..." class="ou-align-items-after-text"></ou-tree>

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Style	Comments	Example

`ou-clear-hyperlink-color`	This style may be used to override the standard hyperlink color and use the default text color instead. It applies to all the hyperlinks in the defined container.	`<body class="ou-clear-hyperlink-color"> - Applied to all hyperlinks on the entire page`
		`<div class=ou-clear-hyperlink-color"> - Applied to all hyperlinks in the specified <div>`
		`<a class="ou-clear-hyperlink-color"> - Applied to a single element`

`ou-icon-color-standard`
`ou-icon-color-gray`
`ou-icon-color-red`
`ou-icon-color-green`
`ou-icon-color-paleblue`
`ou-icon-color-yellow`
`ou-icon-color-orange`
`ou-icon-color-white`
`ou-icon-color-reverse-video`
	These styles may be used to change the color of an icon.	`...`
		`<ou-button type="image" imgref="F1NEWWIN" ...`
		`class="ou-icon-color-gray" ...>`
		`</ou-button>`
		`...`

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Style	Comments	Example
`ou-icon-small` `ou-icon-xsmall`	These styles may be used to change the size of the iconography. u-icon-small makes the icon 16x16 ou-icon-xsmall makes the icon 12x12. This style should only be used for decorator icons. Clickable icons should be standard size for accessibility.	`...` `<ou-decorator imgRef="F1ACCT" class="ou-icon-small"></ou-decorator>`

`ou-show-as-grid`	This style renders single elements as if they were rows in a grid.	`<div class="ou-show-as-grid">`
		`<div>`
		`  <label .../>`
		`  <span .../>`
		`</div>`
		`...`
		`<div>`
		`  <label .../>`
		`  <span .../>`
		`</div>`
		`</div>`

`ou-show-as-label-above`	This style renders an element in redwood view mode which sets the label iabove the field value. The style is ignored in redwood view mode.	`<div class="ou-show-as-label-above">`
		`  <label .../>`
		`  <span .../>`
		`</div>`

`ou-show-as-label-in-front`	This style renders an element in classic view mode which sets the label in front of the field value. The style is ignored in classic view mode.	`<div class="ou-show-as-label-in-front">`
		`  <label .../>`
		`  <span .../>`
		`</div>`

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Style	Comments	Example

`ou-show-as-standard-lines`	This style may be used to render a simple name/ value two columns table as single elements. It "converts" the table into standard looking line elements.	`<table class="ou-show-as-standard-lines"><tr>`
		`<td>... name ...</td>`
		`<td>... value ...</td>`
		`</tr></table>`

Using OJET

There are some UI maps delivered by the product that use UI widgets provided by Oracle JavaScript Extension Toolkit (OJET). Releases for OJET do not always align with releases of the framework. In addition, there are times when OJET adjusts APIs that the product uses. The framework will attempt to ensure that each release of the product has the latest and greatest version of the OJET libraries. Implementations are discouraged from attempting to use features in OJET that are not used by the product because the product is not necessarily testing those features and is not ensuring that upgrades to the APIs for those features are backward compatible.

Note that the product isolates the references to OJET into a UI map fragment that is included in the maps that use OJET widgets. This is so that changes to future versions of OJET are minimized to a single place. The map is called F1–OJETLIBS. If your implementation wants to use OJET, the recommendation is to use this UI map fragment.

Process Flows

This section describes concepts and provides guidelines related to the configuration of various type of process flows.

- Understanding Process Flows
- Designing Process Flows
- Defining Process Flow Types

Understanding Process Flows

A process flow is a user interface guiding a user through a series of actions in order to accomplish a specific task. The task can be as simple as the collection of information in order to update business data or involve more complex logic such as submitting and tracking batch processes, exchanging messages with an external system, etc.

This section describes topics related to designing and working with process flows.

A Process Flow Is Made Of Panels

Each process flow consist of a number of sequential "steps" needed to accomplish a certain task. Each step is represented by a stop on a progress bar and an associated panel.

Progress is linear in that each step may only lead to a single next step. A process flow always starts at a single initial step but allows for one or more final steps at which the user may choose to complete the process.

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At any step the user may take the following actions:

- Enter data or take action as prompted by the step's panel.
- Continue to a next step, if any.
- Navigate back to any step they have previously visited.
- Finish the process flow if the current step is a final step.
- Save off their work on the process flow and either continue their work or navigate away. At a later time the user may resume their work on the process flow from where they have left off.
- Cancel the process flow.

A process flow type defines the entire metadata needed to control the behavior of process flows of a given type. This includes the sequence of steps, the panel and rules associated with each step and more.

Panel Presentation

The panel presented on each step of the process flow is rendered based on the panel type selected on the step configuration.

For a **Data Area** type of panel, the panel is rendered using UI Hints built into the schema of a specified data area.

For a **UI Map** type of panel, the panel is rendered using a specified UI map fragment.

For a **Panel Set** type of panel, the panel is rendered as a set of tabs, one for each panel that references the current panel as its parent panel. Clicking on each tab renders the UI based on the selected panel's type. The behavior of a panel set is analogous to or can be thought of as a nested process flow within a single panel. A panel set may not include another panel set.

A Single UI Map

While the user enters data one panel at a time, data is collected and captured at the entire process flow level. All the elements edited and displayed on the various panels of the process flow must be included in the overall process schema and referenced by their appropriate XPath location in that schema. Each type of process flow defines its unique schema on a designated UI map.

The UI map's HTML should simply include the **Process Flow Controller (F1-ProcessController)** UI map fragment and nothing else. The latter is designed to render the user interface for a process flow based on the metadata defined on its process flow type.

Panel Scripts

A single **Pre-Processing** service script may be associated with a panel for the purpose of preparing the data before the panel is presented to the user. The system calls the script each time the user navigates to this panel on a non-finalized process flow.

A single **Post-Processing** service script may be associated with a panel for the purpose of validating the data entered by the user on that panel. The system calls the script each time the user exits the panel on a non-finalized process flow.

Process Flow Scripts

A single **Process Start** service script may be associated with a process flow for the purpose of preparing the data before a newly initiated process flow is presented to the user.

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A single **Process End** service script is executed when the user clicks on the **Finish** or **Cancel Process** buttons to complete the process flow. The entire set of data collected by the process flow UI map schema is provided to this service script for final processing.

> **Note**
>
> The schema of these scripts should be the same as the **Process Flow UI map** schema. This would ensure that business rules have access to the entire data captured by the user.

Summary Panel

By default, when a user finishes a process flow, as well as when they view an already closed process, the process flow portal displays the last panel the user was working on. For more complex process flows, you may provide a panel that summarizes information from the entire process. When specified on the process flow type, the system displays that summary panel instead a the default view of a closed process. The user may toggle between the summary view and the detailed view at any time.

The summary panel may be implemented as a UI map fragment or a data area like other panels but may not be associated with any panel script.

Launching A New Process Flow

Each process flow must be initiated and executed by a designated BPA script that has the following simple steps:

- Set BPA area height to zero.
- Populate the temporary variable **$processCode** with the code of the specific process flow type.
- Transfer control to the **Process Flow Navigation (F1-PROCEXEC)** common BPA script.

Launching a process flow of a specific type is assumed to be made from a designated menu option or within a specific context applicable to that type of work. As such, this item needs to be configured specifically for each type of process flow. The navigation option associated with that launching option should reference the BPA script associated with the corresponding type of process flow.

Saving Off Work

The user may save off their work on a process flow at any time. If enabled on the process flow type, the system would also automatically save the data when the user navigates to another panel or away from the process flow portal.

On either manual or automatic save operations, the **Process Manager** script defined on the process flow type is called to save off the entire process flow data on a designated record in the database.

The base product provides a generic **Process Flow** maintenance object that is designed to support the storage of any type of process flow as well a corresponding process manager script. Should process flows of a specific type be stored elsewhere, then a dedicated process manager script should be implemented and used instead.

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Review Process Flow Records

A process flow record is created when a user saved off their work or the process flow type enables automatic saving. When the user finishes a process flow, depending on the process flow type configuration the record may be deleted or retained for audit purposes.

The **Process Flow Query** portal allows a user to resume their work on a in-progress flow and review the information associated with any finalized flows.

Reviewing process flow records of a specific type could also be made from a designated menu option or within a specific context applicable to that type of work. As such this item needs to be configured specifically for each type of process flow. The navigation option associated with that item should reference a query portal designed to query and manage the specific type of process flow records.

Designing Process Flows

A wide range of process flows may be designed to implement online tasks business users may need to perform. Refer to Understanding Process Flows for more information.

Below is a high-level summary of the steps required to design and configure various types of process flows.

Analyze The Task

The following provides a the high-level guidance in analyzing the necessary data and rules needed to support an implementation of a new type of process flow:

- Identify the data and business rules that are needed to complete the entire task.
  - When possible, organize data into logical groups of details defined as data areas.
  - Design logic for the final processing script that accepts the entire data entered along with the user's action to either complete or cancel the task.
  - If data needs to be initially prepared for a newly initiated process flow, design logic for a corresponding initial processing script.
  - Determine whether a summary panel may be useful for the user to review the outcome of a completed process.
- Design the sequence of panels the user should follow to complete the task. Identify the initial and final panels.
- Review each panel and determine the following:
  - Is it a single panel or a nested process flow (i.e. a panel set)?
  - What is the title of the panel and its label on the progress bar?
  - How should the layout be rendered? Use a data area that leverages UI Hints to describe the panel layout when possible. For more complex HTML requirements you may use a UI map fragment.
  - Should details on this panel be defaulted with some initial values when the user enters this panel? If so, design logic for a corresponding pre-processing script.
  - If data entered on this panel should be validated before the user exits the panel, design logic for a corresponding post-processing script.
- Design the summary panel if needed.

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- Determine whether this type of process flow should be automatically saved by the system or solely rely on the user to control when data is saved.
- Determine whether a record of a completed process flow should be retained for audit purposes or deleted upon completion.
- Determine whether a user may delete in progress records of such process flow.
- Determine whether process flows of this type are saved and stored in a dedicated table in the database or are saved in the generic table provided by the base product. The assumption is that introducing new designated storage maintenance objects is not common. Refer to your edge product documentation for additional maintenance objects that may have been provided to support specific types of process flows shipped with the product.
- Determine the context in which a user can initiate, resume work on, and review process flows of that type.
  - The process flow may be launched from a menu or a favorite script etc.
  - Design the query portal a user would use to find and resume a saved off process flow of this type as well as review completed process flow records. This step is only needed if the base product query portal is not suitable for this type of tasks. Depending on the context of this task, the query may be associated with the same menu line that initiates the process flow.
  - Determine if specific characteristics may need to be stored along with the process flow record for the purpose of identifying in-progress flows by context. Design your process flow service scripts to populate these characteristic values in the control data area available to these scripts.

Using UI Map Panels

Typically a map fragment is rendered as part of a complete UI map but when used as a process flow panel the system renders the panel assuming the fragment contains a complete map.

Therefore, such fragment should includes the following items:

- The standard error message section used for reporting errors.
- This line <xml style="display:none"></xml> at the end of the HTML content for proper binding of data to their HTML elements.

A UI map based panel allows for more control over some of the buttons available to the user. For example, the panel may prevent the user from proceeding to the next panel unless required information is entered. Refer to the explicit APIs listed in the process controller UI Map (F1-ProcessController) for more information.

Configure The Process Flow Type

The following describes the high-level steps needed to configure a new type of process flow:

- Create the UI map for the process flow. Its schema should contain all the details needed to complete the task. Its HTML should only include the process controller UI map fragment.
- Create a start processing service script if needed.
- Create a final processing service script such that it applies all the rules needed to complete or cancel the task.
- For each panel perform the following:

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  - Create a UI map fragment for it unless it corresponds to a data area already included in the process flow schema. Make sure the XPath of each element references in the data area or UI map is the same XPath of that element in the process flow's UI map schema.
  - Create a pre-processing service script if needed. Not applicable to the summary panel.
  - Create a post-processing service script if needed. Not applicable to the summary panel.
  - Set up a label and title MD fields if existing ones cannot be used.
- Create a BPA script for the process flow.
- Configure the process flow type record.
- Set up a navigation option and reference the BPA script on it. Associate the navigation option with a menu or provide other means for the user to initiate the process flow.
- Create a query portal for the specific type of process flow records. Add the new query portal to a menu or provide other means for the user to resume work on a process flow they have saved off or review completed records.

Control Visibility of Standard Buttons

You may leverage the following javaScript functions to control the visibility of standard process flow buttons:

- Next: `enableNext()`, `disableNext()`, `hideNext()` , `showNext()`.
- Finish: `enableFinish()`, `disableFinish()`, `hideFinish()` , `showFinish()`.
- Save: `enableSave()`, `disableSave()`, `hideSave()` , `showSave()`.

Defining Process Flow Types

This portal is used to maintain process flow types.

Refer to Understanding Process Flows for more information.

You can access the portal from the **Admin Menu**, and then **System**, and then **Process Flow Type.** You are brought to a query portal with options for searching for a specific process flow type. Once a process flow type has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page

- **Process Flow Type.** This zone provides information about the selected process flow type.

Action Method

Action method is an object that may abe used to define configuration based on some criteria. For example, when initiating a Start Service scenario, the service request type may differ based on the CIS division and the customer class. When a user initiates a Start Service process, the system can prompt the user for information about the customer that can determine the CIS division and the customer class. The system can then call an algorithm passing this information to retrieve the appropriate service request type to use as defined in the action method. Throughout this section, the term 'criteria' is used to identify the information used to determine the desired configuration and the term 'details' or 'results' is used to identify the configuration information being determined.

If you were to design a use case to use this functionality consider the following:

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- What information needs to be identified (the 'details'/ 'results')? The example above uses a configuration object as its example (service request type). However, the information you are determining could be anything that can differ by some combination of attributes. You could use this to determine which collection algorithm to execute based on criteria. Or the number of days to wait to continue with some process for some use case.
- When and where do I need to determine this information and what do I do with it once I receive it?
  - Is this needed as part of a user interaction?
  - Or is this needed for internal processing?
- What is the criteria needed to determine the desired information? Do I have this information at the time that I need it? Or do I need to prompt a user for the information?

The framework product supplies the generic objects needed to support this type of functionality. The individual edge products or implementations can build their use cases with the tools provided. The topics in this section further describes the provided features.

Action Method Role

The action method functionality is driven by the Action Method Role, which represents a given use case. Some examples of action method roles that may be relevant in an enterprise product are 'Start Service', 'Stop Service' and 'Transfer Service'. The valid action method roles are defined using an extendable lookup and referenced on the Action Method. One and only one action method may be defined for one action method role.

The action method role record may reference an action method role BPA script, if the use case for this Action Method Role involves user interaction. The responsibility of this script, if needed is to take the action method role value, determine the action method that references the role and identify the more specific Action Processing BPA script (defined on the business object) and transferring control to that script. This reference may be used for audit or information purposes, depending on how you have implemented the user experience. The action method role BPA is ideally configured on an appropriate menu entry or an action button on a specific user interface related to this use case.

If your business use case does not require user interaction, then an action method role BPA script is not necessary.

Action Method Business Object

The action method's business object is used to define the information that needs to be configured for both the criteria and the results. Continuing to use the above example, the business object for a Start Service use case defines a list that captures the CIS division and customer class along with the service request type to use. The information is configured in the XML data area for the action method and the schema design is dictated by the business requirements. For example, it may be that your use case dictates a default value for the results (in our case, the service request type) plus override values based on a division and customer class combination.

Get Action Method Details Plug-in

Besides defining the schema information for capturing the criteria and results, the business object defines the algorithm that should be invoked to retrieve the results based on the criteria.

The plug-in spot is **Get Action Method Details**. Its API is flexible in the information it receives and returns so that each action method use case can design the algorithm based on its business requirements.

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The algorithm receives a list of 'Criteria Data' using a 'name' and up to 5 values (to handle multi-part primary keys). Typically only 'value 1' is needed for each entry. The algorithm type designed for a given action method business object can determine what information is receives. It could be that it expects the criteria elements defined on the action method. In our example, the algorithm type could expect to receive the CIS division and customer class. Alternatively, the algorithm type could be designed to receive a value that can be used to determine the criteria needed. For example, it could receive the account ID and use that information to determine the CIS division and customer class.

The algorithm returns one or more results as 'Details'. The information returned is based on the use case. In our example, the service request type is returned. Your business requirements may use the action method role to return multiple results, for example a service request type and a process flow type to invoke to capture all the information needed to start service.

The product provides a business service `F1-RetrieveActionMethodDetails` to call the algorithm for a given action method value.

Action Processing BPA

If your business requirement requires user interaction either to determine the criteria to pass to the Get Action Method Details algorithm or to use the resulting information to continue with an online action, an Action Processing BPA is needed. This BPA should be designed and linked to your action method business object as an option using the **Action Processing BPA Script** option type.

The design of this BPA depends on your business requirements. But at a high level, it may need to prompt the user for information needed to determine the criteria associated with the action method details, then call the `F1-RetrieveActionMethodDetails` business service to execute the algorithm for your action method. Once the results are returned, the script would proceed with the next step in the business use case.

> **Note**
>
> If any additional information needs to be gathered by the server before or after the call to the business service that executes the algorithm, then the recommendation is that the BPA should call a service script that does all the server level logic at one time.

Action Method Role vs. Action Method Business Object

The action method role defines the use case. The business object is used to design the schema for the criteria and the results and identifies the action processing BPA and the Get Action Method Details plug-in. It may warrant a unique business object for each action method role. However, there may be cases where more than one action method role and its action method can reuse the same business object. For example, imagine there are different service request types for Start Service, Stop Service and Transfer Service, however in all cases the valid value is driven by the CIS division and customer class. These three separate action method roles and action methods can reuse a common business object defining the criteria of CIS division and customer class determining the appropriate service request type.

- Defining Action Methods

Defining Action Methods

Refer to Action Method for an overview of action method functionality.

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To maintain the action methods applicable to your implementation, open **Admin**, and then **System**, and then **Action Method.**

This is a standard All-in-One portal and includes the standard List and display zones for an action method.

The information captured on the action method depends on the business objects supported by your product or implementation. Refer to the embedded help text for more information.

Algorithms

In this section, we describe how to set up the user-defined algorithms that perform many important functions including:

- Validating the format of a phone number entered by a user.
- Validating the format of a latitude/longitude geographic code entered by a user.
- In products that support payment and billing:
  - Calculating late payment charges.
  - Calculating the recommended deposit amount.
  - Constructing your GL account during the interface of financial transactions to your GL
- And many other functions...
- The Big Picture Of Algorithms
- Algorithm Entity
- Defining Algorithm Types
- Defining Algorithms
- Advanced Algorithm Tips

The Big Picture Of Algorithms

Many functions in the system are performed using an algorithm. Algorithms are called at strategic points (often referred to as a "plug-in spot") within system processing to perform specific code. The plug-in spots are preconfigured with the product and vary from object to object. Algorithms are used by the base product to provide out of the box functionality. The algorithm framework provides a means for implementations to insert their own custom code, which can be instead of the base delivered code or in addition to it.

> **Note**
>
> **Algorithm = Plug-in.** We use the terms plug-in and algorithm interchangeably throughout this documentation.

Algorithm Type Versus Algorithm

Often the documentation will just use the term 'algorithm', but in actuality there are two important objects that provide this plug-in functionality.

- An **Algorithm Type** defines program to execute and identifies the plug-in spot. The program may be defined using Java or using a plug-in script. The algorithm type may also define parameters that must be supplied to algorithms of this type.

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- An **Algorithm** is an instance of an **Algorithm Type**. If the algorithm type does not define any parameters, then there will be only one algorithm for the algorithm type. If the algorithm defines parameters, then there could be several algorithms for a given algorithm type, one for each unique set of parameter values for a given use case. The algorithm is the object that gets referenced on a given control table when configuring your system.

Algorithm Plug-in Spot

The plug-in spot, also called Algorithm Entity and System Event, defines several aspects of the functionality for algorithms that are executed.

- When in system processing are algorithms of this plug-in spot executed? For example, algorithms for the Installation Option - To Do Pre-creation are called when a To Do is getting added, before any insert to the database is performed.
- The API for the plug-in spot. This is often referred to as the "hard parameters" for the plug-in spot. What information is every algorithm program provided when called? Additionally, if the algorithm is expected to return information to the caller, this is also part of the hard parameters. For example, the Installation Option - To Do Pre-creation plug-in spot receives all the information about the To Do that is about to be added. It may add or update values. It may also return an indication to not create the To Do, if desired.

> **Note**
>
> The hard parameters are different from the parameters defined on the algorithm type. Those are referred to as the "soft parameters". Those parameters are used to configure settings that the algorithm type code uses per its specific functionality.

- What is the responsibility of algorithms for the plug-in spot? When defining a plug-in spot, the product defines the responsibility of the code for the algorithm types created for that spot. For example, is the algorithm determining information and returning it? Or is it supposed to perform an update? Algorithms for the Installation Option - To Do Pre-creation plug-in spot should not do any updates. Rather they should adjust the To Do information (if desired) in the hard parameters and return them. The calling logic will use that adjusted information when inserting the To Do record.
- Where do you configure the algorithm? We have been using the Installation Option - To Do Pre-creation plug-in spot as an example. As the description suggests, these algorithms are configured on the Installation Option - Algorithm collection. Each plug-in spot defines where (on which control table) the algorithms are plugged in. The system standard for the description of the Algorithm Entity flag value that defines the available plug-in spots is "Control Table Name - Event". For example the To Do Type - Calculate Priority algorithm plug-in spot means that algorithms are configured on the To Do Type. This information also indicates the granularity of the algorithm. Installation Option algorithms are system wide. But an algorithm plugged in on To Do Type, for example, indicates that only To Do Entries for that To Do Type will have that algorithm executed.
- Are multiple algorithms allowed? There are some plug-in spots where it doesn't make sense to support multiple algorithms. An example of this is the Batch Control - Select Records plug-in. This plug-in is used by the plug-in driven batch process and is responsible for selecting the records to process. Only one algorithm of this type is allowed on a given Batch Control. An example of a plug-in spot that would support multiple algorithms is a validation plug-in spot. Note that when a plug-in spot supports multiple algorithms, there can be yet additional aspects of the plug-in spot design.
  - In some cases, this type of plug-in spot simply executes each algorithm. A validation plug-in spot is an example of this.

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- In some cases, the algorithm could return an indication to the plug-in spot 'driver' to not execute any subsequent algorithms. Business Object Status - Enter is an example of a plug-in spot that supports this capability.
- In some cases, the plug-in spot may support sharing information from one algorithm to the next. Migration Plan - Pre-Compare is an example of a plug-in spot that supports this capability.

Refer to Algorithm Entity for information about a portal provided to display information about a plug-in spot.

Base Product Algorithms

The base product provides many, many algorithm types and algorithms out of the box. Sometimes algorithms are delivered to provide support for common use cases that we know our clients will need. Many algorithms, however, are provided because we are implementing system functionality using the same infrastructure and capabilities that our implementation use for their own custom code.

When an algorithm type is delivered, the decision as to whether an algorithm is also provided depends on some factors related to whether soft parameters are defined for the algorithm type.

- If no parameters are defined for the algorithm type, a corresponding algorithm is typically also provided.
- If parameters are defined and the values are on configuration data that is normally owned by the implementation, a base algorithm will probably not be defined.
- If parameters are defined and the values are not dependent on configuration data, it's possible that one or more algorithms are provided.

To review the algorithm types that are delivered with the product, go to the Algorithm Type query. The query provides several search options, including searching by the algorithm entity lookup value.

- How To Add A New Algorithm
- Minimizing The Impact Of Future Upgrades

How To Add A New Algorithm

Before you can add a new algorithm, you must determine if you can use one of the algorithm types supplied with the system by using the algorithm type query.

If you can use one of the algorithm types, simply add the algorithm and then reference it on the respective control table. Refer to Defining Algorithms for how to do this.

If you have to add a new algorithm type, you may have to involve a programmer. Let's use an example to help clarify what you can do versus what a programmer must do. Assume that you require an additional geographic type validation algorithm. To create your own algorithm type you must:

- Write a new program to validate geographic type in the appropriate manner. Alternatively, you may configure a plug-in script to implement the validation rules. The advantage of the latter is that it does not require programming. Refer to plug-in script for more information.
- Create an Algorithm Type called **Our Geographic Format** (or something appropriate). On this algorithm type, you'd define the name of the program (or the plug-in script) that performs the function. You'd also define the various parameters required by this type of algorithm.
- After creating the new Algorithm Type, you can reference it on an Algorithm.

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- And finally, you'd reference the new Algorithm on the Geographic Type that requires this validation.

Minimizing The Impact Of Future Upgrades

The system has been designed to use algorithms so an implementation can introduce their own logic in a way that's 100% upgradeable (without the need to retrofit logic). The following points describe strong recommendations about how to construct new algorithm type programs so that you won't have to make program changes during future upgrades:

- Do not alter an algorithm type's hard parameters. For example, you might be tempted to redefine or initialize parameters defined in an algorithm type's linkage section. Do not do this.
- Follow the naming conventions for the new algorithm type code and your source code, i.e., both the source code and the algorithm type should be prefixed with "CM". The reason for this naming convention is to make it impossible for a new, base-package algorithm type from overwriting your source code or algorithm type meta-data (we will never develop a program or introduce meta-data beginning with CM).
- Avoid using embedded SQL to perform insert/update/delete. Rather, invoke the base-package's object routines or common routines.
- Avoid using base messages (outside of common messages, i.e., those with a message number < 1000) as we may deprecate or change these messages in future releases. The most common problem is caused when an implementation clones a base package algorithm type program because they need to change a few lines of logic. Technically, to be 100% upgradeable, you should add new messages in the "90000" or greater category (i.e., the category reserved for implementation-specific messages) for every message in your new program even though these messages may be duplicates of those in the base package.

Algorithm Entity

This portal is used to view information about a plug-in spot (algorithm entity). Refer to Algorithm Plug-in Spot for more information.

Navigate using **Admin**, and then **System**, and then **Algorithm Entity**.

Use the **Algorithm Entity Query** portal to search for an existing plug-in spot. Each plug-in spot is defined in the Algorithm Entity lookup (`ALG_ENTITY_FLG`). Once an algorithm entity is selected, you are brought to the viewing portal to view details about the algorithm entity.

The following zones appear on the Main page.

- **Algorithm Entity**. This zone provides information about the plug-in spot, including a link to view the Plug-in Spot API, also called the hard parameters for the plug-in spot. In addition it displays the detailed description, which should provide information about the algorithm's responsibility and when it is called.

  > **Note**
  >
  > This information is also available via a help icon on the algorithm type page and when defining a plug-in script, once you select the algorithm entity value.

- **Algorithm Types**. All existing algorithm types for the plug-in spot are listed. If there are algorithms, the count of algorithms are displayed. Clicking the count opens another zone.

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- **Algorithms**. If you clicked the algorithm count for an algorithm type, another zone appears with information about the algorithms for that type.

Refer to the embedded help in the portal for more information about each zone.

Defining Algorithm Types

The system provides many algorithm types to support base product functionality.

You can access the portal from the **Admin**, and then **System**, and then **Algorithm Type**. You are brought to a query portal with options for searching for a specific algorithm type. Once an algorithm type has been selected you are brought to the maintenance portal to view and maintain the selected record.

Refer to The Big Picture Of Algorithms for more information.

> ⚠ **Caution**
>
> Important! If you introduce a new algorithm type, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page.

- **Algorithm Type.** This zone provides information about the selected algorithm type.
  - Algorithm Entity defines where algorithms of this type can be "plugged in". The values for this field are customizable using the lookup table. This field name is `ALG_ENTITY_FLG`.
  - > ⓘ **Note**
    >
    > When adding a new algorithm type that is for a Java program, the parameters are automatically generated based on the Java code. Once an algorithm type exists, any additional parameters defined in the Java code should be manually added to the algorithm type. For other program types, algorithm type parameters must be manually defined.
  - > ⓘ **Note**
    >
    > When a new algorithm type parameter is added for any program type, existing algorithms for the algorithm type do not automatically get updated with the new parameter. The algorithms must be manually updated.
- **Algorithms.** This zone lists available algorithms for the selected algorithm type .

Actions

The page supports the following special actions:

- **View the source.** If the program is shipped with the base package, you can use the adjacent button to display the source code of this program in the Javadocs viewer. For plug-in scripts, drill into the plug-in script to view the details.

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Defining Algorithms

This portal is used to view and maintain information about an algorithm.

You can access the portal from the **Admin Menu**, and then **System**, and then **Algorithm**. You are brought to a query portal with options for searching for a specific algorithm. Once an algorithm has been selected you are brought to the maintenance portal to view and maintain the selected record.

Refer to The Big Picture Of Algorithms for more information.

> ⚠ **Caution**
>
> Important! If you introduce a new algorithm, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Algorithm.** This zone provides information about the selected algorithm.
- **Other Algorithms.** This zone lists other algorithms of the same algorithm type. The zone is only visible when such algorithms exist.

The following zones may appear as part of the portal's **References** tab page

- **Algorithm References.** This zone list various configuration entities referencing the current algorithm.

> ⓘ **Note**
>
> If the product delivers an algorithm with parameter values defined, an implementation may override the base provided parameter values by adding an additional effective dated collection of parameters.

> ⓘ **Note**
>
> If an algorithm is defined and subsequently a new parameter is added to the algorithm type, existing algorithms for the algorithm type should be updated to add a new effective dated entry to the parameter collection. At this point the latest list of parameters for the algorithm type are visible. Configure the parameters accordingly.

Advanced Algorithm Tips

Initiating Actions that Cannot be Rolled Back

If you have an algorithm that creates a sync request or performs some other logic that could cause a message to be sent and cannot be rolled back, you should be sure to cater for warnings in the design.

- The algorithm should be performed after all validations that could accumulate warnings.

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- The algorithm should include a step to call the Business Service `F1-CheckWarning` and see if any warnings have been accumulated. If so, don't perform the action. It means that the user will get a warning and if they click "OK", all the processing will happen again, but this time without accumulating any warnings. Refer to the plug-in script `F1-GnChgDCap` for an example.

Script Options

We use the term "script" to define processing rules that your implementation sets up to control both front-end and back-end processing:

- Rules that control front-end processing are called Business Process Assistant (BPA) scripts. For example, your implementation could set up a BPA script to assist a user through your organization's payment cancellation process.
- Rules that control back-end processing are called Server-based scripts. For example, your implementation could set up a server-based script to control the processing that executes whenever a given type of adjustment is canceled.

The topics in this section describe how to configure your scripts.

- The Big Picture Of Scripts
- The Big Picture Of BPA Scripts
- The Big Picture Of Server-Based Scripts
- Defining Scripts
- Merging Scripts
- Maintaining Functions

The Big Picture Of Scripts

This section describes features and functions that are shared by both BPA scripts and server-based scripts.

- Scripts Are Business Process-Oriented
- A Script Is Composed Of Steps
- A Script May Declare Data Areas
- Securing Script Execution
- Script Engine Version

Scripts Are Business Process-Oriented

To create a script, you must analyze the steps used to implement a given business process. For example, you could create a "stop auto pay" BPA script that:

- Asks the user to search and select the customer / taxpayer
- Asks the user to define the date on which the person would like to stop making automatic payments
- Invokes a server-based script that populates the end-date on the account's latest automatic payment instructions.

After you understand the business process, you can set up a script to mimic these steps. If the business process is straightforward (e.g., users always perform the same steps), the script

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configuration will be straightforward. If the business process has several logic branches, the composition of the script may be more challenging.

A Script Is Composed Of Steps

A script contains one or more steps. For example, a "stop auto pay" BPA script might have three steps:

- Ask the user to search and select the customer / taxpayer
- Ask the customer the date on which they'd like to stop making automatic payments (and default the current date)
- Invoke a server-based script that, in turn, updates the account's auto pay options.

Each step references a step type. The step type controls what happens when a step executes. It might be helpful to think of a script as a macro and each step as a "line of code" in the macro. Each step's step type controls the function that is executed when the step is performed.

> **NOT_SUPPORTED**
>
> Refer to How To Set Up Each Step Type for a detailed description of all available step types and how to set them up.

A Script May Declare Data Areas

Both BPA and server-based scripts may have one or more data areas:

- If the script contains steps that exchange XML documents, you must declare a data area for each type of XML document. For example, if a BPA script has a step that invokes a service script, the BPA script must declare a data area that holds the XML document that is used to pass information to and from the service script.
- You can use a data area as a more definitive way to declare your temporary storage. For example, you can describe your script's temporary storage variables using a stand-alone data area schema and associate it with your script.

Various step types involve referencing the script's data areas as well as support the ability to compare and move data to and from field elements residing in the data areas.

An Edit Data step supports the syntax to dynamically declare data areas as part of the step itself. This technique eliminates the need to statically declare a data area. Refer to Edit Data Syntax for more information on edit data commands and examples of the use of dynamic data areas.

> **Note**
>
> Some server based scripts may not use data areas as means of defining or exchanging data, depending on script type and the chosen scripting technique. Refer to The Big Picture Of Server Based Scripts for an overview of server scripts and their applicable scripting options.

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Securing Script Execution

The system supports the ability to secure the execution of scripts by associating the script with an Application Service. Refer to The Big Picture of Application Security for more information. Application security is optional for user-invocable BPA scripts. If a script is not associated with an application service, all users may execute the script. Otherwise, only users that have **Execute** access to the application service may execute the script. For service scripts, the application service is required.

Script Engine Version

Script engine version defines key information affecting the context and execution of the script.

- Script engine version values of 1, 2 and 3 define the version of the XML Path Language (XPath) to be used for the script. Versions 2 and 3 use the XPath 2 engine supplied by the XQuery team. This is the same engine used inside the Oracle database. The current script engine version 3 is a modified version that offers performance improvements without impacting existing version 2 scripts.

  The default script engine version is 3.0 for plug-in and service scripts. The default version for BPA scripts is 1.0 as higher level versions are not applicable.

  There are some additional details to note about script engine version 1.0:

  – The XPath library used is Jaxen

  – For BPA scripts, it uses the browser's xpath and XML support except for Internet Explorer where the XSXML parser is used.

  – Xpath 1 (and even JavaScript) uses floating point arithmetic, which means that adding a collection of numbers with two decimal places might end up with a value of 10779.079999999998 instead of 10779.08

- A Script Engine Version value of **Groovy** is only applicable to plug-in scripts and Groovy Library scripts. It is used to indicate that only Groovy related step types are used in the script and signals to the system that there is no need to convert the data to and from an XML interface. This allows for greater efficiency in script execution. This is the default value for Groovy Library scripts and cannot be changed.
- The value **Framework Version 2.1 Compatibility Mode** remains for upgrade purposes. This value should only be applicable to early versions of BPA scripts using syntax that is incompatible with XPath syntax.

The Big Picture Of BPA Scripts

> **NOT_SUPPORTED**
>
> Refer to The Big Picture Of Scripts to better understand the basic concept of scripts.

Users may require instructions in order to perform certain tasks. You may set up scripts that step a user through your business processes. For example, you might want to create scripts to help users do the following:

- Add a new person to an existing account
- Set up a customer to pay automatically

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- Modify a customer who no longer wants to receive marketing information
- Modify a customer's web password
- Record a trouble order
- Merge two accounts into one account
- Fix a bill with an invalid rate

Users execute these business processes by initiating BPA scripts (BPA). Users can also define their favorite BPA scripts in their user preferences.

BPA scripts may be designed by either of the following approaches:

- **Self-contained** and standalone flows. With this approach, the script is executed as an independent flow that cannot interact with the current application pages. Every step in these flows is contained within the script itself, including prompting for additional information from the user and performing server functions etc.
- **Guiding** flows that surf on top of one or more application pages and interact with these pages in parallel to script execution.

> ⚠ **Caution**
>
> This approach is considered legacy functionality and as such limited to fixed pages. It does not work with portal pages. With portals being the product's modern user interface technology, the overall support for this type of BPA scripts is planned to be deprecated in a future release.

> ⚠ **Caution**
>
> Future upgrade issues. There may be times when fixed pages are changed or converted to portals to leverage modern user experience capabilities. Such changes made by the base-package will necessitate a redesign of these guided flows. Please refer to the release notes for such changes.

The topics in this section describe background topics relevant to BPA scripts.

- How To Invoke Scripts
- Developing and Debugging Your BPA Scripts
- Launching A Script From A Menu
- Launching A Script When Starting The System
- Executing A Script When A To Do Entry Is Selected
- The Big Picture Of Script Eligibility Rules

How To Invoke Scripts

Refer to Initiating Scripts for a description of how end-users initiate scripts.

The **Accessibility Option** setting for a BPA script may be used to control how it can be initiated. Set this value to **Accessible from Script Menu** for any script that may be launched as a stand-alone script. Scripts with this configuration may be linked to a navigation option so that they may be invoked from a menu and may be configured by a user as a favorite script. Set this value to **Not Accessible from Script Menu** for any script that cannot be launched on

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its own. For example, any script that is a invoked as a sub-script from another script should have this setting. In addition, any script that is designed to be launched from within a specific portal where certain data is provided to the script should include this setting.

Developing and Debugging Your BPA Scripts

We recommend considering the approaches outlined below when you construct scripts.

While designing your scripts, determine the most maintainable way to set them up. Rather than creating complex, monolithic scripts, we recommend dividing scripts into smaller sections. For example

- Determine if several scripts have similar steps. If so, set up a script that contains these common steps and invoke it from the main scripts using a **Perform script** step.
- Determine if a large script can be divided into logical sections. If so, set up a small script for each section and create a "master script" to invoke each sub script via a **Transfer control** step.

For debugging purposes, you may find it helpful to categorize the step types into two groups: those that involve some type of activity in the script area, and those that don't. The following step types cause activity in the script area: **Height**, **Display text**, **Prompt user**, **Input data**, **Input Map**, **Set focus to a field**.

> ⚠ **Caution**
>
> Guiding scripts that interact with the user using the script area are limited to surf over fixed pages only and are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

The rest of the step types are procedural and involve no user interaction. There are two techniques you can use to assist in debugging these step types.

- You can instruct the system to display text in the script area.
- You can display an entire data area (or a portion thereof) in the script area by entering **%+...+%** where **...** is the name of the node whose element(s) should be displayed.

> ⓘ **Note**
>
> **Time saver.** When you develop a new BPA script, change your user preferences to include the script as your first "favorite". This way, you can press `Ctrl+Shift+1` to invoke the script (eliminating the need to select it from the script menu).

Launching A Script From A Menu

You can create menu items that launch BPA scripts rather than open a page. To do this, create a navigation option that references your script and then add a menu item that references the navigation option.

If the navigation option is referenced on a context menu and the navigation option has a "context field", a temporary storage variable will be created and populated with the unique identifier of the object in context. For example, if you add a "script" navigation option to the bill context menu and this navigation option has a context field of BILL_ID, the system will create a

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temporary storage variable called BILL_ID and populate it with the respective bill id when the menu item is selected.

Launching A Script When Starting The System

You can set the system to launch a script upon startup. This may be used for integrations from an external system or for use cases within the application where a link has been configured to launch the application in a new browser tab, allowing the original page to remain open. Refer to Creating Application Links in External Applications for details of what is supported.

Executing A Script When A To Do Entry Is Selected

The system creates To Do entries to highlight tasks that require attention (e.g., records in error). Users can complete many of these tasks without assistance. However, you can set up the system to automatically launch a script when a user selects a To Do entry. For example, consider a To Do entry that highlights a bill that's in error due to an invalid mailing address. You can set up the system to execute a script when this To Do entry is selected by a user. This script might prompt the user to first correct the customer's default mailing address and then re-complete the bill.

The following points provide background information to help you understand how to implement this functionality:

- Every To Do entry references a To Do type and a message category and number. The To Do type defines the category of the task (e.g., bill errors). The message number defines the specific issue (e.g., a valid address can't be found.). Refer to The Big Picture of System Messages for more information about message categories and numbers.
- When a user drills down on a To Do entry, either a script launches OR the user is transferred to the transaction associated with the entry's To Do type. You control what happens by configuring the To Do type accordingly:
  - If you want to launch a script when a user drills down on an entry, you link the script to the To Do type and message number. Keep in mind that you can define a different script for every message (and some To Do types have many different messages).
  - If the system doesn't find a script for an entry's To Do type and message number, it transfers the user to the To Do type's default transaction.

> **Note**
>
> **How do you find the message numbers?** We do not supply documentation of every To Do type's message numbers (this list would be impossible to maintain and therefore untrustworthy). The best way to determine which message numbers warrant a script is during pre-production when you're testing the system. During this period, To Do entries will be generated. For those entries that warrant a script, simply display the entry on To Do maintenance. On this page, you will find the entry's message number adjacent to the description.

- These types of scripts invariably need to access data that resides on the selected To Do entry. Refer to How To Use To Do Fields for the details.

The Big Picture Of Script Eligibility Rules

You can configure eligibility criteria on the scripts to limit the scripts that a user sees in the script search. For example, you could indicate a script should only appear on the script menu if

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the user belongs to the level 1 customer service representative group. You may also indicate that a script should only appear if the data a user is viewing has certain criteria. For example, if you are using Oracle Utilities Customer Care and Billing, you can indicate that a script should only appear if the current account's customer class is residential. By doing this, you avoid presenting the user with scripts that aren't applicable to the current data in context or the user's role.

The topics in this section describe eligibility rules.

- Script Eligibility Rules Are Not Strictly Enforced
- You Can Mark A Script As Always Eligible
- You Can Mark A Script As Never Eligible
- Criteria Groups versus Eligibility Criteria
- Defining Logical Criteria
- Examples Of Script Eligibility Rules

Script Eligibility Rules Are Not Strictly Enforced

The script search gives a user a choice of seeing all scripts or only scripts that are eligible (given the current data in context and their user profile). This means that it's possible for a script that isn't eligible for the given context data / user to be executed via this search. In other words, the system does not strictly enforce a script's eligibility rules.

It might be more helpful to think of eligibility rules as "highlight conditions". These "highlight conditions" simply control whether the script appears in the script search when a user indicates they only want to see eligible scripts.

You Can Mark A Script As Always Eligible

If you don't want to configure eligibility rules, you don't have to. Simply indicate that the script is always eligible.

You Can Mark A Script As Never Eligible

If you have scripts that you do not want a user to select from the script menu, indicate that it is never eligible. An example of a script that you wouldn't want a user to select from the menu is one that is launched when a To Do entry is selected. These types of scripts most likely rely on data linked to the selected To Do entry. As a result, a user should only launch scripts of this type from the To Do entry and not from the script menu.

Criteria Groups versus Eligibility Criteria

Before we provide concrete examples of eligibility criteria, we need to explain two concepts: Criteria Groups and Eligibility Criteria. A script's criteria groups control whether a user is eligible to choose a script. At a high level, it works like this:

- A criteria group has one or more eligibility criteria. A group's criteria control whether the group is considered true or false.
- When you create a group, you define what should happen if the group is true or false. You have the following choices:
  - The user is eligible to choose the script.
  - The user is not eligible to choose the script.
  - The next group should be checked.

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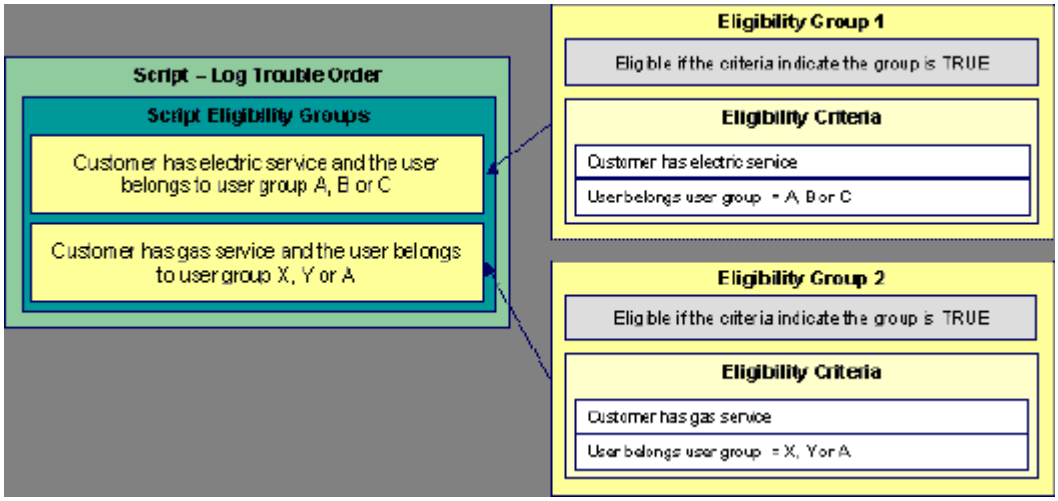
We will use the following example from Oracle Utilities Customer Care and Billing to help illustrate these points. Assume a script is only eligible if:

- The customer has electric service and the user belongs to user group A, B or C.
- OR, the customer has gas service and the user belongs to user group X, Y or A.



This script requires two eligibility groups because it has two distinct conditions:

- IF (Customer has electric service AND (User belongs to user group A, B or C))
- IF (Customer has gas service AND (User belongs to user group X, Y or A))

If either condition is true, the script is eligible.

You would need to set the following criteria groups in order to support this requirement:

Group No.	Group Description	If Group is True	If Group is False
1	Customer has electric service and the user belongs to user group A, B or C	**Eligible**	**Check next group**
2	Customer has gas service and the user belongs to user group X, Y or A	**Eligible**	**Ineligible**

The following criteria are required for each of the above groups:

Group 1: Customer has electric service and the user belongs to user group A, B or C				
Seq	Logical Criteria	If Eligibility Criteria is True	If Eligibility Criteria is False	If Insufficient Data
10	Customer has electric service	**Check next condition**	**Group is false**	**Group is false**
20	User belongs to user group A, B or C	**Group is true**	**Group is false**	**Group is false**

Group 2: Customer has gas service and the user belongs to user group X, Y or A				
Seq	Logical Criteria	If Eligibility Criteria is True	If Eligibility Criteria is False	If Insufficient Data

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10	Customer has gas service	**Check next condition**	**Group is false**	**Group is false**
20	User belongs to user group X, Y or A	**Group is true**	**Group is false**	**Group is false**

The next section describes how you might configure the specific logical criteria in each of the groups.

Defining Logical Criteria

When you set up an eligibility criterion, you must define two things:

- The field to be compared
- The comparison method

You have the following choices in respect of identifying the *field to be compared* :

- You can execute an algorithm to retrieve a field value from somewhere else in the system.
- Some products may support choosing a characteristic linked to an appropriate object in the system (such as an account or person).

You have the following choices in respect of identifying the *comparison method*:

- You can choose an operator (e.g., >, <, =, BETWEEN, IN, etc.) and a comparison value.
- You can execute an algorithm that performs the comparison (and returns True, False or Insufficient Data). This is also a very powerful feature, but it's not terribly intuitive. We'll present a few examples later in this section to illustrate the power of this approach.

The Examples Of Script Eligibility Rules provide examples to help you understand this design.

Examples Of Script Eligibility Rules

The topics in this section provide examples about how to set up script eligibility rules.

- A Script With A Time Span Comparison
- A Script With Service Type Comparison

A Script With A Time Span Comparison

A script that is only eligible for senior citizens has the following eligibility rules:

- Customer class = Residential
- Birth date equates to that of a senior citizen

These rules require only one eligibility group on the script. It would look as follows:

Group No.	Group Description	If Group is True	If Group is False
1	Residential and Senior Citizen	**Eligible**	**Ineligible**

The following criteria will be required for this group:

Group 1: Residential, Calif, Senior

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Seq	Field to Compare	Comparison Method	If True	If False	If Insufficient Data
10	Algorithm: retrieve account's customer class	= R	**Check next condition**	**Group is false**	**Group is false**
30	Person characteristic: Date of Birth	Algorithm: True if senior	**Group is true**	**Group is false**	**Group is false**

The first criterion is easy; it calls an algorithm that retrieves a field on the current account. This value, in turn, is compared to a given value. If the comparison results in a True value, the next condition is checked. If the comparison doesn't result in a True value, the **Group is false** (and, the group indicates that if the group is false, the script isn't eligible).

The last criterion contains a time span comparison. Time span comparisons are used to compare a date to something. In our example, we have to determine the age of the customer based on their birth date. If the resultant age is > 65, they are considered a senior citizen. To pull this off, you can take advantage of a comparison algorithm supplied with the base script as described below.

- Field to Compare. The person characteristic in which the customer's birth date is held is selected.
- Comparison Method. We chose a comparison algorithm that returns a value of **True** if the related field value (the customer's date of birth) is greater than 65 years (refer to `SECC-TIMESPN` for an example of this type of algorithm). Note that this time span algorithm can be used to compare days, weeks and months as well.

You'll notice that if a value of **True** is returned by the **True if senior** algorithm, the group is true (and we've set up the group to indicate a true group means the script is eligible).

A Script With Service Type Comparison

Imagine a script that is only eligible if the current customer has gas service and the user belongs to user groups A, B or C. This script would need the following eligibility rules:

- Customer has gas service
- User belongs to user group A, B, or C

These rules require only one eligibility group on the script. It would looks as follows:

Group No.	Group Description	If Group is True	If Group is False
1	Has gas service and user is part of user group A, B or C	**Eligible**	**Ineligible**

The following criteria are required for this group:

Group 1: Has gas service and user is part of user group A, B, or C

Seq	Field to Compare	Comparison Method	If True	If False	If Insufficient Data
10	Algorithm: check if customer has gas service	= True	**Check next condition**	**Group is false**	**Group is false**

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20	Algorithm: check if user belongs to user group A, B or C	= True	**Group is true**	**Group is false**	**Group is false**

Both criteria are similar - they call an algorithm that performs a logical comparison. These algorithms are a bit counter intuitive (but understanding them provides you with another way to implement complex eligibility criteria):

The first criterion works as follows:

- Field to Compare. We chose a "field to compare" algorithm that checks if the current account has service agreements that belong to a given set of service types. It returns a value of **True** if the customer has an active service agreement that matches one of the service types in the algorithm. In our example, the "check if customer has gas service" algorithm returns a value of **True** if the customer has at least one active service agreement whose SA type references the gas service type. The "check if customer has electric service" algorithm is almost identical, only the service type differs.
- Comparison Method. We simply compare the value returned by the algorithm to True and indicate the appropriate response.

The second criterion works similarly:

- Field to Compare. We chose a "field to compare" algorithm that checks if the user belongs to any user group in a set of user groups. It returns a value of **True** if the user belongs to at least one user group defined in parameters of the algorithm. Refer to algorithm type `SECF-USRNGRP` for an example of this type of logic.
- Comparison Method. We simply compare the value returned by the algorithm to True and indicate the appropriate response.

> **Note**
>
> **Bottom line.** The "field to compare" algorithm isn't actually returning a specific field's value. Rather, it's returning a value of **True** or **False**. This value is in turn, compared by the "comparison method" and the group is set to true, false or check next accordingly.

The Big Picture Of Server-Based Scripts

> **NOT_SUPPORTED**
>
> Refer to The Big Picture Of Scripts to better understand the basic concept of scripts.

Server-based scripts allow an implementation to configure backend business processes. The system supports three types of server-based scripts, `Plug-In` scripts, **Service** scripts and **Groovy Library** scripts.

- Plug-in scripts allow an implementation to develop routines that are executed from the system's various plug-in spots. For example, an implementation could configure a plug-in script that is executed every time an adjustment of a given type is frozen.

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- Service scripts allow an implementation to develop common routines that are invoked from both front-end and back-end services. For example, an implementation could create a service script that terminates an account's automatic payment preferences. This service script could be invoked from a BPA script initiated by an end-user when a customer asks to stop paying automatically, and it could also be executed from a plug-in script if a customer fails to pay their debt on time. Service scripts are typically written using xpath scripting.
- Groovy Library scripts allow an implementation to develop groups of common routines written in the Groovy language which may be invoked from **Groovy Member** step types.

The topics in this section describe background topics relevant to server-based scripts.

- Additional Coding Options For Server Scripts
- Plug-In Scripts
- Service Scripts
- Groovy Library Scripts
- Debugging Server-Based Scripts

Additional Coding Options For Server Scripts

Server based scripts often perform complex functions best supported by coding in languages with more comprehensive command sets than the base script steps. The system supports two common third-party languages for this purpose.

XML Path Language (XPath) is a language for querying and evaluating elements or nodes in an XML document. XPath commands and expressions can be used directly within edit data step types. The script engine version is used to define the applicable XPath version.

Groovy is an object-oriented, dynamic language for the Java platform. The framework supports the use of Groovy within server-based scripts to provide restricted and controlled access to Java-like code, particularly for cloud based implementations. The following topic provides more information on how to incorporate Groovy code into scripts.

- Using Groovy Within Scripts

Using Groovy Within Scripts

Groovy code can be incorporated in scripts using the step type **Groovy Members**. For each script with Groovy code, there will be a single Groovy class created by concatenating all **Groovy Members** steps.

For security, the product and third party Java classes available for scripting in Groovy are restricted. The allowable base classes may be viewed in the Groovy Javadocs viewer via the 'Java Docs' action in the Script portal. The list of allowable third party classes can be viewed via the 'Third Party Groovy Allowlist' action also in the Script portal.

> **Note**
>
> This system supports the use of Groovy for back end processing purposes. It is not intended for user interfaces. Groovy is also not applicable to BPA scripts.

Groovy Script Engine

For scripts invoked from within Java and entirely written in Groovy should use a script engine version of **Groovy**. The system processes this type of script in a similar way to code written in

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Java. This avoids the need to convert the script to and from XML format and allows the use of code that acts directly on the system objects with consequent performance benefits.

The following script types support the Groovy engine version:

Plug In Scripts

Plug-in Scripts can be configured to use the Groovy engine if they contain only Groovy oriented step types. The system provides an automatically generated superclass that defines the plug-in spot API. Internally, the Groovy code must conform to the system conventions for Java based algorithm types, including the inclusion of an 'invoke' method that is the plug-in entry point, and the definition of 'soft' parameters using annotations.

Groovy Library Scripts

Groovy Library Scripts provide the ability to create groups of common routines written in Groovy that can be called from within other scripts. Scripts of this type must include a single step type of **Groovy Library Interface** in which the publicly available methods in the library are listed. The supporting code for those methods is defined in one or more **Groovy Members** step types within the library script. The methods defined in the library can accept arguments and return values of any type. Scripts of this type use the Groovy engine by default and cannot include scripting step types.

Scripts that need to invoke methods from a Groovy library can use the createLibraryScript method provided by the system to instantiate the library interface. Ensure that the class being instantiated includes the .class filename extension.

Invoking Groovy within the Scripting Engine

If a plug-in script or a service script is configured to use a scripting engine version, it can include a mixture of regular and **Groovy Members** step types. The script step types will define the process to be executed. The **Groovy Members** steps contain code that can be called from **Edit Data** step types within the script using the **invokeGroovy** command. Only Groovy methods that receive no arguments and return void are supported using this command. Refer to the section on edit data steps for more details.

For scripts using this option, the framework provides a superclass containing methods that support common scripting actions such as move commands, string evaluation, and methods to invoke business objects, business services and service scripts. Refer to the Groovy specific Javadocs for details of the supported methods.

Importing Groovy Classes

All the Groovy classes used by your script should be explicitly declared in a **Groovy Imports** step type. When saving a script, if the system finds classes referenced in the script that are not explicitly declared, the system issues a warning and automatically adds import statements for the classes. Script writers should review the imports to confirm that they are the correct classes (in case there is a class with the same name in two different packages).

Backward Compatibility

In previous releases, the system did not require explicit imports and had logic to automatically import all callable classes available to Groovy at run-time. For any existing script that does not explicitly declare its imports, the system continues to fall back on importing all callable classes at runtime. However, the recommendation is to identify and update any such script as this is not the recommended practice.

The system provides a batch program `F1-CAGVY` that reports all scripts that required the automatic import step to successfully compile. In addition, this batch program is useful when the version of Groovy is upgrade to proactively detect possible issues in compilation of existing

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scripts that may occur due to changes in Groovy. Implementations are encouraged to run this batch program in the short term to identify and fix any scripts missing explicit imports and also for any Groovy version upgrade to review any implementation owned scripts that may be reported.

Complex SQL Statements in Groovy

> **Important**
>
> Whenever you are designing an SQL statement, it is strongly recommended to work with your DBA to ensure the query meets performance standards.

There is a string size limitation in Groovy of 65,535 when using createPreparedStatement. This section highlights valid syntax to use to get around this limitation, without the risk of SQL injection.

Technique 1 - Simple String Concatenation with '+'

The createPreparedStatement method supports concatenating multiple long strings using the + (plus) operator as a connector.

```
def query = createPreparedStatement("SELECT * FROM TABLE_NAME"
+ "WHERE FIELD_A = 'VALUE1'"
+ "AND FIELD_B = 'VALUE2'"), 'My Query');
```

Technique 2 - Special Method in Prepared Statement

The system provides a method concatenateGroovyStrings which accepts varargs of strings:

```
concatenateGroovyStrings(String... args)
```

This method may be used directly in createPreparedStatement as an argument:

```
def query = createPreparedStatement(concatenateGroovyStrings("SELECT* ",
"FROM TABLE_NAME", "My query");
```

Technique 3 - Reference a Variable in Prepared Statement

The system supports defining a variable as the first argument in createPreparedStatement as long as the variable was built using the concatenateGroovyStrings method.

```
def concatStr = concatenateGroovyStrings("SELECT * ", "FROM ", "TABLE_NAME");
def query = createPreparedStatement(concatStr, "My Query");
```

The system validates that the variable used as an argument was created using the concatenateGroovyStrings method. The system also supports a straight reassignment of the variable.

```
def concatStr = concatenateGroovyStrings("SELECT * ", "FROM ", "TABLE_NAME");
def newStr = concatStr;
def query = createPreparedStatement(newStr, "My Query");
```


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Following on with this one, the prepared statement can combine strings and variables, as long as the variable was created using the concatenateGroovyStrings method.

```
if (restrictByField()){
def fieldClause = concatenateGroovyStrings(" AND FIELD_NAME = 'VALUE'");
}
def query = createPreparedStatement("SELECT * FROM TABLE_NAME WHERE OWNER_FLG
= 'CM'" + fieldClause, "My Query");
```

Handling Elements in an Array

When attempting to build an SQL statement, you may have use cases that require looping through a list and dynamically adding content to the SQL statement from within the list. Additional helper methods are provided for these more complex use cases.

Use Case 1: Include one or more values in an "in" clause.

If you have a dynamic list of values that you want to include in an "in" clause, the following helper method handles generating the bind variables.

```
concatenateSqlInClause(String columnExpr, String bindName, int start, int
count)
```

The columnExpr and bindName should be string literals. Example: you have a list of To Do Types and you want to include that list in an "in" clause.

```
def sql = concatenateGroovyStrings("SELECT TD_ENTRY_ID FROM CI_TD_ENTRY",
                  "WHERE ENTRY_STATUS_FLG <> 'C'",
                  "AND",
         concatenateSqlInClause("TD_TYPE_CD", ":tdType", 1,
tdTypeInputCount),"
         )
```

The result of the above would be the following if there are 5 To Do Types in the list:

```
SELECT TD_ENTRY_ID FROM CI_TD_ENTRY WHERE ENTRY_STATUS_FLG <> 'C'
                  AND TD_TYPE_CD IN
(:tdType1,:tdType2,:tdType3,:tdType4,:tdType5)
```

Use Case 2: Create a Bind Name with an index

The following helper method allows you to create bind names for use in creating an SQL statement:

```
concatenateBindName(String bindName, int index)
```

For example, within a 'for' loop where 'i' is the index name,

```
concatenateBindName(:tdType, i)
```

The results of this method can be added to the SQL statement being prepared using concatenateGroovyStrings.

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> **Note**
>
> Use the Script query > Step Information search option to look for base scripts that use the helper method to find examples of this technique.

Use Case 3: Using the index value

There may be use cases where you need the literal value of an index variable. For this use case, the following method is available:

```
literalFor(int i)
literalFor(long l)
```

This may be used to dynamically build the column names, for example when you want to search for records by the prime key value and the number of prime keys is variable. Example:

```
String sql = concatenateGroovyStrings("SELECT * FROM F1_MO_UPD WHERE ")
for (int i = 1; i <= pkCount; i++) {
    sql = concatenateGroovyStrings(sql, "PK_VALUE", literalFor(i), " = ",
concatenateBindName(":pkVal", i))
    if (i < pkCount) {
        sql = concatenateGroovyStrings(sql, " AND ")
    }
```

For an object that has a two-part primary key, the above result is as follows:

```
SELECT * FROM F1_MO_UPD WHERE PK_VALUE1 = :pkVal1
    AND PK_VALUE2 = :pkVal2
```

Plug-In Scripts

> **Note**
>
> This section assumes you are familiar with the notion of plug-in spots (algorithm entities) and plug-ins. See The Big Picture Of Algorithms for more information.

As an alternative to writing a java program for a plug-in spot, the framework supports creating plug-ins using the defined script steps, Xpath commands, Groovy code or a combination of these three options.

The following topics describe basic concepts related to plug-in scripts.

- A Plug-In Script's API
- Setting Up Plug-In Scripts

A Plug-In Script's API

Like program-based plug-ins, plug-in scripts:

- Run on the application server.

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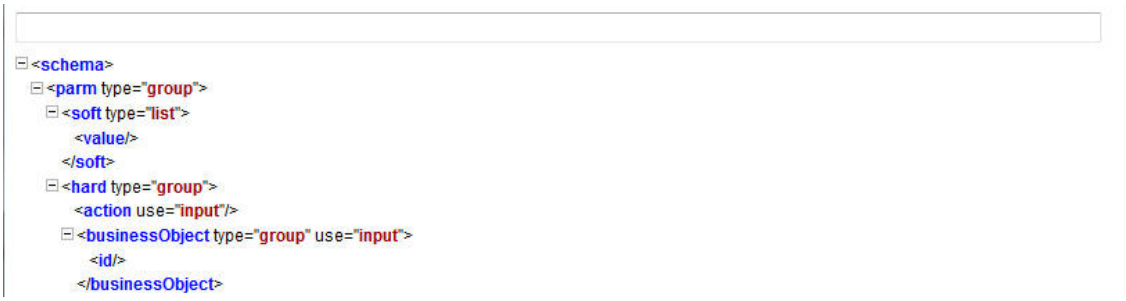
- Have their API (input / output interface) defined by the plug-in spot (i.e., plug-in scripts do not get to declare their own API).
- Can only be invoked by the "plug-in spot driver".

For plug-ins configured to use a script engine version, the best way to understand the script's API is to use the **View Script Schema** hyperlink to view its parameters data area schema.



Notice the two groups: soft and hard. If you are familiar with plug-in spots, you'll recognize these as the classic soft and hard parameters:

- The **soft** parameters are the values of the parameters defined on the algorithm. Notice they are not named - if you want to reference them in your plug-in script, you must do it by position.
- The **hard** parameters are controlled by the plug-in spot (i.e., the algorithm entity). Notice that this plug-in spot has a single input parameter called " **businessObject/id"**. Also notice the `use=` attribute - this shows that this parameter is input-only (i.e., you can't change it in the plug-in script).

> **Note**
>
> **XPath.** You can click on an element name to see the XPath used to reference the element in your script.

Plug-ins configured to use the **Groovy** engine version do not use an XML interface for the API and instead are processed in the same way as Java algorithms. The framework supplies a dynamically generated superclass that implements the plug-in spot for Groovy objects. Use the **View Script Superclass** hyperlink to view this superclass and the methods to set and get the hard parameters.

> **Note**
>
> For plug-in scripts using the **Groovy** engine version, soft parameters do not appear in the plug-in spot API as defined by the superclass. Plug-ins using only Groovy code define their soft parameters using annotations, in a similar way to Java algorithms, and fetch those values using methods defined in the algorithm code.

Setting Up Plug-In Scripts

The following points describe how to implement a plug-in script:

- Compose your plug-in script, associating it with the appropriate algorithm entity (plug-in spot).

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- Create a new algorithm type for the respective algorithm entity, referencing your plug-in script as the program to carry out the algorithm type's function. Only plug-in scripts associated with the algorithm entity may be referenced on the algorithm type.
- Set up an algorithm for the respective algorithm type and plug it in where applicable. Refer to Setting Up Algorithm Types for more information.

Service Scripts

BPA scripts run on the client's browser and guide the end-users through business processes. Service scripts run on the application server and perform server-based processing for BPA scripts, zones and more. You may want to think of a service script as a common routine that is set up via scripting (rather than programming).

The following topics describe basic concepts related to service scripts.

- A Service Script's API
- Invoking Service Scripts

A Service Script's API

As with any common routine, a service script must declare its input / output parameters (i.e., its API). A service script's API is defined on its schema.

> **Note**
>
> Refer to Schema Nodes and Attributes for a complete list of the XML nodes and attributes available to you when you construct a schema.

Invoking Service Scripts

Any type of script configured to use a scripting engine version may invoke a service script:

- A BPA script may invoke a service script to perform server-based processing.
- Plug-in scripts may invoke a service script (like a "common routine").
- A service script may call another service script (like a "common routine").

Map zones may be configured to invoke service scripts to obtain the data to be displayed. Refer to Map Zones for more information.

Inbound web services support interaction with service scripts allowing the outside world to interact directly with a service script.

You can also invoke a service script from a Java class.

Groovy Library Scripts

Just as service scripts can define common routines written in scripting language, Groovy library scripts are used to define groups of common components or methods written in Groovy. Groovy library code runs on the application server and performs server-based processing for scripts that utilize Groovy code.

The following topics describe basic concepts related to Groovy library scripts.

- A Groovy Library Script's API

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- Invoking Groovy Library Methods

A Groovy Library Script's API

A Groovy library script's API is composed of one or more public methods whose code is defined in the script's steps. Those methods are defined in a step type of **Groovy Library Interface**. A Groovy library script must have one (and only one) step of this type.

Invoking Groovy Library Methods

Any type of script that supports the **Groovy Members** step type may invoke common methods defined in Groovy library scripts.

Code within a **Groovy Members** step must create an instance of the Groovy library interface definition to enable the interface methods to be invoked. Refer to the topic Using Groovy Within Scripts for more information.

Debugging Server-Based Scripts

The server can create log entries to help you debug your server scripts.

The logs contain a great deal of information including the contents of the referenced data area for **Move data**, **Invoke business object**, **Invoke business service** and **Invoke service script** steps.

Refer to the Debug Mode topic in the Configuration Tools chapter for details of how to execute the application in debug mode.

Defining Scripts

The script maintenance portal is used to maintain your scripts.

You can access the portal from the **Admin Menu**, then **System**, then **Script**. You are brought to a query portal with options for searching for a specific script. Once a script has been selected you are brought to the maintenance portal to view and maintain the selected record.

Scripts may be of the following types: **BPA Script**, **Plug-In Script**, **Groovy Library Script** and **Service Script**. Refer to The Big Picture Of BPA Scripts and The Big Picture Of Server Based Scripts for more information.

> ⚠ **Caution**
>
> Important! If you introduce a new script, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page.

- **Script.** This zone provides information about the selected script. Refer to Securing Script Execution for more information.
- **Steps.** Use this zone to review and maintain the script's steps. You may update a single step or maintain all steps as a list. Refer to How To Set Up Each Step Type for an overview of the step types.

The following zones may appear as part of the portal's **Schema** tab page. This tab page only appears for service scripts and BPA Scripts.

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- **Schema Editor.** This zone allows you to edit the script's schema using the Schema Designer tool. The purpose of the schema is to describe the data elements passed to and from the script.

> **Note**
>
> Refer to Schema Syntax and UI Hint syntax for a complete list of the XML nodes and attributes available to you when you construct a schema.

> **Tip**
>
> Click the **View Schema** hyperlink to view the business object's expanded schema definition. Doing this opens the schema viewer window.

The following zones may appear as part of the portal's **Data Areas** tab page. This tab page does not appear for Groovy Library scripts or plug-in scripts using the **Groovy** engine version.

- **Data Areas.** Use this zone to define the data areas used to pass information to and from the server or any other data area describing your temporary storage. Click on the **View Data Area** action to view the data area's schema in the schema viewer window.

The following zones may appear as part of the portal's **Eligibility** tab page. This tab page only appears for BPA scripts.

- **Script Eligibility.** Use this zone to define a BPA script's eligibility rules. Refer to the guidelines under The Big Picture Of Script Eligibility for more information on how to define this information.

The following zones may appear as part of the portal's **References** tab page.

- **Script References.** This zone list various configuration entities referencing the current script or its schema.

Actions

The page supports the following special actions:

- **View Schema.** Click this link to view the script's expanded schema definition. Doing this opens the schema viewer window. This action is only available for BPA scripts and service scripts.
- **View Script As Text.** Click this link to view the internal scripting commands in a separate window.
- **Test.** Use this action to test your service script of BPA script.
  - For a service script, enter input values and save. The service is performed and output information is presented, but the system issues a roll-back so that the changes are not committed. Note that if your service uses the save-point dispatcher to perform any actions or if it issues a call to an external system, the roll-back does not apply to those actions. If the service issues an error the corresponding message is displayed. Note that the input and output testing user interface is dynamically rendered based on UIHints embedded in the service script's schema. As such, the user interface may be as elaborate or basic as the UIHints in that schema.
  - Testing a BPA script is only applicable to a BPA that does not rely on information passed to it from somewhere else. Because the system cannot detect if this is the

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case for your BPA, the Test button is always visible. Attempting to use it on a BPA that relies on information passed into it may show an error.

> **Note**
>
> This action is secured by a designated "Test a Service" application service and the "Generic Service Executor" application service and also requires security rights for creating a script, which is the alternative way for testing any service. It is recommended to allow access to this function in non-production environments only.

- **Java Docs.** Use this action to launch the Groovy Javadocs viewer.
- **Third Party Groovy Allowlist.** Use this action to review the allowlist of third party Groovy classes and verify the restricted list of classes available for Groovy coding in the script.
- **View Script Supreclass.** Use this action to view the code of the runtime generated superclass for the related plug-in spot's implementation.. This action appears only for plug-in scripts using an engine version of **Groovy**.
- How To Set Up Each Step Type
- Additional Topics

How To Set Up Each Step Type

The contents of this section describe how to set up each type of step. Note that some step types are only applicable for BPA scripts and some step types are only supported for server based scripts. In addition, some BPA script steps are considered legacy functionality and therefore only supported on fixed pages and not portals. Each section indicates whether there are any script type limitations.

- Conditional Branch Steps
- Display Text Steps
- Edit Data Steps
- Go To Steps
- Height Steps
- Input Data Steps
- Invoke Business Object Steps
- Invoke Business Service Steps
- Invoke Function Steps
- Invoke Map Steps
- Invoke Service Script Steps
- Groovy Imports Steps
- Groovy Library Interface Steps
- Groovy Member Steps
- Label Steps
- Mathematical Operation Steps
- Move Data Steps

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- Navigate To A Page Steps
- Perform Script Steps
- Press A Button Steps
- Prompt User Steps
- Set Focus To A Field Steps
- Terminate Steps
- Transfer Control Steps

Conditional Branch Steps

Conditional branch steps allow you to conditionally jump to a different step based on logical criteria. For example, you could jump to a different step in a script if the customer is residential as opposed to commercial. In addition, several fields are required for **Conditional Branch** steps:

Compare Field Type and **Compare Field Name** define the first operand in the comparison. The **Field Type** defines where the field is located. The **Field Name** defines the name of the field. The following points describe each field type:

- **Current To Do Information**. Use this field type when the field being compared resides on the current To Do entry. Refer to How To Use To Do Fields for instructions on how to define the appropriate **Field Name**.
- **Data Area**. Use this field type when the field being compared is one that you put into one of the scripts data areas in an earlier step. **Field Name** must reference both a data area structure name as well as the field, for example "parm/charType". Refer to How To Reference Fields In Data Areas for instructions on how to construct the appropriate **Field Name**.
- **Page Data Model**. Use this field type when the field being compared resides on one of the tab pages in the object display area. Refer to How To Find The Name Of Page Data Model Fields for instructions on how to find the appropriate **Field Name**.
- **Predefined Value**. Use this field type when the field being compared is a global variable.
- **Temporary Storage**. Use this field type when the field being compared is one that you put into temporary storage in an earlier step. The **Field Name** must be the same as defined in an earlier step.
- **User Interface Field**. Use this field type when the field being compared resides on the currently displayed tab page. Refer to How To Find The Name Of User Interface Fields for instructions on how to find the appropriate **Field Name**.

Condition defines the comparison criteria:

- Use >, <, =, >=, <=, <> (not equal) to compare the field using standard logical operators. Enter the comparison value using the following fields.
- Use **In** to compare the first field to a list of values. Each value is separated by a comma. For example, if a field value must equal `1`, `3` or `9`, you would enter a comparison value of `1,3,9`.
- Use **Between** to compare the field to a range of values. For example, if a field value must be between `1` and `9`, you would enter a comparison value of `1,9`. Note, the comparison is inclusive of the low and high values.

Comparison Field Type, **Comparison Field Name** and **Comparison Value** define what you're comparing the first operand to. The following points describe each field type:

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- **Current To Do Information**. Use this field type when the comparison value resides on the current To Do entry. Refer to How To Use To Do Fields for instructions on how to define the appropriate **Field Name**.
- **Data Area**. Use this field type when the comparison value resides in one of the scripts data areas. **Field Name** must reference both a data area structure name as well as the field, for example "parm/charType". Refer to How To Reference Fields In Data Areas for instructions on how to construct the appropriate **Field Name**.
- **Page Data Model**. Use this field type when the comparison value resides on one of the tab pages in the object display area. Refer to How To Find The Name Of Page Data Model Fields for instructions on how to find the appropriate **Field Name**.
- **Predefined Value**. Use this field type when the field being compared is a constant value defined in the script. When this field type is used, use **Comparison Value** to define the constant value. Refer to How To Use Constants In Scripts for instructions on how to use constants.
- **Temporary Storage**. Use this field type when the comparison value is a field that you put into temporary storage in an earlier step. The **Field Name** must be the same as defined in an earlier step.
- **User Interface Field**. Use this field type when the comparison value resides on the currently displayed tab page. Refer to How To Find The Name Of User Interface Fields for instructions on how to find the appropriate **Field Name**.

> **Note**
>
> **Conditional field types.** The field types **Current To Do Information**, **Page Data Model** and **User Interface Field** are only applicable to BPA scripts. Only the field types **Temporary Storage** and **Predefined Value** are applicable when the Condition is **In** or **Between**.

The above fields allow you to perform a comparison that results in a value of **TRUE** or **FALSE**. The remaining fields control the step to which control is passed given the value:

- **If True, Go to** defines the step that is executed if the comparison results in a **TRUE** value.
- **If False, Go to** defines the step that is executed if the comparison results in a **FALSE** value.

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> **Note**
>
> **Numeric Comparison**. Comparison of two values may be numeric or textual (left-to-right). Numeric comparison takes place only when values on both side of the comparison are recognized as numeric by the system. Otherwise, textual comparison is used. Fields for **Current To Do Information**, **Data Area**, **Page Data Model**, and **User Interface Field** types are explicitly associated with a data type and therefore can be recognized as numeric or not. This is not the case for fields residing in **Temporary Storage** or those set as **Predefined Values**. A **Temporary Storage** field is considered numeric if it either holds a numeric value moved to it from an explicitly defined numeric value (see above) or it is a resultant field of mathematical operation. A **Predefined Value** field is considered numeric if the other field it is compared to is numeric. For example, if a numeric field is compared to a **Predefined Value** the latter is considered numeric as well resulting in numeric value comparison. However, if the two fields are defined as **Predefined Values** the system assumes their values are text strings and therefore applies textual comparison.

Display Text Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

> **Caution**
>
> Guiding scripts that interact with the user using the script area are limited to surf over fixed pages only and are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

Display text steps cause a text string to be displayed in the script area. Steps of this type can be used to provide the user with guidance when manual actions are necessary. In addition, they can be used to provide confirmation of the completion of tasks.

The information you enter in the **Text** field is displayed in the script area when the step is executed.

The text string can contain substitution variables and HTML formatting commands. Also note that for debugging purposes, you can display an entire data area (or a portion thereof) by entering **%+...+%** where **...** is the name of the node whose element(s) should be displayed.

Edit Data Steps

Edit data steps provide a free format region where you can specify commands to control your script processing.

Enter your scripting commands in the **Edit Data Text** field. Click the adjacent icon to open a window providing more space for defining the edit data step.

In general, the syntax available within edit data mimics the commands available within the explicit step types. However, there are a few commands that are available only within edit data. For example, the two structured commands: **For**, and **If**.

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> **Note**
>
> Not all BPA step types are supported using the edit data syntax. Refer to the details below for more information on edit data commands and examples.

The topics in this section provide detail of the syntax supported in the edit data step type.

Comments

You can place comments into your script using the double slash notation `//` in the first two characters of the edit data step. Example:

```
//
// quit with error
//
if ("not(customer/securityEnabled)")
terminate with error (8000, 1001 %1="customer/id" %2='not allowed');
end-if;
```

Temporary Variables

Temporary variables can be declared within all types of scripts. They should be referenced by a leading single dollar sign ('$'). However, temporary variables behave differently in the various script types:

- In BPA Scripts temporary variables remain persistent from one BPA script to another (refer to the Perform Script and Transfer Control statements), which means that you can use temporary variables to communicate between BPA scripts.
- Temporary variables cannot be passed from a BPA script to a service or plug-in script. Only data area elements can be passed between these types of scripts.
- Within service and plug-in scripts, temporary variables remain persistent only for the life of the particular script that declared the variable. This means that temporary variables cannot be passed between plug-in scripts and service scripts, only global variables, context variables and data area elements can be passed between these types of scripts.

Declaring / Initializing / Defaulting Temporary Variables

When using a temporary variable, it should be declared or initialized with an appropriate value before using it. A typical method for declaring a variable is to simply move data to it in a move statement, for example.

```
move "0" to $index;
```

> **NOT_SUPPORTED**
>
> Refer to Move to a Temporary Variable for more information on implicit declaration of a temporary variable within a move statement.

For BPA scripts, as mentioned above, temporary variables may be passed from one BPA script to another. As such, it is common to reference a temporary variable in a BPA that should have been initialized by a previous BPA. However, if there is any reason that a temporary variable did not get initialized by a previous BPA, a reference to it will cause an error. It is good practice,

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therefore, to use the **default** statement that will initialize temporary variables that are not already created / initialized.

- The following statement will initialize the temporary variable $InputAction – but only if the temporary variable has not yet been initialized:

  ```
  default $InputAction;
  ```

- The following statement will set the value of the temporary variable $InputAction to 'read' – but only if the variable has not yet been initialized:

  ```
  default $InputAction as 'read';
  ```

> **Note**
>
> Scripts should take care not to define variables using a reserved keyword. The following table lists the reserved keywords.

Keyword
add
as
asError
bpa
branch
data
declareBO
declareBS
declareDA
declareMap
declareSS
default
delete
edit
element
else
end-edit
end-for
end-if
error
escape
evaluate
fastAdd
fastUpdate
for
goto
if
in
invokeBO
invokeBS

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Keyword
invokeMap
invokeSS
label
map
move
navigate
navigateAndReloadDashboard
null
page
performScript
popup
read
readWithoutVersion
replace
suppress
target
terminate
to
transferControl
update
using
warn
with

Context Variables

Context variables are only available within service scripts. The context variable will be available for the duration of the service script and all that it invokes. Therefore, you can use a context variable within a service script to communicate information to a lower level service script or schema. They should be referenced by leading double dollar signs ('$$').

> **Note**
>
> Because context variables are available for lower level scripts, they may sometimes be referred to as global variables or global context variables. But they should not be confused with global variables.

Declaring / Initializing / Defaulting Context Variables

When using a context variable, it should be declared or initialized with an appropriate value before using it. A typical method for declaring a variable is to simply move data to it in a move statement, for example.

```
move 'context variable' to $$contextVariable;
```


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NOT_SUPPORTED

Refer to Move using a Context Variable for more information.

Move Statement

The **move** statement copies a source value to a target. The following table highlights various options supported in the move statement.

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Statement	Example Description
Move to Element **move "xpath" to "xpath";**	Moves a "tacent" to this Bar. Example "xpath" to "xpath" for "epacem."

> **Note**
>
> An XPath expression is surrounded by double quotes.

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Statement	Example Syntax Explanation
	rmattedValue";

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Statement	Example Description
	Moves a "cement" (with X-Path/Fonts at the "Nature" function.

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Statement	Example Syntax Explanation
	erson/lastName)" to "parm/fullName";

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Statement	Example Description
	Moves a tensor to the X-Path (subspacing/buffer)

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Statement	Example Description
	t,ign.)" to "person/firstName";

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Statement	Example Description
	Moves a tenant with XPath substring/full-name (Neanmen, c't

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Statement	Example Description
	ion)" to "person/lastName";

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Statement	Example Description
	Moves a "stemmer" to the Xpath/substring function.

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Statement	Example Syntax Explanation
	arm/year";

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Statement	Example Description
Move to Element **move 'literal' to "xpath";** **Note** A literal value is surrounded by single quotes.	Moves to the next using a literal string. account/

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Statement	Example Syntax Explanation
	preferences[type="mail"]/text";

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Statement	Example Description
Move to Element **move 'Boolean' to "xpath";**	Moves (a component with Boolean a>0) to the Boolean's storing.

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Statement	Example Syntax Explanation
	true'
	to "account/hasDebitBalance";

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Statement	Example Syntax Explanation
	end-if;

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Statement	Example Description
	Moving a <prescription, which > chresult as in a Bolo Balan.

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Statement	Example Description
	Note that the "filter" or "enable" example below is located </>

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Statement	Example Description
	<n/a><c/o><u/n><d><e></schema> move "boolean(a

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Statement	Example Syntax Explanation
	count[balance>0]) " to " account/hasDe

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Statement	Example Syntax Explanation
	bitBalance";

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Statement	Example Description
Move to Group **move "xpath" to "xpath";**	Moves "tacoelement/customer" to "group" to "with" transother.

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Statement	Example Description
	This system attaches the sequential level of the elements in a

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Statement	Example Description
	mgs and the mengroup/olvis t"ance sofurom/ches ourcfes/che"m

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Statement	Example Description
	at to the "parsons/chem" a. For lists and groups, the de

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Statement	Example Syntax Explanation
	fault behavior is to move all elements within the s

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Statement	Example Syntax Explanation
	source group/list to the target group/list (eveni

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Statement	Example Syntax Explanation
	f the yare not defined in the target group/list). Th

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Statement	Example Syntax Explanation
	ebusinessserviceF1-MoveByNamemaybeusedform

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Statement	Example Description
	or regranular control of the move (without having t

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Statement	Example Description
	o define each individual movestatement).

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Statement	Example Description
Move using a Temporary Variable	When moving to a temporary location (Temporary Variable, Temporary Variable)

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Statement	Example Description
	[illegible]

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Statement	Example Description
	arsonCe;ildCount;

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Statement	Example Description
	When moving from a "Arcomatic Balance" to a "variable" pattern/variable

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Statement	Example Description
	Least Variable "Sys.Variable" by double quotes. **move $variab**

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Statement	Example Syntax Explanation
	le "to “xpath”;

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Statement	Example Description
Move using a Context Variable **move "xpath" to $$variable;** **move $$variable to “xpath”;**	Context variables, value or target, are interpreted

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Statement	Example Description
	cardinal hour/any double quotes. move from a c

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Statement	Example Syntax Description
	ontext variable.move $ $contextVari

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Statement	Example Syntax Explanation
	able to "MarketMessage/sender";

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Statement	Example Description
Move using a Dynamic Location **move "xpath" | 'literal' to evaluate("xpath" | $variable);** **move evaluate("xpath" | $variable) to "xpath" | $variable;**	The evaluate statement allows you to move a dynamic location

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Statement	Example Description
	Example Description

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Statement	Example Description
	"evaluate("

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Statement	Example Syntax Description
	schemaLocation") to $Variable;// mo

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Statement	Example Syntax Description
	ve evaluate($Variable) to "schemaLoc

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Statement	Example Syntax Explanation
	ation";

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Statement	Example Syntax and Description
Move escape **move escape("xpath" | $variable) to "xpath" | $variable;**	Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]"; Move escape($variable) to "//*[contains(text(),'&')]"; Move escape("//*[contains(text(),'&')]") to $variable; Move escape($variable) to $variable; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes" doctype "mydoctype"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes" doctype "mydoctype" indent; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes" doctype "mydoctype" indent "2"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes" doctype "mydoctype" indent "2" cdata-section-elements "myelement"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes" doctype "mydoctype" indent "2" cdata-section-elements "myelement" omit-xml-declaration; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes" doctype "mydoctype" indent "2" cdata-section-elements "myelement" omit-xml-declaration media-type "text/xml"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes" doctype "mydoctype" indent "2" cdata-section-elements "myelement" omit-xml-declaration media-type "text/xml" method "xml"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes" doctype "mydoctype" indent "2" cdata-section-elements "myelement" omit-xml-declaration media-type "text/xml" method "xml" escape-uri-attributes "no"; Move escape("//*[contains(text(),'&')]") to "//*[contains(text(),'&')]" validate "myschema.xsd" type "myroot" version "1.0" encoding "UTF-8" standalone "yes" doctype "mydoctype" indent "2" cdata-section-elements "myelement" omit-xml-declaration media-type "text/xml" method "xml" escape-uri-attributes "no" include-content-type "yes";

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Statement	Example Description
	Example Description

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Statement	Example Description
	Our schemes are Locative Value-for HTML content and escapes

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Statement	Example Syntax Explanation
	it, i.e. replaces any HTML-like characters with

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Statement	Example Syntax Explanation
	special characters that are escaped from HTML rend

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Statement	Example Syntax Explanation
	ering. By doing so the text would be displayed as pl

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Statement	Example Syntax Explanation
	a inline text when displayed as part of an HTML element.

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Statement	Example Syntax Explanation

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Statement	Example Syntax Explanation

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Statement	Example Syntax Explanation

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Statement	Example Syntax Explanation

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Statement	Example Syntax Explanation

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Statement	Example Description
Move null **move null to "xpath";**	Remove an empty node in a field or multiple of its scrubbed to the XML instance

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Statement	Example Description
	Document (chrsoughtheresspecialistyrtaxbolfmove')nulg'

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Statement	Example Description
	Note that you can specify either an outline or the

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Statement	Example Description
	Use the expression to ring, or upon a Remove. If you also specify a dg

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Statement	Example Description
	resource tag error tuple or group with a handle such as "ffix" or "element" (with "lobee

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Statement	Example Description
	limit (actual from mpr/sec/sr/ing. Enabled)") mov

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Statement	Example Syntax Explanation
	e n u l l t o " c u s t o m e r / * " ; e n d - i f ;

Go To Statement

The edit data step supports functionality analogous to the Go To step type. The syntax is **goto label;** where the label represents another location within the edit data text field (identified by this label) or represents another step in the script.

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The following is an example of going to another location in the same step identified by the label **addSpouse**.

```
if ("string(parm/spouse/name) != $BLANK")
  goto addSpouse;
end-if;
addSpouse: invokeBO 'Person' using "parm/spouse" for add;
```

The following is an example of going to a different step within the same script. The step sequence is the reference used as the label.

```
if ("string(parm/spouse/name) != $BLANK")
  goto 110;
end-if;
.
.
.
110: invokeBO 'Person' using "parm/spouse" for add;
```

Conditional Branch Statement

The edit data step supports functionality analogous to the Conditional Branch step type. The syntax is **branch ("xpath") goto label else label;** where:

- The XPath condition in the **branch** statement must evaluate to a Boolean value of True or False.
- The targets for the **goto** and **else** statements are labels that represent another location within the edit data text field (identified by this label) or represent another step in the script.

The following example uses labels for **addSpouse** and **addAccount**

```
branch ("string(parm/spouse/name) != $BLANK") goto addSpouse else addAccount;
```

If Statement

The **if** statement is similar to the conditional branch statement. Either can be used to structure the logic of your script. This statement may optionally include an **else** statement but it should always end with an `end-if` statement.

> **Note**
>
> This is an example of a statement that is not represented as a separate step type. It is only available within the edit data text.

The syntax is **if ("xpath") else end-if;**. The XPath condition must evaluate to a Boolean value of True or False. The following are some examples.

Example where the XPath contains a simple logical condition.

```
if ("string(parm/spouse/name) != $BLANK")
  //
  // Create spouse since spouse name present
  goto addSpouse;
else
```


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```
  //
  // Create account without spouse
  goto addAccount;
end-if;
```

Example where the XPath contains a complex condition.

```
if ("string(parm/spouse/name) != $BLANK and string(parm/hasSpouse) = true or
boolean(parm/requireSpouse)")
  //
  // Create spouse since spouse name present
  goto addSpouse;
end-if;
```

Example of a stacked set of statements used to evaluate multiple possible values of a field.

```
if ("parm/rowCount = 0")
  //
  // no rows found
  goto quit;
end-if;
if ("parm/rowCount = 1")
  //
  // one row found
  goto process;
end-if;
if ("parm/rowCount > 1")
  //
  // more than one row found
  goto quit;
end-if;
quit: terminate;
```

The following XPath shows Boolean based on the existence of the node. In this example, if the node exists in the XML instance document being processed, the statement will evaluate to True. If no element is found, the statement evaluates to false.

> **Note**
>
> When treating XPath nodes as Boolean variables be aware that an empty node evaluates to True. Only a missing node return False.

```
if ("boolean(parm/spouse/name)")
  goto addSpouse;
else
  //
  // Create account without spouse
  goto addAccount;
end-if;

if ("not(parm/spouse/name)")
  //
```


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```
  // Create account without spouse
  goto addAccount;
else
  goto addSpouse;
end-if;
```

For Statement

The **for** statement creates a list of nodes or values depending on your XPath expression. If you specify a list node then every child node of the list, along with its contents, will be available within the loop. If you specify a child node directly, then a list of values only will be available within the loop.

> **Note**
>
> For more information on creating new entries in a list, please refer to the creating a new list instance example.

> **Note**
>
> This is an example of a statement that is not represented as a separate step type. It is only available within the edit data text.

The syntax is **for ($variable in "xpathList") end-for;**. The XPath condition must evaluate to a Boolean value of True or False.

The following examples are based on this sample schema:

```
<schema>
  <SAList type="list">
    <id/>
    <balance/>
  </SAList>
  <SAContributor type="list">
    <id/>
  </SAContributor>
</schema>
```

Example that specifies the list node in the XPath expression where all child nodes are available for processing.

```
move "0" to $AccountBalance;
move "0" to $index;
for ($SAList in "SAList")
    move "$SAList/balance + $AccountBalance" to $AccountBalance;
    //
    // keep track of each SA contributing to the balance in the SA
Contributor list
    move "1 + $index" to $index;
    move "$SAList/id" to "SAContributor[$index]/id";
end-for;
```


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Example that specifies a child node within the list node in the XPath expression. Only values of that node are available for processing.

```
move "0" to $AccountBalance;
for ($SABalance in "SAList/balance")
    move "$SABalance + $AccountBalance" to $AccountBalance;
end-for;
```

Example that shows that a filter can be used to limit the rows selected by the **for** loop.

```
move "0" to $AccountDebitBalance;
for ($SAList in "SAList[Balance>0]")
    move "$SAList/balance + $AccountDebitBalance" to $AccountDebitBalance;
end-for;
```

Example that shows the use of a filter when specifying child nodes.

```
move "0" to $AccountCreditBalance;
for ($SABalance in "SAList[Balance<0]/balance")
    move "$SABalance + $AccountCreditBalance"
to $AccountCreditBalance;
end-for;
```

List Processing

This section provides details about processing lists. The examples in this section reference the following schema:

```
<schema>
  <parm type="group">
    <name/>
  </parm>
  <Person type="group">
    <names type="list">
      <type/>
      <name/>
    </names>
  </Person>
</schema>
```

Referencing a List Element. You can move a value to a particular list instance by referencing an identifying node in the list within a filter. The syntax is **move "xpath" to "xpathList[filter]/element";** Example:

```
move "parm/name" to "Person/names[type='main']/name";
```

Creating a New List Instance. A special notation can be used within a move target statement to indicate a new list instance should be created. The "+" indicates to the script processor that a new instance of a list should be initiated for the target element. The syntax is **move "xpath" to "+xpathList";** Example:

```
move "parm/name" to "Person/+names/name";
```


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Deleting a List Instance. An XML list entry can be deleted from the database by moving an action attribute of 'delete' to the element name. To cause a database delete of a list entry requires an attribute of action="delete" in the target node and a subsequent update BO interaction. The syntax is **move 'delete' to "xpathList@action");** Example:

```
if ("parm/action = 'd'")
    move "0" to $index;
    for ($CCList in "CCList")
        move "1 + $index" to $index;
        if ("$CCList/id = parm/id")
            move 'delete' to "CCList[$index]@action";
            goto update;
        end-if;
    end-for;
end-if;
```

The following shows the resulting XML.

```
<root>
  <CCList>
    <id>9876538976</id>
    <balance>309.98</balance>
  </CCList>
  <CCList action="delete">
    <id>4321125899</id>
    <balance>87.45</balance>
  </CCList>
</root>
```

> **Note**
>
> Deleting a list instance through use of the action attribute is risky if iterative BO interactions are required. The XML document that contains the list instance to be deleted will not be altered after a successful BO interaction, which means the document will still contain the list instance even though it no longer exists. To solve this problem, it is essential to re-read the BO after any BO update where the action attribute of 'delete' has been used.

> **Note**
>
> An alternative to the delete attribute described here, is to use the BO action of replace. Manipulating a list to use the replace action avoids the problem described above concerning stale information in request documents post BO update.

Functions for Processing a List

XPath provides several functions that are useful to process elements of a list including **count**, **sum** and **last**.

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The following examples are based on this sample XML document:

```
<xml>
  <ft>
    <type>bill</type>
    <date>20100101</date>
    <amt>30.30</amt>
    <cat>tax</cat>
  </ft>
  <ft>
    <type>adj</type>
    <date>20100301</date>
    <amt>20.20</amt>
    <cat>int</cat>
  </ft>
  <ft>
    <type>bill</type>
    <date>20100201</date>
    <amt>10.10</amt>
    <cat>tax</cat>
  </ft>
</xml>
```

The following is an example of a sum. The syntax is **move "sum(xpathList/element)" to $variable;** The example sums the total balance.

```
move "sum(ft/amt)" to $TotalBalance;
```

The following is an example of a sum using a filter to get a subtotal. The example sums the balance of the entries that have the ‘tax’ category.

```
move "sum(ft[cat='tax']/amt)" to $TaxBalance;
```

The following is an example of a count. The syntax is **move "count(xpathList)" to $variable;** The example finds the count of the number of FT entries in the list.

```
move "count(ft)" to $TranCount;
```

The following is an example of ‘last’, which is used to locate the last entry. The syntax is **move "last(xpathList)" to $variable;** The example finds the last amount in the FT list.

```
move "ft[last()]/amt" to $LastAmount;
```

Declare and Invoke Schema Based Objects

You can invoke a business object, business service or service script within the edit data step. To support the dynamic invoke, a dynamic data area name can be declared.

The schema being declared may be a business object (BO) schema, a business service (BS) schema, a service script (SS) schema, data area (DA) schema or a UI map schema. The declare statement will differ based on the type of schema, but the syntax is analogous.

- **declareBO 'BO Name' | $variable | "xpath" as 'DynamicDataArea';**

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- **declareBS 'BS Name' | $variable | "xpath" as 'DynamicDataArea';**
- **declareSS 'SS Name' | $variable | "xpath" as 'DynamicDataArea';**
- **declareDA 'DA Name' | $variable | "xpath" as 'DynamicDataArea';**
- **declareMap 'Map Name' | $variable | "xpath" as 'DynamicDataArea';**

When invoking a BO, BS or SS, the name of the object can be specified as a literal or it can be a value contained within an element or a variable. For every Invoke, you must supply an XPath reference to a group name.

When invoking a business object, an action must be supplied. The syntax is **invokeBO 'BO Name' | $variable | "xpath" using "xpath" for action;**. The valid actions are as follows:

- **read**. This action reads the current view of the BO data.
- **add**. This action will add the object and read and return the resulting view of the BO.
- **fastAdd**. This action will add the object but does not perform a subsequent 'read' to return the resulting view of the BO. This option is better than add for performance purposes if there is no reason to re-read the record.
- **update**. This action will update the object and read and return the resulting view of the BO. This action executes a 'merge' of the information specified in the invoke statement's request XML document with existing BO data. Using this action allows the script to only indicate the elements that are changing.
- **fastUpdate**. This action will update the object but does not perform a subsequent 'read' to return the resulting view of the BO. This option is better than update for performance purposes if there is no reason to re-read the record.
- **delete**. This action deletes the object.
- **replace**. This action is an alternate to the update action. The replace action completely replaces existing BO data with the information in the request document. Typically, the replace action is used when a BO contains a list because it is easier to simply replace all instances of a list rather than attempt a list merge, which requires special logic to delete a list instance explicitly.

> **Note**
>
> The replace action must be used when using the UI map functionality to Upload a CSV File.

> **Note**
>
> The replace action is currently not supported for any maintenance object that is maintained in a 'fixed' page that uses a list metaphor to show all the records in the page at once. Currency is an example of this type of page.

Examples:

```
invokeBO 'BusinessObject' using "dataArea" for fastAdd;

invokeBO $variableBO using "dataArea" for fastUpdate;

invokeBO "daName/boElement" using "dataArea" for replace;
```


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The syntax of the invoke statements for both a business service and service script are similar. The BS / SS is specified along with the XPath reference to the group name:

- **invokeBS 'BS Name' | $variable | "xpath" using "xpath";**
- **invokeSS 'SS Name' | $variable | "xpath" using "xpath";**

The examples use the **invokeBS** statement but the statements are similar for the **invokeSS** statement.

```
invokeBS 'BusinessService' using "dataArea";

invokeBS $variableBS using "dataArea";

invokeBS "daName/bsElement" using "dataArea";
```

BO Warnings. Note that for BPA scripting, the **invoke** statements may also indicate how to handle warnings.

Syntax	Description	Examples

`with warn asError`	Indicates that a warning should be treated as an error displayed in the UI map. The text **asError** is optional.	`invokeBO 'BusinessObject' using "dataArea" for add with warn asError;`
		
		`invokeSS 'ServiceScript' using "dataArea" with warn;`

`with warn popup`	Indicates that a warning should be presented in the standard framework popup. In this scenario, the user is presented with standard OK and Cancel buttons. If the user clicks OK, it means that the process should continue. If the user clicks Cancel, the processing should discontinue. This is the recommended setting.	`invokeBS "daName/bsElement" using "dataArea" with warn popup;`

`with warn suppress`	Indicates that a warning should be suppressed. This is the default if no warning syntax is added to the **invoke** statement.	`invokeBS "daName/bsElement" using "dataArea" with warn suppress;`
		
		`invokeSS 'ServiceScript' using "dataArea";`

> **Note**
>
> For service scripts, all objects invoked from the service script will inherit their warning level. Therefore, if the service script is invoked **with warn**, all nested invoke statements will also be invoked **with warn**.

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For BPA scripts, there should also be logic following the invocation to handle errors and warnings (if **with warn as popup** is used). The system variable `$WARNING` is set to **true** if the user has clicked the Cancel button in the warning popup. If a map was shown, the logic should redisplay the map (where the warning message will be redisplayed.) This allows the user to potentially make changes and save again. If no map was shown prior to the warning, then the logic should terminate.

The system variable `$ERROR` indicates that an error was received. If a map was shown prior to the error, then the logic should redisplay the map where the error will be shown. If no map was shown, then the product provides a BPA Script `F1-HandleErr` that should be used to display the error. The following is an example of typical error handling logic.

```
invokeBO "F1-DetermineBo/output/bo" using "boSchema" for update with warn
popup;
if ("$WARNING")
   if ("map_schema/action = 'DEL'")
     terminate;
   else
     goto maintMap;
   end-if;
end-if;
if ("$ERROR")
  if ("map_schema/action != 'DEL'")
    goto maintMap;
  else
    transferControl 'F1-HandleErr';
  end-if;
end-if;
```

System and Global Variables

The following tables highlight system and global variables available for script writing.

System Variables - All Script Types

The following system variables are available for all script types (service scripts, plug-in scripts, and BPA scripts).

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Variable	Description
$BLANK	Represents an empty node. (Restrain (Empty node/Source/name) != $BLANK")

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Variable	Description
	goto addSpouse;end-if;

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Variable	Description
$CURRENT-DATE	Reprovesents the current date. For BPA scripts, this is the b

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Variable	Description
	rowserdate. For serverscripts this is the serverdate (an

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Variable	Description
	disaffected by the system data overrider logic).

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Variable	Description
$CURRENT-STD-DTTM	Represents the current date-time expressed in standard Data Time

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Variable	Description
	time (meaning without any adjustments for summer time/day

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Variable	Description
	lightsavingstime).

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Variable	Description
$DEVICE-OS	Removes "$DEVICE-OS" device operating system;

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Variable	Description
$DEVICE-BROWSER	Represents the user's device browser. $DEVICE-BROWSER.$ temp Device Bro

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Variable	Description
	wser;

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Variable	Description
$DEVICE-DISPLAY-TYPE	Represents the user's device-type as "Yes" or "No"

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Variable	Description
	Description Displays Type: Medium or Small size. Returned values m

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Variable	Description
	ayb elikeoraDesktop,oraTabletandoraPhone.

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Variable	Description
$DEVICE-INFO	Provides the Combination of all three device properties (Description, Inventory, Fault)

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Variable	Description
	DEVICE-OS, DEVICE-BROWSER and DEVICE-DISPLAY-TYPE) an

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Variable	Description
	each property value is separated by semi-colon.

System Variables - BPA Scripts Only

The following system variables are only available / applicable for BPA script types.

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Variable	Description
$DOUBLE_QUOTE	Represents a double-quote.

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Variable	Description
$SINGLE_QUOTE	Represents a Transport Upper "Ex" to $temp Field;

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Variable	Description
$SPACE	Contains a single space value. Field;

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Variable	Description
$SYSTEM-DATE	Reprovesents $SYSTEM-DATE. Note that this date is affected

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Variable	Description
	d by the system date over ride logic)

System Variables - Server Scripts Only

The following system variables are only available / applicable for service script and plug-in script types.

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Variable	Description
$ADDITIONAL-IP-INFO	Am HTTP "request" $ADDITIONAL-IP-INFO "additional" $ADDITIONAL-IP-INFO "address/scheme"

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Variable	Description
	Exsampleration

Copyright © 2026, Oracle and/or its affiliates.

Variable	Description
	is some information available on the proxy server or load b

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Variable	Description
	balancer, such as the originating IP address.

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Variable	Description
$CURRENT-DTTM	Represents the current date-time. $temp Date Time;

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Variable	Description
$F1-INSTALLATION-TIMEZONE	Represents the time zone of the Oracle Fine Mortgage Instalation

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Variable	Description
	Exampleption Zones;

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Variable	Description
$LANGUAGE	Represents the language code that is used by Typical

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Variable	Description
	ly this is the user's default language.

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Variable	Description
$PROCESS-DATE	Reprovesents the process date. The process date differs from

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Variable	Description
	m t h e c u r r e n t d a t e b e c a u s e t h e p r o c e s s d a t e w i l l r e m a i n c o n

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Variable	Description
	sistent throughout the duration of the process being exec

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Variable	Description
	uted. For example, if a service description stores several business

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Variable	Description
	nessobjects–theprocessdateisinitializedatthestart

Copyright © 2026, Oracle and/or its affiliates.

Variable	Description
	of the service script executed for each business object w

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Variable	Description
	will have the same processed defaulted. The current date

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Variable	Description
	, especially the current date time, will reflect the actual

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Variable	Description
	time of processing.

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Variable	Description
$PROCESS-DTTM	Represents the Process Date-time. Note that the Process Date-time is not the Data Time.

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Variable	Description
	date and time is initialized at the start of a particular pro

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Variable	Description
	cessandwillnotreflectthe exactdateandtimeofanupdat

Copyright © 2026, Oracle and/or its affiliates.

Variable	Description
	e.

Copyright © 2026, Oracle and/or its affiliates.

Variable	Description
$REQUESTING-IP-ADDRESS	Represents the IP address from the HTTP "request". Note that

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Variable	Description
	Exampl e
	iquest/questionrouted/through.proxyserverorloadbala

Copyright © 2026, Oracle and/or its affiliates.

Variable	Description
	ncer, this IP address is the IP address of the proxy or loa

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Variable	Description
	dbalancer, not the IP address of the end user. Refer to the

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Variable	Description
$ADDITIONAL-IP-INFO	variable for ip information.

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Variable	Description
$USER	Represents the User ID of the user executing the script.

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Variable	Description
	a t n e e d t o k n o w t h e u s e r I D o f t h e c u r r e n t u s e r , r e f e r t o U s e f

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Variable	Description
	ul Tips and Tricks.

Global Variables

BPA scripts and service scripts have access to the values defined in Global Context.

When a BPA script is launched from the user interface, these variables will be automatically initialized. They may be referenced with a single dollar sign in front of the field name. For example if PER_ID is a supported global variable, then $PER_ID can be referenced within the BPA script:

```
move "$PER_ID" to "schema/customerId";
```

For service scripts, global variables may only be referenced if the service script has been invoked directly from a BPA script or a zone on a portal. When a service script is invoked from a BPA script or portal zone, it will have access to the suite of global context variables populated in the UI session. For service scripting, the global fields must be prefixed by two dollar signs (instead of one like in BPA scripting). For example if PER_ID is a supported global context variable, then $$PER_ID can be referenced within the service script.

```
move $$PER_ID to "schema/customerId";
```

> **Note**
>
> As described in Context Variables, a service script may declare context variables that use the same two dollar sign syntax.

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Perform Script and Transfer Control Statements

The edit data step supports functionality analogous to the Perform script step type and the Transfer Control step type. These are both applicable only to BPA scripts.

Syntax	Valid Values	Comments
`performScript`	'BPA Script Name'	Script to perform is explicitly provided.
	$Variable	Script to perform is found in a variable.
	"XPath"	Script to perform is found in an element, referenced by its XPath.
`transferControl`	Analogous to the **performScript** statement	

> **Note**
>
> When the script named in the **performScript** statement has finished, control will be returned to the calling BPA script. When the script named in the **transferControl** statement has finished, you will not be returned to the calling script, complete control will be granted to the transferred to script.

Navigate Statement

The edit data step supports functionality analogous to the Navigate to a page step type. This is applicable only to BPA scripts.

Syntax	Valid Values	Comments
`navigate`	'Navigation Code'	Navigation option is explicitly provided.
	$Variable	Navigation option is found in a variable.
	"XPath"	Navigation option is found in an element, referenced by its XPath.

In addition, the edit data step supports the ability to indicate that the sidebar should be refreshed when navigating. This is only applicable to BPA scripts.

Syntax	Valid Values
`navigateAndReloadDashboard`	Analogous to the **navigate** statement

Declare BO with BO Group

This statement is specific to BPA scripts that plan to use the base script Main BO Maintenance Processing (`F1_MainProc`) for its Generate Edit Map statements. This script expects that the data used to display in the map is within a **boGroup** tag.

Syntax	Valid Values	Comments
`declareBOWithBOGroup`	'BO Name'	BO is explicitly provided.
	$Variable	BO is found in a variable.
	"XPath"	BO is found in an element, referenced by its XPath.

The following table highlights additional syntax for this statement.

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Syntax	Valid Values
as	'Dynamic Schema Name'

Examples:

```
declareBOWithBOGroup 'BusinessObject' as 'newMapSchema';

declareBOWithBOGroup $variableBO as 'newMapSchema';

declareBOWithBOGroup "daName/boElement" as 'newMapSchema';
```

Invoke Map Statement

The edit data step supports functionality analogous to the Invoke map step type. This is applicable only to BPA scripts.

Syntax	Valid Values	Comments
invokeMap	'Map Name'	UI Map is explicitly provided.
	$Variable	UI Map is found in a variable.
	"XPath"	UI Map is found in an element, referenced by its XPath.

The following table highlights additional syntax for this statement.

Syntax	Valid Values	Comments
using	"Data Area group name"	Indicates the data area to be passed to and from the server when rendering the HTML form associated with the map.
target	bpa	
	page	
	popup	

Refer to the Invoke map step type for more information about the **target** values.

If the UI map is configured to return a value, then it can be evaluated using the $MAP-VALUE variable.

```
invokeMap 'UI Map' using "dataArea";

invokeMap $variableMap using "dataArea";

invokeMap "daName/mapElement" using "dataArea" target bpa;

// $MAP-VALUE is a variable returned by the invoked map.
if ("$MAP-VALUE='continue' ")
    goto 300;
else
    terminate;
end if;
```


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Generate Edit Map Statements

The 'generate edit map' statements are used to dynamically generate and launch a UI edit map based on a schema definition. The schema used may be a BO schema, a BS schema, an SS schema or a DA schema. This is applicable only to BPA scripts. The generate statement will differ based on the type of schema, but the syntax is analogous.

Syntax
`generateBOEditMap`
`generateBSEditMap`
`generateSSEditMap`
`generateDAEditMap`

The BO code / BS code / SS code / DA code may be specified using a literal (surrounded by single quotes), as a temporary variable or by referencing an XPath schema location (surrounded by double quotes).

The following table highlights additional syntax for this statement.

Syntax	Valid Values	Comments
`using`	"Data Area group name"	Indicates the data area to be passed to and from the server when rendering the HTML form associated with the map.
`target`	`bpa`	
	`page`	In Redwood view mode this option presents the form in the large drawer panel.
	`popup`	
	`sdrawer`	Presents the form in the small drawer panel.
	`mdrawer`	Presents the form in the medium drawer panel.
	`ldrawer`	Presents the form in the large drawer panel.

The target values indicate where the generated map should be displayed as described in the Invoke map step type. If the UI map is configured to return a value, then it can be evaluated using the `$MAP-VALUE` variable.

The examples use the **generateBOEditMap** but the statements are similar for the other schema types.

```
generateBOEditMap 'BO Name' using "dataArea";

generateBOEditMap $variableMap using "dataArea";

generateBOEditMap "daName/mapElement" using "dataArea" target bpa;

generateBOEditMap "daName/mapElement" using "dataArea" target sdrawer;

generateBOEditMap "daName/mapElement" using "dataArea" target $drawerSize;
```


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```
// $MAP-VALUE is a variable returned by the invoked map.
if ("$MAP-VALUE='continue' ")
    goto 300;
else
    terminate;
end if;
```

Terminate Statement

The edit data step supports functionality analogous to the Terminate step type.

The following is an example of a simple **terminate** step that will stop the script.

```
if ("not(parm/spouse/name)")
  terminate;
else
  goto addSpouse;
end-if;
```

The **terminate with error** statement is only available in a service script.

> **Note**
>
> For issuing an error from a BPA script refer to Useful Tips and Tricks.

Syntax	Attributes	Comments
`terminate with error (x, y %n= element= )`	'x' represents the message category	Required.
	'y' represents the message number	Required.
	%n="Element XPath" or %n='literal'	Specify the substitution parameters supported by the message using either literal values or XPath references. When the value to substitute is an element within a list, use the XPath of the element within the list qualified by the list occurrence.
	element='Element XPath' or element=$variable	Optionally specify an element name within a UI map to highlight as part of the error. When the element in error is within a list, use the XPath of the element within the list qualified by the list occurrence.

Example of a simple field:

```
if ("string(customer/lastName) = $BLANK")
  terminate with error (8000, 1001 %1="customer/lastName" %2='Last name
required' element='customer/lastName');
end-if;
```


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Example of terminate where the element to mark is in a list:

```
for ($list in "parm/hard/newBusinessObject/listName")
  if //** check some condition for elementName
      terminate with error (11000, 11000 %1="$list/elementName"
element='$list/elementName');
  end-if;
end-for;
```

> **NOT_SUPPORTED**
>
> For more information on presenting errors in a UI map, please refer to Display Errors.

Invoking Groovy Code

If you have a plug-in script or a service script that mixes XPath scripting and Groovy scripting, the edit data step supports the ability to invoke Groovy code using the syntax **invokeGroovy 'method';** where 'method' is the name of a method defined in a **Groovy Members** step within the script. Only methods that do not receive arguments and return void can be invoked in this way. However, the method invoked from the edit data step can be supported by additional Groovy code in other **Groovy Members** step types.

Example Edit Data step:

```
invokeGroovy 'invoke';
```

Example Groovy Members step:

```
void invoke() {
  initParms()
  readBO()
  initConfig()
  retrieve()
  updateBO()
}
```

> **Note**
>
> As mentioned in Using Groovy Within Scripts, if this is a plug-in script and the code is only Groovy, you should use the **Groovy** script engine version rather than the above technique. This is considered more efficient as it avoids the conversion of the data to and from the XML interface.

Debugging a BPA Script

If a BPA script has height greater than zero, then selected nodes of the script's data area can be displayed at runtime. The XML data is displayed during script execution within the BPA script's display area. Specify the XPath of an XML node from any of the BPA script's data areas, between the paired characters: '%+' and '+%'.

For example, the entire contents of the schema group node named 'input', and the specific contents of the schema element named 'output/status' will be displayed in the BPA script's

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display area. The debug text must be entered into the BPA script's text area and not within the script's edit data field. Debug text can be declared for any explicit step of the script.

```
display input: %+input+% , and output status: %+output/status+%
```

Useful Tips and Tricks

This section provides some suggestions about how to implement some common logic.

Finding the Logged In User in a BPA

For server based scripts, the $USER variable is populated with the current logged in user. This variable is not available for BPA scripts. The BPA can call the service script `F1-GetUser` if this information is needed.

Issuing an Error from a BPA script

For server based scripts, you use the **terminate with error** statement to return an error message to display to the user. The BPA can display that error by transferring control to `F1-HandleErr` as described in the Declare and Invoke Schema Based Objects. This is not supported in a BPA script. A technique that is available to a BPA for issuing an error is to call the business service `F1-RethrowError` passing the error details. This business service populates the appropriate system error fields needed to issue the error. Then transfer control to `F1-HandleErr`.

```
  if ("string($assignedToUser) != string(F1-GetUser/user)")
    declareBS 'F1-RethrowError' as 'errorMsg';
    move '11010' to "errorMsg/messageCategory";
    move '11511' to "errorMsg/messageNumber";
    move "$toDoEntryId" to "errorMsg/messageParameters/+parameters/
parameterValue";
    invokeBS 'F1-RethrowError' using "errorMsg";
    transferControl 'F1-HandleErr';
  end-if;
```

Go To Steps

Go to steps allow you to jump to a step other than the next step. Additional fields required for **Go To** steps:

Next Step defines the step to which the script should jump.

Height Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

> **Caution**
>
> Guiding scripts that interact with the user using the script area are limited to surf over fixed pages only and are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

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Height steps are used to change the height of the script area to be larger or smaller than the standard size.

The following additional fields are required for **Height** steps:

Script Window Height defines the number of **Pixels** or the **Percentage** (according to the **Height Unit**) that the script window height should be adjusted. The percentage indicates the percentage of the visible screen area that the script area uses. For example, a percentage value of `100` means that the script area will use the entire area.

> **Note**
>
> **Standard Number of Pixels**. The default number of pixels used by the script area is `75`.

> **Note**
>
> **Adjust script height in the first step**. If you want to adjust the height of the script area, it is recommendation to define the **height** step type as your first step. Otherwise, the script area will open using the standard height and then readjust, causing the screen to redisplay.

> **Note**
>
> **Hide script area**. You could use this type of step to set the height to `0` to hide the script area altogether. This is useful if the script does not require any prompting to the user. For example, perhaps you define a script to take a user to a page and with certain data pre-populated and that is all.

> **Note**
>
> **Automatically close script area**. If you want the script area to close when a script is completed, you could define the final step type with a height of 0.

Input Data Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

> **Caution**
>
> Guiding scripts that interact with the user using the script area are limited to surf over fixed pages only and are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

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Input data steps cause the user to be prompted to populate an input field in the script area. The input value can be saved in a field on a page or in temporary storage. A **Continue** button always appears adjacent to the input field. You may configure steps of this type to display one or more buttons in addition to the **Continue** button. For example, you may want to provide the ability for the user to return to a previous step to fix incorrect information. The user may click on any of these buttons when ready for the script to continue.

The following additional fields are required for **Input Data** steps:

Destination Field Type and **Destination Field Name** define where the input field will be saved. The **Field Type** defines where the field is located. The **Field Name** defines the name of the field. The following points describe each field type:

- **Page Data Model**. Use this field type to put the input field into a field that resides on any of the tab pages in the object display area (i.e., the field populated doesn't have to reside on the currently displayed tab page, it just has to be part of the object that's currently displayed). Refer to How To Find The Name Of Page Data Model Fields for instructions on how to find the appropriate **Field Name**.
- **Temporary Storage**. Use this field type to put the input field into temporary storage. Use **Field Name** to name the field in temporary storage. Refer to How To Name Temporary Storage Fields for more information.
- **User Interface Field**. Use this field type to put the input field into a field that resides on the currently displayed tab page. Note, if you want to execute underlying default logic, you must populate a **User Interface Field**. Refer to How To Find The Name Of User Interface Fields for instructions on how to find the appropriate **Field Name**.

The **Prompt Values** grid may be used to define additional buttons. A separate button is displayed in the script area for each entry in this grid.

- **Prompt Text** is the verbiage to appear on the button. Refer to How To Substitute Variables In Text for a description of how you can substitute field values into the prompts.
- **Sequence** controls the order of the buttons.
- **Next Script Step** defines the step to execute if the user clicks the button.

Invoke Business Object Steps

Invoke business object steps allow you to interact with a business object in order to obtain or maintain its information.

The following additional fields are required for **Invoke business object** steps:

Use **Warning Level** to indicate whether warnings should be suppressed and if not, how they should be presented to the user. By default, warnings are suppressed. If **Warn As Popup** is used, the warning is displayed using the standard popup dialog. If **Warn As Error** is used processing is directed to the **If Error, Go To** step. This field is only applicable to BPA scripts. Refer to BO warnings for more information about handling warnings when invoking a BO.

Group Name references the data area to be passed to and from the server when communicating with the **Business Object**. Indicate the **Action** to be performed on the object when invoked. Valid values are **Add, Delete, Fast Add (No Read), Fast Update (No Read), Read, Replace, Update**.

> **NOT_SUPPORTED**
>
> Refer to BO Actions for more information about the various actions.

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The business object call will either be successful or return an error. The next two fields only appear when the call is issued from a BPA script, to determine the step to which control is passed given the outcome of the call.

If Success, Go To defines the step that is executed if the call is successful. This field is only applicable to BPA scripts.

If Error, Go To defines the step that is executed if the call returns on error. Please note that the error information is held in global variables. This field is only applicable to BPA scripts.

> **Note**
>
> **Error technique.** Let's assume a scenario where a business object is invoked from a BPA script and the call returned an error. If the BPA script is configured to communicate with the user using a UI map, you may find it useful to invoke the map again to present the error to the user. Alternatively, you may invoke a step that transfers control to a script that displays the error message information and stops.

Invoke Business Service Steps

Invoke business service steps allow you to interact with a business service.

The following additional fields are required for **Invoke business service** steps:

Use **Warning Level** to indicate whether warnings should be suppressed and if not, how they should be presented to the user. By default, warnings are suppressed. If **Warn As Popup** is used, the warning is displayed using the standard popup dialog. If **Warn As Error** is used processing is directed to the **If Error, Go To** step. This field is only applicable to BPA scripts.

Group Name references the data area to be passed to and from the server when the **Business Service** is invoked.

The business service call will either be successful or return an error. The next two fields only appear when the call is issued from a BPA script, to determine the step to which control is passed given the outcome of the call.

If Success, Go To defines the step that is executed if the call is successful. This field is only applicable to BPA scripts.

If Error, Go To defines the step that is executed if the call returns on error. Please note that the error information is held in global variables. This field is only applicable to BPA scripts.

> **Note**
>
> **Error technique.** Let's assume a scenario where a business service is invoked from a BPA script and the call returned an error. If the BPA script is configured to communicate with the user using a UI map, you may find it useful to invoke the map again to present the error to the user. Alternatively, you may invoke a step that transfers control to a script that displays the error message information and stops.

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> **Note**
>
> Functions were implemented prior to the introduction of business services (BS), service scripts (SS) and business objects (BO). The functionality is still supported, but the recommendation for implementations going forward is to use a step that invokes one of the above configuration tool objects in a script rather than defining a function.

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

Invoke function steps may be used to retrieve or update data independent of the page currently being displayed. For example, if you design a script that takes different paths based on the customer's customer class, you could invoke a function to retrieve the customer's customer class.

> **NOT_SUPPORTED**
>
> You must set up a function before it can be referenced in a script. Refer to Maintaining Functions for the details.

The following additional fields are required for **Invoke Function** steps:

Function defines the name of the function. The function's **Long Description** is displayed below.

When a function is invoked, it will either be successful or return an error. The next two fields control the step to which control is passed given the outcome of the function call:

- **If Success, Go to** defines the step that is executed if the function is successful.
- **If Error, Go to** defines the step that is executed if the function returns on error. Refer to How To Use Constants In Scripts for a list of the global variables that are populated when a function returns an error.

> **Note**
>
> **Error technique.** If a function returns an error, we recommend that you invoke a step that transfers control to a script that displays the error message information and stops (note, the error information is held in global variables). You would invoke this script via a **Transfer Control**.

The **Send Fields** grid defines the fields whose values are sent to the function and whose field value source is not **Defined On The Function**. For example, if the function receives an account ID, you must define the name of the field in the script that holds the account ID.

- **Field** contains a brief description of the field sent to the function.

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- **Source Field Type** and **Mapped Field / Value** define the field sent to the function. Refer to the description of Source Field under How To Set Up Move Data Steps for a description of each field type.
- **Comments** contain information about the field (this is defined on the function).

The **Receive Fields** grid defines the fields that hold the values returned from the function. For example, if the function returns an account's customer class and credit rating, you must set up two fields in this grid.

- **Field** contains a brief description of the field returned from the function.
- **Destination Field Type** and **Mapped Field** define the field returned from the function. Refer to the description of Destination Field under How To Set Up Move Data Steps for a description of each field type.
- **Comments** contain information about how the field (this is defined on the function).

Invoke Map Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

Invoke map steps are used to invoke a UI Map to display, capture and update data using an HTML form. You may configure steps of this type to display one or more buttons in addition to the **Continue** button. For example, you may want to provide the ability for the user to return to a previous step to fix incorrect information. The user may click on any of these buttons when ready for the script to continue.

The following additional fields are required for **Invoke map** steps:

Group Name references the data area to be passed to and from the server when rendering the HTML form associated with the **Map**.

Use **Target Area** to designate where the map will be presented.

- Select **BPA Zone** if the map should be presented within the script area.

> **Caution**
>
> Guiding scripts that interact with the user using the script area are limited to surf over fixed pages only and are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

- Select **Page Area** if the map should be presented in the object display area, i.e. the frame typically used to house a maintenance page. In Redwood view mode this option presents the form in the large drawer panel.
- Select **Pop-up Window** if the map should be launched in a separate window.
- Select **Small, Medium, Large Drawer** if the map should be launched in a drawer panel.

The **Returned Values** grid contains a row for every button defined on the map.

- **Returned Value** is the value returned when the user clicks the button.

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- **Use as Default** can only be turned on for one entry in the grid. If this is turned on, this value's Next Script Step will be executed if the returned value does not match any other entry in the grid. For example, if the user closes a pop-up (rather than clicking a button), the default value will be used.
- **Next Script Step** defines the step to execute if the user clicks the button.

Invoke Service Script Steps

Invoke service script steps allow you to execute a service script.

The following additional fields are required for **Invoke service script** steps:

Use **Warning Level** to indicate whether warnings should be suppressed and if not, how they should be presented to the user. By default, warnings are suppressed. If **Warn As Popup** is used, the warning is displayed using the standard popup dialog. If **Warn As Error** is used processing is directed to the **If Error, Go To** step. This field is only applicable to BPA scripts.

Group Name references the data area to be passed to and from the server when the **Service Script** is invoked.

The service script call will either be successful or return an error. The next two fields only appear when the call is issued from a BPA script to determine the step to which control is passed given the outcome of the call.

If Success, Go To defines the step that is executed if the call is successful. This field is only applicable to BPA scripts.

If Error, Go To defines the step that is executed if the call returns on error. Please note that the error information is held in global variables. This field is only applicable to BPA scripts.

> **Note**
>
> **Error technique.** Let's assume a scenario where a service script is invoked from a BPA script and the call returned an error. If the BPA script is configured to communicate with the user using a UI map, you may find it useful to invoke the map again to present the error to the user. Alternatively, you may invoke a step that transfers control to a script that displays the error message information and stops.

Groovy Imports Steps

> **Note**
>
> **Server based scripts only.** This step type is not applicable to BPA scripts.

Groovy Imports step types provide a free format text area where you list the Groovy classes to be imported for use by the code in **Groovy Member** steps within the script.

Enter a description of the imports step in the **Text** field. Click the adjacent icon to open a window providing more space for entering text.

Enter the list of classes to import in the **Edit Data Text** field using the syntax **import 'class';** where 'class' is the fully qualified package name of the Groovy class. Click the adjacent icon to open a window providing more space for editing the text.

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When saving a script, if the system has been configured accordingly, when the system detects references to a Groovy class that is not explicitly listed in this step, the system warns the user and adds an explicit import for that class. (If no Groovy Import step type exists for the script, one will be added.) Users should review the imported class to ensure it is the expected class, in the case of multiple classes with a similar name.

> **Note**
>
> For security, the classes that may be imported are restricted to those allowed by the Framework. The warning and automatic update to the script is controlled by a property setting. Refer to the topic Using Groovy Within Scripts for more information.

Groovy Library Interface Steps

> **Note**
>
> **Server based scripts only.** This step type is not applicable to BPA scripts.

Groovy Library Interface steps are only applicable to **Groovy Library Scripts**. They provide a free format text area where you can list the Groovy methods defined within the script that are available for use by other scripts.

Enter a description of the interface step in the **Text** field. Click the adjacent icon to open a window providing more space for entering text.

Enter the list of interface methods in the **Edit Data Text** field. Click the adjacent icon to open a window providing more space for editing the list.

> **Note**
>
> Every **Groovy Library Script** must have one and only one step of type **Groovy Library Interface**. The supporting code for the available methods is defined using one or more **Groovy Member** steps in the same script. Refer to the topic Using Groovy Within Scripts for more information.

Groovy Member Steps

> **Note**
>
> **Server based scripts only.** This step type is not applicable to BPA scripts.

Groovy Member steps provide a free format text area where you can enter Groovy code.

Enter a description of the code block in the **Text** field. Click the adjacent icon to open a window providing more space for entering text.

Enter your code in the **Edit Data Text** field. Click the adjacent icon to open a window providing more space for editing the code.

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> **Note**
>
> While it is possible to set up multiple steps of type **Groovy Member** the system treats these steps as a single class for compilation and execution purposes. Refer to the topic Using Groovy Within Scripts for more information.

Useful APIs

The following provides information about APIs that may be useful for Groovy programmers.

Lookup object instantiation

This API allows programmers to instantiate a lookup for subsequent use in Groovy code when there is no Java class generated for the lookup (as is often the case with custom lookups). Example:

```
Lookup customLookup = LookupHelper.getLookupInstance("ALG_ENTITY_FLG",
"CMAL");
```

Label Steps

Label steps allow you to describe what the next step(s) are doing. Steps of this type are helpful to the script administrators when reviewing or modifying the steps in a script, especially when a script has many steps. When designing a script, the label steps enable you to provide a heading for common steps that belong together. The script tree displays steps of this type in a different color (green) so that they stand out from other steps.

There are no additional fields for **Label** steps.

Mathematical Operation Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

Mathematical operation steps allow you to perform arithmetic on fields. You can also use this type of step to add and subtract days from dates. For example, you could calculate a date 7 days in the future and then use this value as the customer's next credit review date. The following additional fields are required for **Mathematical Operation** steps:

Base Field Type and **Base Field Name** define the field on which the mathematical operation will be performed. The **Field Type** defines where the field is located. The **Field Name** defines the name of the field. The following points describe each field type:

- **Page Data Model**. Use this field type when the field resides on any of the tab pages in the object display area. Refer to How To Find The Name Of Page Data Model Fields for instructions on how to find the appropriate **Field Name**.
- **Temporary Storage**. Use this field type when the field resides in temporary storage. You must initialize the temporary storage field with a Move Data step before performing mathematical operations on the field. Refer to How To Set Up Move Data Steps for more information.

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- **User Interface Field**. Use this field type when the field resides on the currently displayed tab page. Refer to How To Find The Name Of User Interface Fields for instructions on how to find the appropriate **Field Name**.

Math Operation controls the math function to be applied to the **Base Field**. You can specify +, -, /, and *. Note, if the base field is a date, you can only use + or -.

Math Field Type, **Math Field Name** and **Math Field Value** define the field that contains the value to be added, subtracted, divided, or multiplied. The following points describe each field type:

- **Current To Do Information**. Use this field type when the value resides on the current To Do entry. Refer to How To Use To Do Fields for instructions on how to define the appropriate **Field Name**.
- **Page Data Model**. Use this field type when the value resides on any of the tab pages in the object display area. Refer to How To Find The Name Of Page Data Model Fields for instructions on how to find the appropriate **Field Name**.
- **Predefined Value**. Use this field type when the value is a constant. When this field type is used, use **Source Field Value** to define the constant value. Refer to How To Use Constants In Scripts for more information. Note, if you are performing arithmetic on a date, the field value must contain the number and type of **days**/ **months**/ **years**. For example, if you want to add 2 years to a date, the source field value would be **2 years**.
- **Temporary Storage**. Use this field type when the value is a field that you put into temporary storage in an earlier step. The **Field Name** must be the same as defined in an earlier step.
- **User Interface Field**. Use this field type when the value resides in a field on the current tab page. Refer to How To Find The Name Of User Interface Fields for instructions on how to find the appropriate **Field Name**.

Move Data Steps

Move data steps allow you to move data (from a source to a destination). The following additional fields are required for **Move data** steps:

Source Field Type, **Source Field Name** and **Source Field Value** define what you're moving. The following points describe each field type:

- **Context Variable**. Use this field type in a plug-in or service script if the source value is a variable initiated in a higher level script. This is only applicable to Service Scripts and Plug-in Scripts.
- **Current To Do Information**. Use this field type when the source value resides on the current To Do entry. Refer to How To Use To Do Fields for instructions on how to define the appropriate **Field Name**. This is only applicable to BPA Scripts.
- **Data Area**. Use this field type when the field being compared is one that you put into one of the script's data areas in an earlier step. **Field Name** must reference both a data area structure name as well as the field, for example "parm/charType". Refer to How To Reference Fields In Data Areas for instructions on how to construct the appropriate **Field Name**.
- **Global Context**. Use this field type when the source value is a global context variable. This is only applicable to BPA Scripts.
- **Page Data Model**. Use this field type when the source value resides on any of the tab pages in the object display area (i.e., the source field doesn't have to reside on the currently displayed tab page, it just has to be part of the object that's currently displayed).

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Refer to How To Find The Name Of Page Data Model Fields for instructions on how to find the appropriate **Field Name**. This is only applicable to BPA Scripts.

- **Portal Context**. Use this field type when the source value is a variable in the portal context. This is only applicable to BPA Scripts.
- **Predefined Value**. Use this field type when the source value is a constant value defined in the script. When this field type is used, use **Source Field Value** to define the constant value. Refer to How To Use Constants In Scripts for instructions on how to use constants.

> **Note**
>
> **Concatenating fields together.** You can also use **Predefined Value** if you want to concatenate two fields together. For example, let's say you have a script that merges two persons into a single person. You might want this script to change the name of the person being merged out of existence to include the ID of the person remaining. In this example, you could enter a **Source Field Value** of `%ONAME` **merged into person %PERID** (where **ONAME** is a field in temporary storage that contains the name of the person being merged out of existence and **PERID** contains the ID of the person being kept). Refer to How To Substitute Variables In Text for a description of how you can substitute field values to compose the field value.

- **Temporary Storage**. Use this field type when the source value is a field that you put into temporary storage in an earlier step. The **Field Name** must be the same as defined in an earlier step.
- **User Interface Field**. Use this field type when the source value resides on the currently displayed tab page. Refer to How To Find The Name Of User Interface Fields for instructions on how to find the appropriate **Field Name**. This is only applicable to BPA Scripts.

Destination Field Type and **Destination Field Name** define where the source field will be moved. The **Field Type** defines where the field is located. The **Field Name** defines the name of the field. The following points describe each field type:

- **Context Variable**. Use this field type in your plug-in or service script if you use a variable to communicate information to a lower level service script or schema. This is not applicable to BPA Scripts.
- **Data Area**. Use this field type when the destination field resides on one of the scripts data areas. **Field Name** must reference both a data area structure name as well as the field, for example "parm/charType". Refer to How To Reference Fields In Data Areas for instructions on how to construct the appropriate **Field Name**.
- **Page Data Model**. Use this field type when the destination field resides on any of the tab pages in the object display area (i.e., the field populated doesn't have to reside on the currently displayed tab page, it just has to be part of the object that's currently displayed). Refer to How To Find The Name Of Page Data Model Fields for instructions on how to find the appropriate **Field Name**. This is only applicable to BPA Scripts.
- **Portal Context**. Use this field type when the destination to be updated is in the current portal context. This is only applicable to BPA Scripts.
- **Temporary Storage**. Use this field type when the destination field resides in temporary storage. Use **Field Name** to name the field in temporary storage. Use **Field Name** to name the field in temporary storage. Refer to How To Name Temporary Storage Fields for more information.

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- **User Interface Field**. Use this field type when the destination field resides on the currently displayed tab page. Refer to How To Find The Name Of User Interface Fields for instructions on how to find the appropriate **Field Name**. This is only applicable to BPA Scripts.

> **Note**
>
> **Conditional field types.** The field types **Current To Do Information**, **Page Data Model** and **User Interface Field** are only applicable to BPA scripts.

Navigate To A Page Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

Navigate to a page steps cause a new page (or tab within the existing page) to be displayed in the object display area. Steps of this type are a precursor to doing anything on the page. The following additional field is required for **Navigate to a page** steps:

Navigation Option defines the transaction, tab, access mode (add or change) and any context fields that are passed to the transaction in change mode. For example, if you want a script to navigate to Person - Characteristics for the current person being displayed in the sidebar, you must set up an appropriate navigation option. Refer to Defining Navigation Options for more information.

> **Note**
>
> **Navigating to a page in update mode.** Before you can navigate to a page in change mode, the page data model must contain the values to use for the navigation option's context fields. If necessary, you can move values into the page data model using a Move Data step first. For example, before you can navigate to a page in change mode with an account ID in context, you may need to move the desired account ID into the ACCT_ID field in the page data model. The actual field name(s) to use are listed as context fields on the navigation option.

Perform Script Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

Perform script steps cause another BPA script to be performed. After the performed script completes, control is returned to the next step in the original script. You might want to think of the scripts referred to on steps of this type as "subroutines". This functionality allows you to encapsulate common logic in reusable BPA scripts that can be called from other BPA scripts. This simplifies maintenance over the long term.

The following additional field is required for **Perform script** steps:

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Subscript is the name of the script that is performed.

Press A Button Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

> **Caution**
>
> Guiding scripts that interact with the user using the script area are limited to surf over fixed pages only and are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

Press a button steps cause a button or link text to be 'pressed' in the object display area, the application toolbar or the page title area. For example, you could use this type of step to add a new row to a person's characteristic (and then you could use a **Move Data** step to populate the newly added row with a given char type and value). The following additional fields are required for **Press a button** steps:

Button Name is the name of the button to be pressed. This button must reside on the currently displayed tab page (or in the application toolbar or page actions toolbar). Refer to How To Find The Name Of A Button for more information.

Prompt User Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

> **Caution**
>
> Guiding scripts that interact with the user using the script area are limited to surf over fixed pages only and are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

Prompt user steps cause the user to be presented with a menu of options. The options can be presented using either buttons or in the contents of a drop down. You can also use steps of this type to pause a script while the user checks something out (and when the user is ready to continue with the script, they are instructed to click a prompt button). The following additional fields are required for **Prompt User** steps:

Prompt Type controls if the prompt shown in the script area is in the form of `Button(s)` or a **Dropdown**. Note, if you use a **Dropdown**, a Continue button appears adjacent to the dropdown in the script area when the step executes. The user clicks the Continue button when they are ready for the script to continue.

The **Prompt Values** grid contains a row for every value that can be selected by a user. Note, if you use a **Prompt Type** of `Button(s)`, a separate button is displayed in the script area for each entry in this grid.

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- **Prompt Text** is the verbiage to appear on the button or in the dropdown entry. Refer to How To Substitute Variables In Text for a description of how you can substitute field values into the prompts.
- **Sequence** controls the order of the buttons or dropdown entries.
- **Use As Default** can only be turned on for one entry in the grid. If this is turned on for a dropdown entry, this value is defaulted in the grid. If this is turned on for a button, this button becomes the default (and the user should just have to press `Enter` (or `space`) rather than click on it).
- **Next Script Step** defines the step to execute if the user clicks the button or selects the dropdown value.

Set Focus To A Field Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

> **Caution**
>
> Guiding scripts that interact with the underlying page's fields and buttons are limited to surf over fixed pages only and are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

Set focus to a field steps cause the cursor to be placed in a specific field on a page. A **Continue** button always appears in the script area when this type of step executes. The user may click the **Continue** button when they are ready for the script to continue. You may configure steps of this type to display one or more buttons in addition to the **Continue** button. For example, you may want to provide the ability for the user to return to a previous step to fix incorrect information. The user may click on any of these buttons when ready for the script to continue.

The following additional fields are required for **Set focus to a field** steps:

Destination Field Name defines the field on which focus should be placed. This field must reside on the currently displayed tab page. Refer to How To Find The Name Of User Interface Fields for instructions on how to find the appropriate **Field Name**.

The **Prompt Values** grid may be used to define additional buttons. A separate button is displayed in the script area for each entry in this grid.

- **Prompt Text** is the verbiage to appear on the button. Refer to How To Substitute Variables In Text for a description of how you can substitute field values into the prompts.
- **Sequence** controls the order of the buttons.
- **Next Script Step** defines the step to execute if the user clicks the button.

Terminate Steps

Terminate steps cause a server-based script to end processing successfully or issue an error.

The following additional fields are required for **Terminate** steps:

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Error indicates whether an error should be thrown or not. If error, **Error Data Text** must be specified, indicating the error message and any message substitution parameters. Refer to Edit Data Syntax the actual syntax of initiating an error message.

> **Note**
>
> The ability to terminate a step in error is only supported for server-based scripts.

Transfer Control Steps

> **Note**
>
> **BPA scripts only.** This step type is only applicable to BPA scripts.

Transfer control steps cause the current BPA script to terminate and the control to pass to another BPA script. You might want to construct a BPA script with steps of this type when the script has several potential logic paths and you want to segregate each logic path into a separate BPA script (for ease of maintenance).

The following additional fields are required for **Transfer control** steps:

Subscript is the name of the script to which control is transferred.

Additional Topics

The contents of this section provide additional information about steps.

- How To Find The Name Of User Interface Fields
- How To Find The Name Of Page Data Model Fields
- How To Find The Name Of A Button
- How To Substitute Variables In Text
- How To Use HTML Tags And Spans In Text Strings and Prompts
- How To Use Constants In Scripts
- How To Use Global Variables
- How To Name Temporary Storage Fields
- How To Work With Dates
- How To Use To Do Fields
- How To Reference Fields In Data Areas
- Script Engine Version 2 and Above Notes

How To Find The Name Of User Interface Fields

This section is only relevant if you are using the legacy capability of BPA scripts to bring a user to a base fixed page and populate information into fields on that page.

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> **⚠ Caution**
>
> Guiding scripts that interact with and surf over fixed pages are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

Follow these steps to find the name of a field that resides on a fixed page:

- Navigate to the page in question.
- Right click in the body of the page.
- Select **Inspect** from the pop-up menu to display the HTML.
- In the search look for the text "Widget Info". Note that if there are multiple sections on the page, you will find multiple "Widget Info" results. Based on the details shown, you are able to confirm which section you are looking for. For example, the following is an example from the Algorithm - Main page:

```
* Widget Info:
*     Widget_ID , Element Type - label info - label
*     ALG_CD, IT - CI_ALG$ALG_CD -  Algorithm Code
*     IM_ALG_CD, IM - $SEARCH_FOR_ALG_LBL -  Search for Algorithm
*     OWNER_FLG, IS - $OWNER_FLG -  Owner
*     DESCR50, IT - $DESCR50 -  Description
*     IM_Main_algtypCont, IM - $F1_SHOW_ALG_CTX -  Show Algorithm Context Menu
*     ALG_TYPE_CD, IT - $ALG_TYPE_CD -  Algorithm Type
*     IM_ALG_TYPE_CD, IM - $SEARCH_ALGTYPE_LBL -  Search for Algorithm Type
*     ALG_TYPE_DESCR50, PL - $DESCR50 -  Description
*     ALG_TYPE_LONG_DESC, IA - $DESCRLONG -  Detailed Description
*     IM_VerScroll_lftArrow, IM - $PREVIOUS_ALG_LBL -  Previous Version
*     ALG_VER$recordCount, SN - $OF_LBL -  Of
*     IM_VerScroll_rtArrow, IM - $NEXT_ALG_LBL -  Next Version
*     IM_ADD, IM - $ADD_ALG_LBL -  Add Version
*     IM_DEL, IM - $DELETE_ALG_LBL -  Delete  Version
*     ALG_VER$EFFDT, IT - $EFFDT -  Effective Date
*     L_OWNER_LBL, LP - $OWNER_FLG -  Owner
*     ALG_VER$OWNER_FLG, IS - $OWNER_FLG -  Owner
*     resultGrid, GD
```

The field names that you'll reference in your scripts are defined on the left side of the HTML (e.g., ALG_CD, DESCR50, ALG_TYPE_CD, etc.).

The names of fields that reside in scrolls are in a slightly different format. The following is an example of the HTML for the version scroll that appears on Algorithm - Main. Notice that the fields in the scroll are prefixed with the name of the scroll plus a $ sign. For example, the effective date is called ALG_VER$EFFDT.

```
*     IM_VerScroll_lftArrow, IM - $PREVIOUS_ALG_LBL -  Previous Version
*     ALG_VER$recordCount, SN - $OF_LBL -  Of
*     IM_VerScroll_rtArrow, IM - $NEXT_ALG_LBL -  Next Version
*     IM_ADD, IM - $ADD_ALG_LBL -  Add Version
*     IM_DEL, IM - $DELETE_ALG_LBL -  Delete  Version
*     ALG_VER$EFFDT, IT - $EFFDT -  Effective Date
*     L_OWNER_LBL, LP - $OWNER_FLG -  Owner
*     ALG_VER$OWNER_FLG, IS - $OWNER_FLG -  Owner
```

The names of fields that reside in grids are in a slightly different format. The following is an example of the HTML for the algorithm parameters grid that appears on Algorithm - Main. Notice that the fields in the grid are prefixed with the name of the grid plus a `:x$`. For example,

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the algorithm parameter label is called ALG_PARM:x$ALG_PARM_LBL. When you reference such a field in your script, you have the following choices:

- Substitute x with the row in the grid (and keep in mind, the first row in a grid is row 0 (zero); this means the second row is row 1).
- If you want to reference the "current row" (that is, the row in which the cursor will be placed), you can keep the x notation (x means the "current row").

```
* Widget Info:
*     Widget_ID , Element Type - label info - label
*     ALG_PARM:x$ALG_PARM_LBL, IL - CI_ALG_TYPE_PRM_L$ALG_PARM_LBL -  Parameter
*     ALG_PARM:x$SEQNO, IL - $SEQNO -  Sequence
*     ALG_PARM:x$ALG_PARM_VAL, IA - $ALG_PARM_VAL -  Value
*
```

How To Find The Name Of Page Data Model Fields

You find the name of a **Page Data Model** field in the same way described under How To Find The Name Of User Interface Fields. The only restriction is that you cannot refer to hidden / derived fields. However, you can refer to any of the object's fields regardless of the tab page on which they appear. For example, if you position the object display area to the Main tab of the Account transaction, you can reference fields that reside on all of the tab pages.

> ⚠ **Caution**
>
> If you populate a **Page Data Model** field, none of the underlying default logic takes place. For example, if you populate a customer contact's contact type, none of the characteristics associated with the customer contact type are defaulted onto the customer contact. If you want the underlying defaulting to take place, you must populate a **User Interface Field**.

How To Find The Name Of A Button

This section is only relevant if you are using the legacy capability of BPA scripts to bring a user to a base fixed page and perform functionality by executing existing buttons on that page.

> ⚠ **Caution**
>
> Guiding scripts that interact with and surf over fixed pages are considered legacy functionality. This technique is not supported on top of portal pages and is planned to be deprecated in a future release.

If you want a **Press a button** step to press a button or click a link in the application toolbar, use one of the following names:

Button Name
IM_GOBACK
IM_HISTORY
IM_GOFORWARD
IM_menuButton

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IM_USER_HOME
IM_MY_PREF
IM_helpButton

If you want a **Press a button** step to press a button in the page actions toolbar, use one of the following names:

Button Name
IM_SAVE IM_REFRESH IM_CLEAR IM_COPY
IM_DELETE
IM_ScrollBack
IM_ScrollForward

The following buttons are also supported:

Button Name	Comments
IM_TO_DO	
IM_CurrentTo Do	This navigates to the To Do Entry page for the user's current To Do. Refer to Working On A To Do for more information.
IM_MINIMIZE_DASHBOARD	Pressing this will collapse the sidebar. Note that when a script is finished, it will return the sidebar to the state it was when the script was launched.
IM_MAXIMIZE_DASHBOARD	Pressing this will expand the sidebar. Note that when a script is finished, it will return the sidebar to the state it was when the script was launched.

Follow these steps to find the name of other buttons that reside in the object display area of a fixed page:

- Navigate to the page in question.
- Right click in the body of the page
- Select **Inspect** from the pop-up menu.
- In the search look for the text "Widget Info". Note that if there are multiple sections on the page, you will find multiple "Widget Info" results. Based on the details shown, you are able to confirm which section you are looking for.
- Iconized buttons (e.g., search buttons) are represented as HTML images and their field names are prefixed with **IM**. The following is an example of the HTML on the Algorithm - Main page (notice the **IM** fields for the iconized buttons).

```
 * Widget Info:
 *     Widget_ID , Element Type - label info - label
```


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```
    *     ALG_CD, IT - CI_ALG$ALG_CD -  Algorithm Code
    *     IM_ALG_CD, IM - $SEARCH_FOR_ALG_LBL -  Search for Algorithm
    *     OWNER_FLG, IS - $OWNER_FLG -  Owner
    *     DESCR50, IT - $DESCR50 -  Description
    *     IM_Main_algtypCont, IM - $F1_SHOW_ALG_CTX -  Show Algorithm Context
Menu
    *     ALG_TYPE_CD, IT - $ALG_TYPE_CD -  Algorithm Type
    *     IM_ALG_TYPE_CD, IM - $SEARCH_ALGTYPE_LBL -  Search for Algorithm
Type
```

- Transaction-specific actions buttons are represented as switches. The following is an example of the HTML on the Batch Job Submission - Main page (notice the **SW** fields for the buttons). Note, if you want to **Set focus** to such a field, you would move a **Predefined Value** of **TRUE** to the switch.

```
    *     ACTION_Q_SW, BU - $ACTION_Q_SW -  Duplicate & Queue
    *     ACTION_CANCEL_SW, BU - $CANCEL_SW -  Cancel
```

How To Substitute Variables In Text

You can substitute field values into a step's text string. You do this by prefixing the field name whose value should be substituted in the string with a %. For example, the message, "On %COMPLETION_DTTM this bill was completed, it's ending balance was %ENDING_BALANCE" contains two substitution variables (the bill's completion date / time and the bill's ending balance).

To substitute the value of an element from a data area you need to reference its XPath location as follows: %=XPath=%. If you want to substitute the whole XML node, not just the value, you need to reference it as follows %+XPath+%.

Only fields linked to the current To Do and fields that reside in temporary storage and global variables can be substituted into a text string.

> **Note**
>
> You can substitute fields that reside in the User Interface or Page Data Model by first moving them into temporary storage (using a **Move data** step).

You can also substitute field values into the verbiage displayed in prompts using the same technique.

How To Use HTML Tags And Spans In Text Strings and Prompts

You can use HTML tags in a step's text string. For example, the word "Continue" will be italicized in the following text string "PressContinue after you've selected the customer" (the and are the HTML tags used to indicate that the surrounded text should be italicized).

The following are other useful HTML tags:

-
 causes a line break in a text string. If you use

 a blank line will appear.
- **** text causes the surrounded text to be colored as specified (in this case, red). You can also use hex codes rather than the color name.

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Please refer to an HTML reference manual or website for more examples.

> **Note**
>
> Refer to Color Contrast for information about the use of the HTML color 'red' and its impact on accessibility.

How To Use Constants In Scripts

Some steps can reference fields called **Predefined Values**. For example, if you want to compare an input value to the letter "Y", the letter Y would be defined as a Predefined Value's field value.

Special constants are used for fields defined as switches. When you move **TRUE** to a switch, it turns it on. When you move **FALSE** to a switch, it turns it off.

You can use a global variable as a Predefined Value. For example, if you wanted to move the current date to a field, you'd indicate you wanted to move a Predefined Value named %CURRENT_DATE.

How To Use Global Variables

Some explicit steps can reference fields called **Predefined Values**. In addition to referencing an ad hoc constant value (e.g., the letter Y), you can also reference a global variable in such a field value. A global variable is used when you want to reference system data.

Note that when using the Edit Data step type, the variable available are slightly different. Refer to Edit Data Syntax for details.

The following global variables exist for BPA scripts:

Variable Name	Comments
%PARM-<name>	This is the value of a parameter of that name passed in to the application when launched via the standard system URL. Refer to Launching A Script When Starting the System for more information on these parameters.
%PARM-NOT-SET	This is to be used to compare against **%PARM-**< > parameters to check if the parameter has been set or not when the application was launched. A parameter that has not been set would be considered equal to this global variable. It is recommended to compare parameters against this global variable before using them for the first time.
%BLANK	A constant that contains a blank value (no value).
%SPACE	A constant that contains a single space value.
%CURRENT-DATE	The current date as known by the browser, not the server.
%SYSTEM-DATE	The server date. Note that this date is affected by the system date override logic)
%SAVE-REQUIRED	A flag that contains an indication of whether the data on a page has been changed (and thus requires saving). You may want to interrogate this flag to force a user to save their work before executing subsequent steps. This flag will have a value of **TRUE** or **FALSE**.

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Variable Name	Comments
%NEWLINE	A constant that contains a new line character (carriage return). Upon substitution, a line break is inserted in the resultant text.

> **Note**
>
> This constant does not have the desired effect when the resultant text is HTML. For example, a step's text and prompt strings. This is because HTML ignores special characters such as new lines. Refer to How To Use HTML Tags And Spans In Text to learn how to cause a line break in an HTML text.

To refer to a global context variable, use %FIELD_NAME. For example, if the field SP_ID is in the global context, you may reference %SP_ID to reference the ID of the service point currently in context. In addition, the following special values are supported:

Variable Name	Comments
%CONTEXT-PERSONID	A constant that contains the ID of the current person.
%CONTEXT-ACCOUNTID	A constant that contains the ID of the current account.
%CONTEXT-PREMISEID	A constant that contains the ID of the current premise.

In addition, if the script is invoking something else via one of the various “Invoke” step types and an error is returned, the following global variables contain information about the error:

Variable Name	Comments
%ERRMSG-CATEGORY %ERRMSG-NUMBER	The unique identifier of the error message number.
%ERRMSG-TEXT	The brief description of the error.
%ERRMSG-LONG	The complete description of the error.

How To Name Temporary Storage Fields

Input Data and **Move Data** steps can create fields in temporary storage. You specify the name of the temporary storage field in the step's **Field Name**. The name of the field must not begin with % and must not be named the same as the global variables. Besides this restriction, you can use any **Field Name** that's acceptable to JavaScript (i.e., you can name a field in temporary storage almost anything). Keep in mind that field names are case-sensitive.

How To Work With Dates

Before we discuss how to work with dates in your scripts, we need to point out that there are two types of date fields: date-only and date-time. Date-only fields only contain a date. Date-time fields contain both a date and a time. The following topics describe how to work with dates on the various step types.

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> **Note**
>
> If you're working with a field that resides on the database (as opposed to a temporary storage field), the database field name will tell you what type of date it is: date-only fields are suffixed with **DT**, and date-time fields are suffixed with **DTTM**.

- Move Data
- Mathematical Operation
- Input Data

Move Data

If you intend to use a **Move data** step to populate a *date-time* field, please be aware of the following:

- If the destination field resides in the *page data model*, the source field value must be in the format YYYY-MM-DD-HH.MM.SS or YYYY-MM-DD. If the field is in the format YYYY-MM-DD, the time of 12:00 am will be defaulted.
- If the destination field resides in the *user interface*, you must use two steps if you want to populate both date and time. To explain this, we'll assume the field you want to populate is called EXPIRE_DTTM:
  - First, you populate the date portion of the field. To do this, you'd move a date (this value can be in any valid date format that a user is allowed to enter) to a field called EXPIRE_DTTM_FWDDTM_P1. In other words, you suffix `_FWDDTM_P1` to the field name.
  - If you want to populate the time, you'd move the time (again, the field value can be in any format that a user could use to enter a time) to a field called EXPIRE_DTTM_FWDTTM_P2. In other words, you suffix `_FWDDTM_P2` to the field name.

If you intend to use a **Move data** step to populate a *date-only* field, please be aware of the following:

- If the destination field resides in the *page data model*, the source field value must be in the format YYYY-MM-DD.
- If the destination field resides in the *user interface*, the source field can be in any valid date format that a user is allowed to enter.

> **Note**
>
> **%CURRENT-DATE.** Keep in mind that the global variable%CURRENT-DATE contains the current date and you can move this to either a page data model, user interface, or temporary storage field. If you move %CURRENT-DATE to a temporary storage fields, it is held in the format YYYY-MM-DD.

Mathematical Operation

If you intend to use a **Mathematical operation** step to calculate a date, you can reference both date-only and date-time fields. This is because mathematical operations are only performed against the date portion of date-time fields.

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Mathematical operations are limited to adding or subtracting days, months and years to / from a date.

> **Note**
>
> A useful technique to perform date arithmetic using the current date is to move the global variable%CURRENT-DATE to a temporary storage field and then perform the math on this field.

Input Data

If you intend to use an **Input data** step on a *date-time* field, please be aware of the following:

- If the field resides in the *page data model*, the user must enter a value in the format YYYY-MM-DD-HH.MM.SS (and therefore we do not recommend doing this).
- If the field resides in the *user interface*, you must use two steps if you want to populate both date and time. To explain this, we'll assume the field you want to populate is called EXPIRE_DTTM:
  - First, you populate the date portion of the field. To do this, you'd input the date (this value can be in any valid date format that a user is allowed to enter) in a field called EXPIRE_DTTM_FWDDTM_P1. In other words, you suffix `_FWDDTM_P1` to the field name.
  - If you want to populate the time, you'd input the time (again, the field value can be in any format that a user could use to enter a time) in a field called EXPIRE_DTTM_FWDTTM_P2. In other words, you suffix `_FWDDTM_P2` to the field name.

If you intend to use an **Input data** step to populate a *date-only* field, please be aware of the following:

- If the field resides in the *page data model*, the user must enter a value in the format YYYY-MM-DD (and therefore we do not recommend doing this).
- If the field resides in the *user interface*, the user can enter any valid date format.

How To Use To Do Fields

As described under Executing A Script When A To Do Entry Is Selected, you can set up the system to automatically launch a script when a user selects a To Do entry. These types of scripts invariably need to access data that resides on the selected To Do entry. The following points describe the type of information that resides on To Do entries:

- **Sort keys**. These values define the various ways a To Do list's entries may be sorted. For example, when you look at the bill segment error To Do List, you have the option of sorting the entries in error number order, account name order, or in customer class order. There is a sort key value for each of these options.
- **Message parameters**. These values are used when the system finds *%n* notation within the message text. The *%n* notation causes field values to be substituted into a message before it's displayed. For example, the message text **The %1 non-cash deposit for %2 expires on %3** will have the values of three fields merged into it before it is displayed to the user (%1 is the type of non-cash deposit, %2 is the name of the customer, and %3 is the expiration date of the non-cash deposit). Each of these three values is stored as a separate message parameter on the To Do entry.

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- **Drill keys**. These values are the keys passed to the page if a user drilled down on the entry (and the system wasn't set up to launch a script). For example, a To Do entry that has been set up to display an account on the account maintenance page has a drill key of the respective account ID.
- **To Do ID**. Every To Do entry has a unique identifier referred to as its To Do ID.

You can access this information in the following types of steps:

- **Move Data** steps can move any of the above to any data area. For example, you might want to move a To Do entry's drill key to the page data model so it can be used to navigate to a specific page.
- **Conditional Branch** steps can perform conditional logic based on any of the above. For example, you can perform conditional logic based on a To Do entry's message number (note, message numbers are frequently held in sort keys).
- **Mathematical Operation** steps can use the above in mathematical operations.

A To Do entry's sort key values are accessed by using a **Field Type** of **Current To Do Information** and a **Field Name** of `SORTKEY[index]`. Note, you can find an entry's potential sort keys by displaying the entry's To Do type and navigating to the Sort Keys tab. If you want to reference the first sort key, use an index value of `1`. If you want to use the second sort key, use an index value of 2 (and so on).

A To Do entry's drill key values are accessed by using a **Field Type** of **Current To Do Information** and a **Field Name** of `DRILLKEY[index]`. Note, you can find an entry's potential drill keys by displaying the entry's To Do type and navigating to the Drill Keys tab. If you want to use the first drill key, use an index value of `1`. If you want to use the second drill key, use an index value of 2 (and so on).

A To Do entry's message parameters are accessed by using a **Field Type** of **Current To Do Information** and a **Field Value** of `MSGPARM[index]`. Note, because a To Do type can have an unlimited number of messages and each message can have different parameters, finding an entry's message parameters requires some digging. The easiest way to determine these values is to display the To Do entry on To Do maintenance. On this page, you will find the entry's message category/number adjacent to the description. Once you know these values, display the message category/number on Message Maintenance. You'll find the message typically contains one or more %n notations (one for each message parameter). For example, the message text **The %1 non-cash deposit for %2 expires on %3** has three message parameters. You then need to deduce what each of the message parameters are. You do this by comparing the message on the To Do entry with the base message (it should be fairly intuitive as to what each message parameter is). If we continue using our example, `%1` is the non-cash deposit type, `%2` is the account name, and `%3` is the expiration date. You can access these in your scripts by using appropriate index value in `MSGPARM[index]`.

A To Do entry's unique ID is accessed by using a **Field Type** of **Current To Do Information** and a **Field Value** of `TD_ENTRY_ID`.

In addition, any of the above fields can be substituted into a text string or prompt. Simply prefix the To Do field name with a % as you would fields in temporary storage. For example, assume you want your script to display the following text in the script area: "ABC Supply does not have a bill cycle" (where ABC Supply is the account's name). If the first sort key linked to the To Do entry contains the account's name, you'd enter a text string of **%SORTKEY[1] does not have a bill cycle**.

How To Reference Fields In Data Areas

Various step types involve referencing field elements residing in the script's data areas. To reference an element in a data area you need to provide its absolute XPath notation starting

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from the data area name. For example, use "F1-BatchControl/batchControl" to reference a top-level "batchControl" element in a script data area called "F1–BatchControl".

You don't have to type in long XPath notations. Use the **View Script Schema** hyperlink provided on the Script portal to launch the script's data areas schema.

Figure Schema Viewer

Doing this opens the schema viewer window where you can:

- Click on the field element you want to reference in your script step. The system automatically populates the text box on the top with the element's absolute XPath notation.
- Copy the element's XPath notation from the text box to your script.

You can also use the **View Data Area**, **View Service Script Data Area**, or **View Plug-In Script Data Area** links on the Data Areas tab page on the Script portal to the same effect. These open up the schema viewer for a specific data area respectively.

Script Engine Version 2 and Above Notes

Scripting using the engine version 2 or above requires some extra syntax to take advantage of XPath 2 functionality. In general, any variable declared will be assumed to be a string. This means, that if you intend to construct a mathematical statement then it is necessary to explicitly declare the data type of variables as integers, numbers, or dates.

> **Note**
>
> Unless otherwise noted, all XPath examples in this topic are for the Version 1 engine – which means XPath 1. Statements that function using XPath 1 will not necessarily work for XPath 2. This is especially true when executing math, see below for examples.

Date and Time Arithmetic

XPath date/time and interval data types support arithmetic operations ('+', '-', '*' etc.) and functions, which can be used for time calculations in the same way as '1 + xs:integer(value)' is used for numeric calculations.

Compare time duration:

```
if ("(xs:dateTime(fn:current-dateTime()) - xs:dateTime($updateDateTimeX))
   ge xs:dayTimeDuration(concat('PT', BO/hoursBetweenStatisticsUpdate, 'H'))")
   goto 60;
end-if;
```


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Compare one date to another:

```
if ("xs:date(parm/endDate) < xs:date(parm/startDate)")
   terminate with error (11108, 11507 element='endDate');
end-if;
```

Compare a date against today's date:

```
if ("xs:date(parm/startDate) <= xs:date($CURRENT-DATE)")
   terminate with error (11108, 11507 element='endDate');
end-if;
```

Calculate the end of month:

```
// covert to ISO
move "concat($year,'-',$mon2,'-01T00:00:00')" to $monthStart;

// calculate
move "xs:dateTime($monthStart) + xs:yearMonthDuration('P1M') -
xs:dayTimeDuration('P0DT1S')"
  to $monthEnd;

// convert from ISO to OUAF
move
"concat($year,'-',$mon2,'-',substring(string($monthEnd),9,2),'-23.59.59')"
to $endDateTime;
```

> **Note**
>
> XPath date/time/interval formats use the ISO standard, which needs to be converted to/from formats supported in the framework.

Comparing Date/Times in String Format

Any ISO-like string format for date/time preserves the YYYY MM DD HH MM SS sequence, which is zero-padded. Regardless of separators, this format will remain appropriate for comparison operations. In particular, date/time values in the framework format “YYYY-MM-DD.HH.MM.SS” can be used with “=”, “!=”, as well as “>”, “>=”, “<”, “<=” operators.

```
// retrieve framework date/time value
invokeBS 'CM-MAXMSRMT' using "CM-MAXMSRMT";
move "string(cm-MAXMSRMT/results[1]/measurementDateTime)" to $lastMsmtDT;

// construct another date/time
move "concat($year,'-01-01-00.00.00')" to $startDateTime;

// compare using string operators
if ("$lastMsmtDT >= $startDateTime")
    move "substring($lastMsmtDT,1,4)" to $latestMsrmtYear;
```


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Converting Date/Times Between Framework and ISO

Conversion of date/time from framework format to ISO is only necessary for date/time arithmetic. Comparisons can be done with the framework format directly. The only difference between the framework format and ISO date/time formats is in the separators:

Framework: “YYYY-MM-DD.HH.MM.SS”

ISO: “YYYY-MM-DDTHH:MM:SS”

Example of converting from the framework format to ISO:

```
move "concat(substring($ouafDT, 1, 10), 'T', translate(substring($ouafDT,
12),'.',':'))" to $isoDT;
```

Example of converting from ISO to the framework format:

```
move "concat(substring($isoDT, 1, 10), '.', translate(substring($isoDT,
12),':','.'))" to $ouafDT;
```

Round Money With a Dynamic Currency Scale

Because different currencies support a different number of decimals, the framework provides an API for rounding a monetary amount based on a given currency.

```
move "parm/amount" to $qnty;
move "currency/decimals" to $decimals;
move "fn:round(xs:decimal($qnty) * math:exp10(xs:double($decimals)))
  div math:exp10(xs:double($decimals))" to "parm/roundedAmount";
```

Looping through Sequences

In XPath 2 it is possible to organize a for-loop over a sequence of integers, not only a node list.

This example shows a loop over a range of months. This is a sequence-forming construct in XPath. The XPath node list, which we are familiar with, is just another type of sequence.

```
for ($month in "1 to 12")
```

This example shows a loop over a give range of years in descending order:

```
for ($year in "fn:reverse(parm/startYear to parm/endYear)")
     move "concat($year,'-01-01-00.00.00')" to $startDateTime;
     move "concat($year,'-12-31-23.59.59')" to $endDateTime;
     ...
```

This example shows a loop through a node list using ‘index’, so that other node lists can be accessed:

```
for ($idx in "1 to count(parm/touData/touList)")
     move "parm/touData/touList[$idx]" to $tou;   // access any list with
this index
```


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The above syntax can be used as an elegant alternative to maintaining indices separately, for example instead of the following:

```
move “0” to $idx;
for ($item in "parm/touData/touList")
     move “1 + xs:integer($idx)” to $idx;
```

String Padding and Decimal Formatting

This is used with specific input formats or output formatting. It is applicable to zero, space and other types of padding.

This example shows prefixing for date/time components, for example producing “2010-01-02” instead of “2010-1-2”.

```
move "substring(concat('0',string($month)), string-length(string($month)),
2)" to $mon2;
```

This example shows suffixing for adding decimal zero-padded alignment, for example producing “12.30” and “4.00” instead of “12.3” and “4”. The example performs 3 tasks: rounding to 2 decimals, inserting a period if necessary, and zero padding.

```
// round and zero-pad to 2 decimals
move "$item/amount" to $qty;
move "fn:round(xs:double($qty) * 100) div 100" to $qty;
move "string($qty)" to $qty;
move "concat(substring-
before(concat($qty,'.'),'.'),'.',substring(concat(substring-
after($qty,'.'),'00'),1,2))" to $qty;
```

Ternary Operation

This makes a choice between values based on a condition, so that it could be used in a single expression instead of an if/else block. It is know in C/C++ as ‘cond ? value1 : value2’ or in BASIC as ‘IFF(cond, value1, value2)’. In XPath the syntax is: "if (cond) then value1 else value2". Note this is not the top-level scripting if-statement block.

In XPath this is an expression, which can be combined with other expressions. In scripting it can be used as:

```
move "if (string(D1-UnitOfMeasure/measuresPeakQuantity) = 'D1MP') then 'D1MX'
else 'D1SM' " to $func;
```

Pipeline Processing

In scripting, it is not easy to create a simple reusable piece of code as there are no local functions, and a separate script call is a coding overhead and requires packing/unpacking parameters. To avoid copying and pasting the same code block between similar script stages, consider ‘pipelining’, which is breaking the overall process into separate top-level steps, some of which could be shared between alternating paths. This is common for parameter preparation and output formatting. An intermediate result between stages can be stored in a “parm” substructure.

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Instead of this code:	Consider this alternative:

`if ("type = A")`
`  prepare params ...`
`  call services for A ...`
`  format output ...`
`end-if;`
`if ("type = B")`
`  prepare params ...`
`  call services for B ...`
`  format output ...`
`end-if;`
	`prepare params ...`
	
	`if ("type = A")`
	`  call services for A ...`
	`end-if;`
	`if ("type = B")`
	`  call services for B ...`
	`end-if;`
	
	`format output ...`

XPath 2 Functions

Script engine versions 2 and above support XQuery 1.0 Functions and Operators, and the XQuery 1.0 standard itself with some minor limitations. Below are the URLs to both specifications. The first link has the functions/operators available to use from XQuery.

- http://www.w3.org/TR/xpath-functions/
- http://www.w3.org/TR/xquery/

The following can only access local file systems. (For other protocols like http they will return an empty sequence):

- fn:doc
- fn:collection

Merging Scripts

Use the Script Merge page to modify an existing script by copying steps from other scripts. The following points summarize the many diverse functions available on the Script Merge transaction:

- You can use this transaction to renumber steps (assign them new sequence numbers).
- You can use this transaction to move a step to a different position within a script. When a step is moved, all references to the step are changed to reflect the new sequence number.
- You can use this transaction to delete a step.
- You can use this transaction to copy steps from other scripts. For example:
  - You may want to create a script that is similar to an existing script. Rather than copying all the information from the existing script and then removing the inapplicable steps, this page may be used to selectively copy steps from the existing script to the new script.
  - You may have scripts that are very similar, but still unique. You can use this transaction to build large scripts from smaller scripts. In this scenario, you may choose to create special 'mini' scripts, one for each of the various options that may make a script unique. Then, you could use the script merge page to select and merge the mini scripts that are applicable for a main script.

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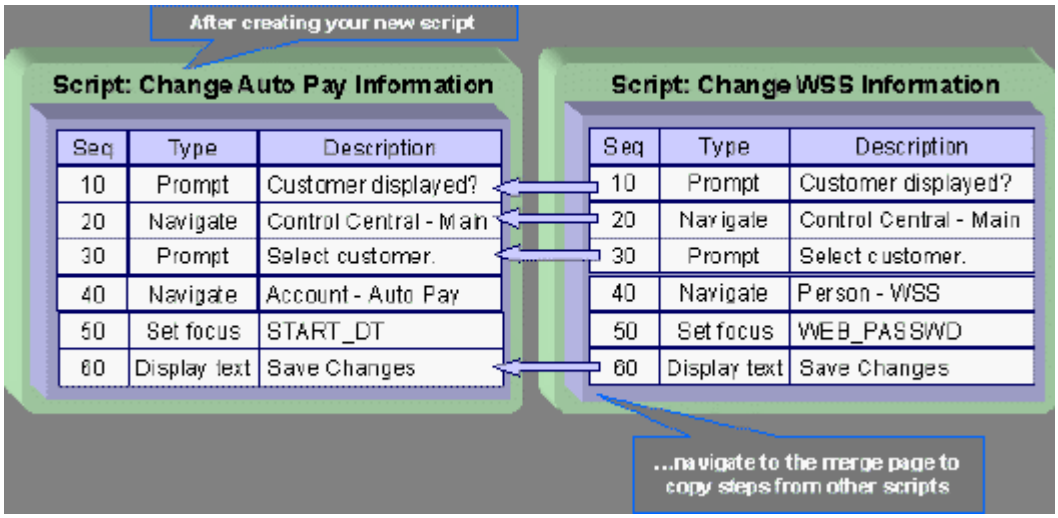
> **Note**
>
> **The target script must exist prior to using this page.** If you are creating a new script, you must first create the Script and then navigate to the merge page to copy step information.



> **Note**
>
> **Duplicate versus Merge**. The Script page itself has duplication capability. You would duplicate a script if you want to a) create a new script and b) populate it with *all* the steps from an existing script.

- Script Merge

Script Merge

Open **Admin**, and then **System**, and then **Script Merge** to open this page.

Description of Page

For **Original Script**, select the target script for merging steps.

For **Merge From Script**, select the template script from which to copy the steps.

> **Note**
>
> You may only copy steps from one Merge From script at a time. If you want to copy steps from more than one script, select the first Merge From script, copy the desired steps, save the original script, and then select the next Merge From script.

The left portion of the page displays any existing steps for the **Original Script**. The right portion of the page displays the existing steps for the **Merge From Script**.

You can use the **Copy All** button to copy all the steps from the **Merge From** script to the **Original** script. If you use **Copy All**, the steps are added to the end of the original script.

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Each time you save the changes, the system renumbers the steps in the original script using the **Start From Sequence Number** and **Increment By**.

Merge Type indicates **Original** for steps that have already been saved in the original script or **Merge** for steps that have been merged, but not yet saved. The **Sequence**, **Step Type** and **Description** for each step are displayed.

The topics that follow describe how to perform common maintenance tasks:

Resequencing Steps

If you need to resequence the steps:

- Use the up and down arrows in the Original Script grid to reorder the steps.
- Make any desired changes to the **Start From Sequence Number** or **Increment By**.
- Click Save.

The steps are given new sequence numbers according to their order in the grid.

Removing a Step from Script

If you want to remove a record linked to the Original script, click the delete button to the left of the record.

For example, to remove the **Reset existing bundle XML** step, click the icon.

		Merge Type	Sequence	Step Type	Description
		Original	10	Edit data	Edit data - Check that the BO is an Export Bundle
		Original	20	Edit data	Edit data - Read the Bundle
		Original	30	Edit data	Edit data - Reset existing bundle XML
		Original	40	Edit data	Edit data - Create new bundle XML

After removal, the grid displays:

		Merge Type	Sequence	Step Type	Description
		Original	10	Edit data	Edit data - Check that the BO is an Export Bundle
		Original	20	Edit data	Edit data - Read the Bundle
		Original	40	Edit data	Edit data - Create new bundle XML

> **Note**
>
> You cannot delete a step that is referenced by other steps unless you also delete the referencing steps, such as **Go to step** or **Prompt** type steps. The system informs you of any missing referenced steps when you attempt to save the original script.

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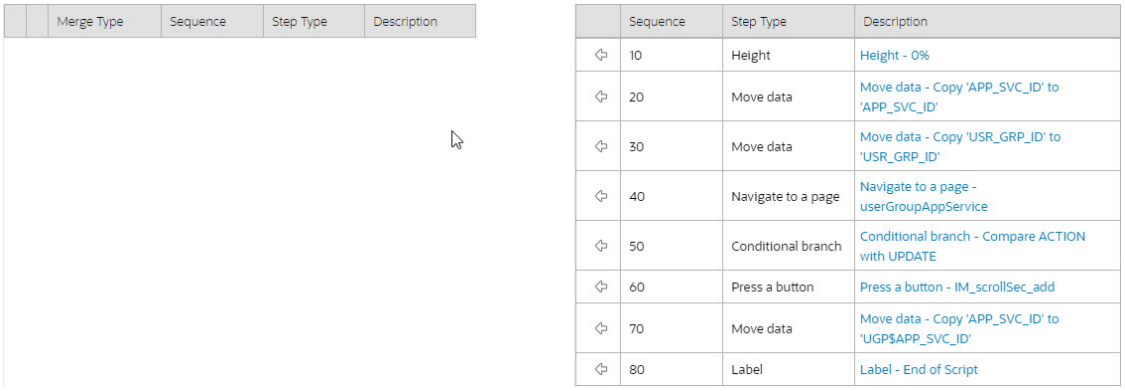
Adding a Step to a Script

You can move any of the steps from the Merge From script to the Original Script by clicking the left arrow adjacent to the desired step. Once a record is moved it disappears from the Merge From information and appears in the Original information with the word **Merge** in the Merge Type column.

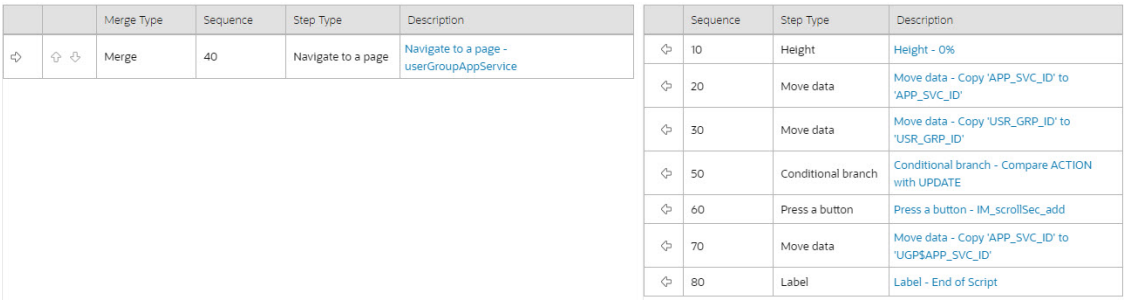
For example, to copy the **Navigate to a page** step, click the left arrow.



	Merge Type	Sequence	Step Type	Description

	Sequence	Step Type	Description
⇦	10	Height	Height - 0%
⇦	20	Move data	Move data - Copy 'APP_SVC_ID' to 'APP_SVC_ID'
⇦	30	Move data	Move data - Copy 'USR_GRP_ID' to 'USR_GRP_ID'
⇦	40	Navigate to a page	Navigate to a page - userGroupAppService
⇦	50	Conditional branch	Conditional branch - Compare ACTION with UPDATE
⇦	60	Press a button	Press a button - IM_scrollSec_add
⇦	70	Move data	Move data - Copy 'APP_SVC_ID' to 'UGP$APP_SVC_ID'
⇦	80	Label	Label - End of Script

The step is moved to the left portion of the page.

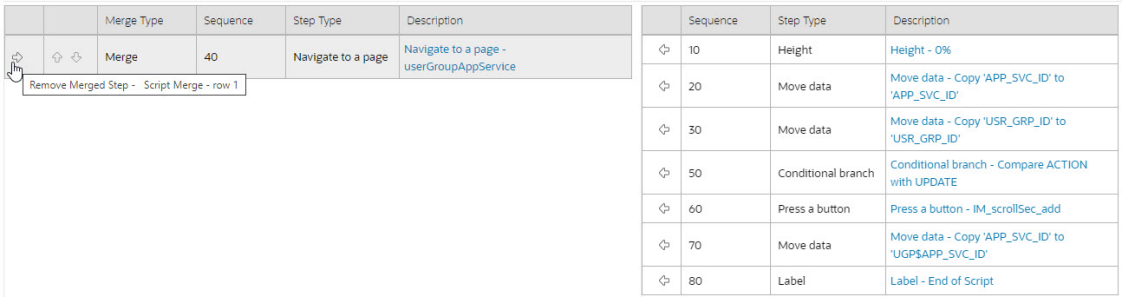


		Merge Type	Sequence	Step Type	Description
⇨	⇧ ⇩	Merge	40	Navigate to a page	Navigate to a page - userGroupAppService

	Sequence	Step Type	Description
⇦	10	Height	Height - 0%
⇦	20	Move data	Move data - Copy 'APP_SVC_ID' to 'APP_SVC_ID'
⇦	30	Move data	Move data - Copy 'USR_GRP_ID' to 'USR_GRP_ID'
⇦	50	Conditional branch	Conditional branch - Compare ACTION with UPDATE
⇦	60	Press a button	Press a button - IM_scrollSec_add
⇦	70	Move data	Move data - Copy 'APP_SVC_ID' to 'UGP$APP_SVC_ID'
⇦	80	Label	Label - End of Script

> **Note**
>
> If you add a step, such as **Go to step** or **Prompt** type steps, that references other steps, you must also add the referenced steps. The step references are updated to use the new sequence numbers when you save the original script. The system informs you of any referenced steps that haven't been added when you attempt to save the original script.

Removing an Uncommitted Step from a Script



		Merge Type	Sequence	Step Type	Description
⇨	⇧ ⇩	Merge	40	Navigate to a page	Navigate to a page - userGroupAppService

Remove Merged Step - Script Merge - row 1

	Sequence	Step Type	Description
⇦	10	Height	Height - 0%
⇦	20	Move data	Move data - Copy 'APP_SVC_ID' to 'APP_SVC_ID'
⇦	30	Move data	Move data - Copy 'USR_GRP_ID' to 'USR_GRP_ID'
⇦	50	Conditional branch	Conditional branch - Compare ACTION with UPDATE
⇦	60	Press a button	Press a button - IM_scrollSec_add
⇦	70	Move data	Move data - Copy 'APP_SVC_ID' to 'UGP$APP_SVC_ID'
⇦	80	Label	Label - End of Script

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Maintaining Functions

> **Note**
>
> Functions were implemented prior to the introduction of business services (BS), service scripts (SS) and business objects (BO). The functionality is still supported, but the recommendation for implementations going forward is to use one of the above configuration tool objects in a script rather than defining a function. The documentation has not been updated throughout this section to highlight where BS, SS or BO could be used to perform the equivalent logic.

Invoke function steps may be used to retrieve or update data independent of the page currently being displayed. For example, if you design a script that takes different paths based on the customer's customer class, you could invoke a function to retrieve the customer's customer class. Doing this is much more efficient than the alternative of transferring to the account page and retrieving the customer class from the Main page.

An **Invoke function** step retrieves or updates the relevant data by executing a service (on the server). These types of steps do not refer to the service directly. Rather, they reference a "function" and the function, in turn, references the service.

> **Note**
>
> **Functions are abstractions of services.** A function is nothing more than meta-data defining the name of a service and how to send data to it and retrieve data from it. Functions allow you to define a scriptwriter's interface to services. They also allow you to simplify a scriptwriter's set up burden as functions can handle the movement of data into and out of the service's XML document.

The topics in this section describe how to set up a function.

> **Note**
>
> **You can retrieve data from all base-package objects.** If you know the name of the base-package "page" service used to inquire upon an object, you can retrieve the value of any of its fields for use in your scripts. To do this, set up a function that sends the unique identifier of the object to the service and retrieves the desired fields from it.

- Function - Main
- Function - Send Fields
- Function - Receive Fields

Function - Main

Use this page to define basic information about a function. Open this page using **Admin**, and then **System**, and then **Function.**

Description of Page

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Enter a unique **Function** code and **Description** for the function.

Use the **Long Description** to describe, in detail, what the function does.

Define the **Internal Service** that the function invokes.

> **Note**
>
> Only page services can be invoked.

The tree summarizes the following:

- The fields sent to the service. You can use the hyperlink to transfer to the **Send Fields** tab with the corresponding field displayed.
- The fields received from the service. You can use the hyperlink to transfer to the **Receive Fields** tab with the corresponding field displayed.
- Scripts that reference the function. You can use the hyperlink to transfer to the script page.

Function - Send Fields

Use this page to add or update the fields sent to the service. Open this page using **Admin**, and then **System**, and then **Function** and then navigate to the **Send Fields** tab.

> **Note**
>
> **Displaying a specific field.** Rather than scrolling through each field, you can navigate to a field by clicking on the respective node in the tree on the Main tab. Also note, you can use the Alt+right arrow and Alt+left arrow accelerator keys to quickly display the next and previous entry in the scroll.

> **Note**
>
> **You're defining the service's input fields.** On this tab, you define which fields are populated in the XML document that is sent to the service. Essentially, these are the service's input fields.

Description of Page

Use **Sequence** to define the order of the **Send Fields**.

Enter a unique **Function Field Name** and **Description** for each field sent to the application service. Feel free to enter **Comments** to describe how the field is used by the service.

Use **Field Value Source** to define the source of the field value in the XML document sent to the service:

- If the field's value is the same every time the function is invoked, select **Defined On The Function**. Fields of this type typically are used to support "hard-coded" input values (so that the scriptwriter doesn't have to populate the field every time they invoke the function). Enter the "hard-coded" **Field Value** in the adjacent field.
- If the field's value is supplied by the script, select **Supplied By The Invoker**. For example, if the function retrieves an account's customer class, the script would need to supply the

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value of the account ID (because a different account ID is passed each time the function is invoked). Turn on **Required** if the invoker must supply the field's value (it's possible to have optional input fields).

Regardless of the Field Value Source, use **XML Population Logic** to define the XPath expression used to populate the field's value in the XML document sent to the service.

Function - Receive Fields

Use this page to add or update the fields received from the service. Open this page using **Admin**, and then **System**, and then **Function** and then navigate to the **Receive Fields** tab.

> **Note**
>
> **Displaying a specific field.** Rather than scrolling through each field, you can navigate to a field by clicking on the respective node in the tree on the Main tab. Also note, you can use the Alt+right arrow and Alt+left arrow accelerator keys to quickly display the next and previous entry in the scroll.

> **Note**
>
> **You're defining the application service's output fields.** On this tab, you define which fields are populated in the XML document that is received from the service. Essentially, these are the service's output fields.

Description of Page

Use **Sequence** to define the order of the **Receive Fields**.

Enter a unique **Function Field Name** and **Description** for each field received from the service. Feel free to enter **Comments** to describe the potential values returned from the service.

Turn on **Required** if the invoker must use the field.

Regardless of the Field Value Source, use **XML Population Logic** to define the XPath expression used to retrieve the field's value from the XML document received from the service.

> **Note**
>
> **Fields in multiple lists.** If a field within the list is unique across the service, the generic list reference is sufficient for the XML population logic. However, if the field you are trying to reference is in multiple lists, the XPath must include the list name. For example, instead of `/pageBody/list/listBody/field[@name='FIELD_NAME']`, the XPath Population Logic must read `/pageBody/list[@name='LIST_NAME']/listBody/field[@name='FIELD_NAME']`.

Maintaining Managed Content

The Managed Content object is used to store various types of text content. Some content is used internally such as Allowlists. Other content may be used by implementations such as XSL

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files used for communicating messages with an external system, JavaScript include files, and CSS files. These files may then be maintained in the same manner as the HTML in UI Maps.

Open this page using **Admin**, and then **System**, and then **Managed Content**.

Use the **Managed Content Query** portal to search for an existing managed content entry. Once the managed content is selected, you are brought to the maintenance page to view and maintain the selected record.

Most fields on the page are self explanatory.

Use **Managed Content Type** to indicate the type of content.

- **Allowlist** is used to capture a list of supported values for given functionality. For example, the product provides allowlists for SQL functions and valid HTML tags.
- **XSLTC** is used to reference XSL files. These may be used internally for user interface referencing. Additionally, the XSLs may be referenced for sending messages to external system using outbound message and for receiving messages in SOAP as inbound messages.

> **Note**
>
> The value F1X (XSLT) is no longer supported and will be deprecated in a future release. Other managed content values are not currently supported by any current framework functionality and are reserved for future use.

Use the **Schema** tab to view and maintain the contents of the managed context text.

Defining Entity Tags

This portal is used to maintain an entity tag along with the list of entities associated with it. Entity tagging supports grouping of configuration, demo and test related entities so they can better describe a logical function. Each group is represented by a unique tag name and entities may be associated with multiple tags.

An entity tag may explicitly restrict the type of entities it can be associated with by referencing a specific maintenance object as part of the entity tag record.

You can access the portal from the**Admin Menu**, and then **Implementation Tools**, and then **Entity Tag**. You are brought to a query portal with options for searching for a specific tag name. Once an entity tag has been selected you are brought to the maintenance portal to view and maintain the selected record.

A Tags sidebar zone allows you to review, add and remove tags for the current entity you review. For configuration type of entities, you may use this portal to tag multiple entities at once.

The following zones may appear as part of the portal's **Main** tab page

- **Entity Tag.** This zone provides information about the selected entity tag.
- **Tagged Entities.** This zone lists entities associated with the selected entity tag. You may also use the zone to remove entities from the list.
- **Tag Entities.** Use this zone to add configuration entities to the selected tag.

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Advanced Schema Topics

The topics in this section describe some advanced information related to schemas used for business objects, business services, service scripts and UI maps.

- Schema Nodes and Attributes
- Schema Designer
- Schema Viewer

Schema Nodes and Attributes

For business object definition, the purpose of the schema is to create a link between the schema and a maintenance object. For business service definition you are specifying the link between the schema and a service (either a general service, search service, or a maintenance object service). For service script definition, you are defining the API for passing information to and from the script. The following documentation is a complete list of the XML nodes and attributes available to you when you construct a schema.

> **Note**
>
> The definition of a schema may include user interface related attributes that represent a separate aspect of the schema for presentation purposes. These attribtutes belong to a separate name space known as UI Hints and as such are not part of the schema's data structure. Refer to Understanding UI Hints for more information.

The Four Element Types

A schema element can be one of four different structure types. Note that there are two classes of element types: the structural nodes group and list, and the data containing nodes of field and raw.

Mnemonic	Valid Values	Description	Examples
`type=`	`"field"`	The field type is the default type for any element not explicitly labeled as something other than a field. Therefore, you virtually never have to explicitly label an element as a field. Note that a field element, unlike group or list, will contain information in its nodes - rather than other nodes.	

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Mnemonic	Valid Values	Description	Examples
	"group"	The group element is typically a structural element of the schema only, in which case it has no mapping. Note that when grouping several elements that are all used to map an XML structure of a CLOB / XML field of a business object driven record, the mapping may be at the group level.	Example where a group is used to create a structure <schema> <input type="group" <userId/> </input> <output type="group"> <firstName/> <lastName/> </output> </schema> Example where the group includes the mapping: <parameters type="group" mapXML="BO_DATA_AREA" mdField= "F1_TODOSUMEMAIL_PARM_ LBL"/> <numberOfDays mdField="F1_NBR_DAYS" required="true"/> <frequency mdField="F1_FREQUENCY" />

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Mnemonic	Valid Values	Description	Examples
	"list"	The list node is structural node like the group node. The only difference is that the list structure has the ability to repeat multiple times in an XML document.	Example of a schema with a list: <schema> <statesList type="list"> <state isPrimeKey="true"/> <description/> </statesList> </schema> Example of a schema with a list: <xml> <statesList> <state>AK</state> <description>Alaska</description> </statesList> <statesList> <state>AL</state> <description>Alabama</description> </statesList> ... </xml>
	"raw"	The raw data type is used to capture a chunk of raw text that doesn't have any inherent structure associated with it.	<sendDetail type="raw" /> Example of an XML instance for the above schema: <sendDetail> <messageInfo> <senderAddress>123 W. Main St, Ontario, CA </senderAddress> <corpZone>3A</corpZone> </messageInfo> </sendDetail>

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The Data Type of a Field Element

Of the four different element types, only a field can have a data type.

Mnemonic	Valid Values	Description	Examples
dataType=	"string"	By default, a field element is a string. Therefore, there is no requirement to specify the string data type.	<schema> <custName dataType="string"/> </schema>

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Mnemonic	Valid Values	Description	Examples

	`"number"`	Defines an element that is a number.
		
		Note
		UI hints include a setting to Suppress Automatic Number Formatting.
		
		Note
		Use **currencyRef** attribute for auto-display of currency symb
			Examples
			
			`<schema>`
			`  <count dataType="number"/>`
			`</schema>`
			
			`<schema>`
			`  <taxRate dataType="number"`
			`   currencyRef="currency"/>`
			`</schema>`

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Mnemonic	Valid Values	Description	Examples
		ol that is associated with the referenced currency code. The currency decimal positions are ignored by this formatting allowing you to display a currency symbol	

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Mnemonic	Valid Values	Description	Examples
		for a unit rate with many decimals.	

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Mnemonic	Valid Values	Description	Examples

	`"money"`
	Optional additional attributes
	`currencyRef=`
	"element name"
		Defines an element that represents a monetary amount.
		The currency reference is optional and if left blank the installation currency will be used. Automatic formatting and validation to be applied based on the currency. For example, the currency symbol will be shown when auto-rendering. In addition, the number of decimal places must not exceed the valid number defined for the currency.
		Note
		Refer to Referencing Other Elements for supported syntax for referring to other elements.
			`<schema>`
			`  <currency default="USD"`
			`    suppress="true"/>`
			`  <balance dataType="money"`
			`   currencyRef="currency"/>`
			`</schema>`

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Mnemonic	Valid Values	Description	Examples
	"lookup" Required additional attribute lookup= "field name"	Defines an element that has valid values defined using a lookup. The lookup field is required.	<schema> <status dataType="lookup" lookup="STATUS_FLG"/> </schema>
	"lookupBO" Required additional attribute lookupBO= "bo name"	Defines an element that has valid values defined using an extendable lookup. The extendable lookup's business object is required.	<schema> <category dataType="lookupBO" lookupBO="CM-BusinessCategory"/> </schema>
	"boolean"	Defines an element that has values of "Y" and "N".	<schema> <allowsEdit dataType="boolean"/> </schema>
	"date"	Defines an element that represents a date.	<schema> <startDate dataType="date"/> </schema>

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Mnemonic	Valid Values	Description	Examples

	`"dateTime"`	Defines an element that represents a date and time.
		
		Note
		Refer to Standard Time Considerations for additional configuration available for date / time fields that represent standard time.
			`<schema>`
			`  <startDateTime`
			`  dataType="dateTime"/>`
			`</schema>`

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Mnemonic	Valid Values	Description	Examples
	"time"	Defines an element that represents a time.	<schema> <startTime dataType="time"/> </schema>
	"uri"	Defines an element captures a URI. Elements defined with this type enable the support for URI Allowlist and Substitution as described in Referencing URIs .	<schema> <exportDirectory dataType="uri"/> </schema>

Referencing Other Elements

There are several attributes that allow for a reference to another element in the same schema. The supported syntax of the XPath reference is the same in every case. This section provides examples using the default reference attribute (**defaultRef**).

Reference a sibling element:

```
<schema>
   <id mapField="ACCT_ID" required="true"/>
   <altId defaultRef="id" required="true"/>
</schema>
```

Reference an element in a higher group:

```
<schema>
   <id mapField="ACCT_ID" required="true"/>
   <msgInfo type="group" mapXML="XML_FIELD">
     <altId defaultRef="../id" required="true"/>
   </msgInfo>
</schema>
```

Reference an element in a lower group:

```
<schema>
   <id mapField="ACCT_ID" defaultRef="msgInfo/altId" required="true"/>
   <msgInfo type="group" mapXML="XML_FIELD">
     <altId required="true"/>
   </msgInfo>
</schema>
```

Reference an element in another group:

```
<schema>
  <acctInfo type="group">
    <id mapField="ACCT_ID" required="true"/>
```


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```
  </acctInfo>
   <msgInfo type="group" mapXML="XML_FIELD">
     <altId defaultRef="../acctInfo/altId" required="true"/>
   </msgInfo>
</schema>
```

Legal vs. Standard Time Considerations

Most date / time fields represent "legal" time such that if a time zone changes their clocks for winter and summer time, the date / time field captures the current observed time. However, some date / time fields should always be captured in standard time to avoid confusion / ambiguity. A good example is a date and time related to detailed interval data. Refer to Designing Time Zones for more information.

When defining an element with `dataType="dateTime"`, you may use `legalTime="true"` to indicate that data captured in the element always represents legal time in the 'base' time zone, or use `stdTime="true"` to indicate that data is stored in standard time in the 'base' time zone. The 'base' time zone is specified on the Installation options.

> **Note**
>
> If an element is mapped to a table / field with a Standard Time Type of **Physical**, then `stdTime="true"` is implied. Refer to Fields for more information.

Example:

```
<schema>
  <startTimeS dataType="dateTime" stdTime="true"/>
  <startTimeL dataType="dateTime" legalTime="true"/>
</schema>
```

If the time zone that represents the date / time field is not the installation time zone, use the optional setting `stdTimeRef`="XPath to time zone element" to indicate that the element represents standard time and indicates the time zone to use. Use `legalTimeRef`= when the element is stored in legal time. Refer to Referencing Other Elements for supported syntax for referring to other elements.

Example:

```
<schema>
  <alternateTimeZone fkRef="F1-TZONE" suppress="true"/>
  <startDateTimeS dataType="dateTime" stdTimeRef="alternateTimeZone"/>
  <startDateTimeL dataType="dateTime" legalTimeRef="alternateTimeZone"/>
</schema>
```

> **Note**
>
> If an element is mapped to a table / field with a Standard Time Type of **Referenced**, then `stdTimeRef`="XPath" is implied. Refer to Fields for more information.

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> **Note**
>
> When schema elements are captured in standard time the UI map supports HTML notation to automatically display the data applying a daylight savings time / summer time correction. Refer to the HTML attribute oraType="dateTime;" for more information.

There may be cases where the date / time is captured in one time zone, but should be displayed using a different time zone. In this case, the attribute `displayRef`="XPath" may be used in addition to the appropriate attribute that identifies the time zone that the data is capture in. Refer to Referencing Other Elements for supported syntax.

```
<schema>
  <displayTimeZone fkRef="F1-TZONE" suppress="true"/>
  <startDateTimeS dataType="dateTime" stdTime="true"
displayRef="displayTimeZone"/>
  <startDateTimeL dataType="dateTime" legalTime="true"
displayRef="displayTimeZone"/>
</schema>
```

The Mapping Attributes

When constructing your schema, you can choose from one of the following mapping attributes.

Mnemonic	Valid Values	Description	Examples

`mapField=`	"field name"	In the case of a business object, the **mapField** attribute is used to identify the database column the element is related to. For business service schemas, the `mapField=` attribute is used to link a schema element with a service element.	`<schema>`
			`  <factId`
			
			`mapField="FACT_ID"/>`
			`</schema>`

`mapChild=`	"table name"	The **mapChild** attribute is used only for business object mapping. It is used in two ways:
		• First, to create a list in the business object that corresponds to a child table of an MO.
		• Second, you can use **mapChild** to identify the child table a flattened field lives in. For more information on flattening, refer to flattening section below.
			Example of a list within a child table in a BO:
			
			`<persons type="list"`
			
			`mapChild="CI_ACCT_PER"`
			`  <personId`
			`mapField="PER_ID"/>`
			`</persons>`

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Mnemonic	Valid Values	Description	Examples
mapList=	"list name"	The **mapList** attribute is used only for business service mapping. It is used in two ways: • First, to create a list in the business service that corresponds to a list in the service. • Second, you can use **mapList** to identify the list that a flattened field lives in. For more information on flattening, refer to flattening section below.	Example of a list within a business service: `<selectList type="list" mapList="DE" <value mapField="COL_VALUE"> <row mapList="DE_VAL"> <SEQNO is="2"/> </row> </value> </selectList>`
mapXML=	"field name"	The **mapXML** attribute is typically used to map XML structures into a large character / XML field of the service. Note that when you use **mapXML** to map either a list or group structure (`type="list"` or `type="group"`) you don't have to map all the child elements within the structure. It is also possible to map list elements to a large character field associated with the list child.	`<enrollmentRequest type="group" mapXML="CASE_CLOB"> <messageID/> <sender/> </enrollmentRequest> <enrollmentKey mapXML="CASE_CLOB"/> <enrollmentInfo type="list" mapChild="CI_CASE_CHILD"> <sequence mapField="CHILD_SEQ"/> <name mapXML="CASE_CHILD_CLOB"/> <value` **`mapXML="CASE_CHILD_CLOB"`**`/> </enrollmentInfo>`

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Mnemonic	Valid Values	Description	Examples

`isPrimeKey=`	`"true"`	You must specify a primary key for a list defined within a mapped XML element (`type="list" mapXML="CLOB"`). The primary key is used by the framework to determine whether a list element add, update or delete is required during a business object update.
		
		Note
		You do not need to specify the prime key for a business object list mapped to maintenance object list. Whe
			`<questionnaire type="list" mapXML="CASE_CLOB">`
			`  <question`
			`  isPrimeKey="true"/>`
			`  <answer/>`
			`</questionnaire>`

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Mnemonic	Valid Values	Description	Examples
		n a physical list is mapped, the prime key is derived from existing physical meta-data.	

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Mnemonic	Valid Values	Description	Examples
orderBy=	"XPath asc|desc , XPath asc|desc "	By default, a list defined within a mapped XML element (type="list" mapXML="CLOB") is sorted by the first element of the list. A different sort order may be specified using the **orderBy** attribute. The attribute value is a comma separated list of field XPaths (relative to the list element) with an optional sort order (ascending is the default). **Note** This is only available for lists mapped as XML within business objects.	<questionnaire type="list" orderBy="page/section, page/sequence" mapXML="CASE_CLOB"> <question isPrimeKey="true"/> <answer/> <page type="group"> <section/> <sequence/> </page> </questionnaire>

Descriptive Attributes

The following attributes can be used to describe a schema element and provide additional configuration related to the element. Typically, these attributes are useful for field elements only.

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Mnemonic	Valid Values	Description	Examples

`<!-- comment -->`		Use this to add a comment to a schema by using special open and close characters: <!-- and -->.	`<schema>`
			`  <!-- This schema is used to capture business information only, please refer to the 'HUMAN' BO for person information -->`
			`</schema>`

`description=`	"text"	The description of an element may be used to provide an internal description of the element to help a reader of the schema to understand the business reason for the element.	`<schema>`
			`  <active type="boolean" description="active account" label="Active"/>`
			`</schema>`

`label=`	"text"	The label of an element is meant to be a short bit of verbiage that would typically precede the element in a user interface.	`<schema>`
			`  <active type="boolean" description="active account"` **`label="Active"`**`/>`
			`</schema>`

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Mnemonic	Valid Values	Description	Examples

`required=`	`"true"`	Used to require the existence of an element during object interaction.
		
		Note
		For included schemas, the required="true" attribute is not processed on business object and business service schemas when
			`<schema>`
			`  <logDate`
			`mapField="LOG_DT"`
			`default="%CurrentDate"`
			
			`required="true"`
			`private="true"`
			`</schema>`

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Mnemonic	Valid Values	Description	Examples
		they are included within a service script schema. This is to support the ability of the service script to populate required elements before an embedded busin	

Mnemonic	Valid Values	Description	Examples
		ess object or business service is invoked from the service script.	

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Mnemonic	Valid Values	Description	Examples

`mdField=`	"field code"	The meta-data field attribute is used to associate an element with a field's metadata. The field defines data type, as well as its label and help text. If you link an element with a meta-data field, you don't need to specify any of these attributes.	`<schema>`
			`  <active mdField="CM_ACTIVE_SW" />`
			`</schema>`

Note

For a business object schema, the mapField attribute is used to derive the data type and label. An mdField attrib

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Mnemonic	Valid Values	Description	Examples
		ute may be provided to override these attributes, if needed. If the element is mapped to an XML column, the mdField is needed to provide the appr op	

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Mnemonic	Valid Values	Description	Examples
		riate data type and label.	
`fkRef=`	"FK Reference Code"	If the element is a foreign key, defining its FK Reference will enable framework validation of the element during schema interaction and automatically provide descriptions and navigation capability.	`<schema> <person fkRef="PER" mapField="CHAR_VAL_FK1"> <row mapChild="CI_SA_CHAR"> <CHAR_TYPE_CD is="PER"/> </row> </person> </schema>`
`private=`	`"true"`	Marking an element as private will prevent it from being exposed in schema interaction. **Note** A private element requires a default.	`<schema> <type mdField="SA_TYPE_CD" default="E1" private="true"/> </schema>`

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Mnemonic	Valid Values	Description	Examples
suppress=	"true"	This setting prevents an element from appearing in automatically generated user interfaces. **Note** This attribute can be specified on a group, in which case all elements of the group will be suppressed.	<schema> <ls mdField="LIFE_SUPPORT_FLG" default="N" suppress="true"/> </schema>

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Mnemonic	Valid Values	Description	Examples
		Note Refer to Defaulting and System Variables for advice related to default values for suppressed elements.	

	`"blank"`	This setting means that automatic UI rendering in display mode will hide the element if its value is blank. The element will still be modifiable on the input map whether blank or not.	`<schema>`
			`  <email mdField="EMAIL" suppress="blank"/>`
			`</schema>`

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Mnemonic	Valid Values	Description	Examples

	`"input"`	This setting means that automatic UI rendering will suppress the element for input, although it may still be displayed if it is not blank.
		
		Note
		Elements marked as `suppress="input"` will behave as with `suppress="blank"`. If the value is blank, no value will
			`<schema>`
			`  <email mdField="EMAIL" suppress="input"/>`
			`</schema>`

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Mnemonic	Valid Values	Description	Examples
		be displayed on either the display or input map. If the element's value is present, then the element will be displayed on both the display and inpu	

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Mnemonic	Valid Values	Description	Examples

t map.

Note

Refer to Defaulting and System Variables for advice related to default values for suppressed elements.

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Mnemonic	Valid Values	Description	Examples
noAudit=	"true"	This setting prevents an element from appearing as a changed element in the business object's audit plug-in spot. If specified on a group or list node it applies to the whole node. You cannot specify it on the schema root node, only on schema elements. **Note** This attribute is only applicable to business object schemas.	<schema> ... <version mapField="VERSION_NBR" noAudit="true"/> ... <workFields type="group" noAudit="true" <lastProcessedId/> <lastProcessedTime/> </workFields> </schema>

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Mnemonic	Valid Values	Description	Examples

`storeEmptyNodes=`	`"true"`	By default, empty nodes are removed from a business object instance when saved. This setting allows a group or a list element to explicitly keep its empty nodes.
		This attribute may be useful in situations where business object data is exchanged with an external system and there is a need to distinguish between an empty value for an element that participates in the synchronization and an element that does not participate and therefore omitted from the message altogether.
		Note
		This is only available for group and list elements.
			`<schema>`
			`  <message type="group" storeEmptyNodes="true">`
			`  ...`
			`  </message>`
			`</schema>`

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Mnemonic	Valid Values	Description	Examples

`emitEmptyGroups=`	`"true"`	By default, empty nodes are not included in the output of a business object or a business service call. This attribute is set at the top level schema node, allowing empty nodes of all groups and list elements to be included in the output.
		This attribute may be useful in the same situations that may require the use of the **storeEmptyNodes=** attribute.
		Note
		This is only available for business object and business service schemas.
			`<schema emitEmptyGroups="true" >`
			`  <message type="group">`
			`  ...`
			`  </message>`
			`</schema>`

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Mnemonic	Valid Values	Description	Examples
emitEmptyElements=	"true"	This attribute is similar to the **emitEmptyGroups**= attribute but may also be specified at the field level. The attribute is applicable to all schema types.	<schema> <messageNumber type="field" emitEmptyElements="true"> ... </message> </schema>

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Mnemonic	Valid Values	Description	Examples
adheresToDA=	“comma separated list of data area names.”	This attribute is applicable to the schema, group and list nodes. It claims that this sub-schema node is intended to "look like" the schema of one of the listed data areas, for polymorphism reasons in general. **Note** The recommended approach for enforcing the structure of a shared data area is by including it in the schema. Thi	<schema> <messageNumber type="group" adheresToDA="DataAreaName"> ... </message> </schema>

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Mnemonic	Valid Values	Description	Examples
		s attribute should be limited to use cases where the ability to include the data area is not possible.	

Schema Constants

There are some product owned schemas where the design warrants a value to be defaulted in the schema, but where the value is implementation specific and therefore cannot be defined by the product. For these situations, the product may use a technique called a schema constant. The design of the schema will include a declared constant. At implementation time, a configuration task will include defining the appropriate value for the constant.

For example, imagine the product delivers an algorithm that will create an outbound message when a certain condition occurs. The outbound message type to use must be configured by the implementation. To use a schema constant to define the outbound message type, the base product will configure the following:

- An option type lookup value for the lookup `F1CN_OPT_TYP_FLG` is defined. For example, `M202` - Activity Completion Outbound Message Type with a Java Value Name of **outmsgCompletion**

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- The base schema that is used to create the "complete activity" outbound message references the schema constant using the Java Value Name of the option type's lookup value

```
...
<outboundMessageType mapField="OUTMSG_TYPE_CD"
default="%Constant(outmsgCompletion)"/>
...
```

At implementation time, the administrative users must configure the appropriate outbound message type for "activity completion". Then, navigate to Feature Configuration, choose the **Schema Constants** feature type, choose the option type **Activity Completion Outbound Message Type** and enter the newly created outbound message type in the option value.

Schema constants may also be used in the flattening syntax to define the row elements required for flattening.

Defaulting and System Variables

The default attribute can be used to default values into field elements as well as the row elements required for flattening . You can default a field to a constant or to one of several system variables.

When an element is required, the default value is applied at the server level when adding or changing the record where no value is provided for this element.

When an element is optional, a default value may be configured to provide a suggested value to the user when populating the record on the user interface in Add mode. Users should be able to remove the default value for this type of element and the system will not attempt to populate it at save time.

> **Note**
>
> The standard for our 'list' maintenance is to show an empty row for a new list that a user may or may not choose to populate. As such, UI default values are not shown for list elements.
>
> It is not recommended to configure a default attribute for an optional element that is not editable or visible on the user interface in Add mode (for example an element with `suppress="true"` or `suppress="input"` or a list element whose default value is not shown per the previous point). The default for this type of element is still applied but the user doesn't have the ability to reset the value. This may result in inconsistencies as defaulting does not occur for optional fields added by a use case other than the UI interaction.

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Mnemonic	Valid Values	Description	Examples
default=	"value"	Use this attribute to default an element to a specified value. The values that are valid depend on the **dataType** setting.	<schema> <perType mapField="PER_OR_BUS_FLG" default="P" required="true"/> </schema>
			<schema> <frequency dataType="number" default="1" required="true"/> </schema>
	"%CurrentDate"	Used to default the element to the current date. This is only applicable to date elements.	<schema> <logDate mapField="LOG_DT" default="%CurrentDate" required="true"/> </schema>
	"%CurrentDateTime"	Used to default the element to the current date / time. This is only applicable to date / time elements.	<schema> <logDateTime mapField="LOG_DTTM" default="%CurrentDateTime" required="true"/> </schema>

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Mnemonic	Valid Values	Description	Examples
	"%StandardDateTime"	Used to default the standard date and time. The standard date and time is identical to the current date and time, unless daylight savings time / summer time is in effect for the base time zone. This may be used with the **stdTime** attribute. **Note** Refer to Standard Time Considerations for more information.	<schema> <startDateTime mapField="START_DTTM" default="%StandardDateTime" required="true"/> </schema>
	"%ProcessDate"	You can default the process date. The process date differs from the current date because the process date will remain constant throughout the duration of the process being executed. The current date will reflect the actual date of processing. This is similar to the batch business date that is a standard batch parameter.	<schema> <billDate mapField="BILL_DT" default="%ProcessDate" required="true"/> </schema>

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Mnemonic	Valid Values	Description	Examples
	"%ProcessDateTime"	This is similar to "%ProcessDate" but for date / time fields.	<schema> <calcDateTime mapField="CALC_DTTM" default="%ProcessDateTime" required="true"/> </schema>
	"%CurrentUser"	Used to default the element to the current user.	<schema> <logUser mapField="LOG_USER" default="%CurrentUser" required="true"/> </schema>
	"%CurrentUserTimeZone"	Used to default the element to the current user's time zone. If the current user's time zone is not found, the installation time zone is used.	<schema> <timeZone default="%CurrentUserTimeZone" required="true"/> </schema>
	"%CurrentUserLanguage"	Used to default the element to the current user's language.	<schema> <custLanguage mapField="CUST_LANG" default="%CurrentUserLanguage" required="true"/> </schema>
	"%InstallationCurrency"	Used to default the currency from the installation record.	<schema> <currency mapField="CURRENCY_CODE" **default="%InstallationCurrency"** required="true"/> </schema>

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Mnemonic	Valid Values	Description	Examples
	"%InstallationCountry"	You can default the country from installation record.	<schema> <country mapField="COUNTRY" default="%Installation Country" required="true"/> </schema>
	"%InstallationLanguage"	You can default the language from the installation record.	<schema> <language mapField="LANGUAGE" **default="%Installation Language"** required="true"/> </schema>
	"%Constant( )"	You can default an element value using a schema constant.	The following is an example of a schema constant used as a default value, where the Java Value Name of the Lookup Value is 'customerLanguage'. <language mapField="CUSTOMER_LANG" default="%Constant(customerLanguage)" required="true"/>

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Mnemonic	Valid Values	Description	Examples
	`"%Context( )"`	You can default a value contained in a context variable.	An example of a context variable used as a default value: `<source mapField="PER_ID" default="%Context(source)" required="true"/>`

Warning

Context variables must be initialized within a server script before the schema context default can be applied. Refer to Conte

Note

When defining a context variable in scripting, it should be prefixed with $$. When referring to the varia

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Mnemonic	Valid Values	Description	Examples
		xt Variables for more information.	ble in the **%Context()** syntax, the prefix is not included.
defaultRef=	"XPath"	Use this attribute to default the value of one element to the value of another one.	Refer to Referencing Other Elements for supported syntax for referring to other elements.

The Flattening Nodes and Attributes

The term "flattening" is used to describe the act of defining one or more single elements for a schema that are actually part of a list within the maintenance object. Flattening is possible if there are other attributes of the list that can be defined to uniquely describe the element or elements. A common use case for flattening is a characteristic. Rather than defining the characteristics of an object using a collection where the user must choose the characteristic type and then define the value, the characteristics are defined as actual elements with the appropriate label already displayed. This technique enables the designer of the schema and the user interface to display each separate characteristic in the logical place in the user interface rather than all lumped together.

> **Note**
>
> A flattened element represents a unique row in the database. This row is inserted when the flattened values are created. The row is updated when any of the flattened values are changed. The row is deleted when all the flattened values are removed. The behavior of effective dated elements is slightly different - please see Flattening an Effective Dated List.

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> **Note**
>
> The flattening feature can also be used to define a list, see Flattened List.

Identifying the List or Child Table

When flattening a child table, the row node is required to identify the list / child table that the element comes from. Within the row node, at least one element must be defined with an `is=` definition that ensures that the element is a unique row in the database. It may also define elements or fields in the row that are suppressed and are populated using default value configuration.

- For a business object, the row node defines the child table the flattened field belongs to.

  The syntax is **<row mapChild="table name">**. This example is for the list of persons for an account in the customer care and billing product. One person may be marked as the "main" person. This illustrates how to define an explicit element for the main person ID to simplify references to that field. It is part of the CI_ACCT_PER child table. What makes it unique is that the MAIN_CUST_SW is **true** (and only one row may have that value)

  ```
  <custId mapField="PER_ID" mdField="CM-MainCust">
    <row mapChild="CI_ACCT_PER">
      <MAIN_CUST_SW is="true" />
      <ACCT_REL_TYPE_CD default="MAIN" />
    </row>
  </custId>
  ```

  > **Note**
  >
  > The above example illustrates that the row node may also define elements within the list that are suppressed and assigned a default value. This syntax is never used to identify a particular row. Note that a default value can either be a literal string, or a system variable.

- For a business service, the row node identifies the list name the flattened field belongs to.

  The syntax is **<row mapList="list name">**. This example shows two entries from a list being flattened to a field value and description.

  ```
  <selectList type="list" mapList="DE">
      <value mapField="COL_VALUE">
      <row mapList="DE_VAL">
            <SEQNO is="2"/>
      </row>
      </value>
    <description mapField="COL_VALUE">
      <row mapList="DE_VAL">
          <SEQNO is="3"/>
      </row>
    </description>
  </selectList>
  ```

Uniquely Identifying the Flattened Field or List

The `is=` syntax within a row or rowFilter element is used to uniquely identify the row.

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Mnemonic	Valid Values	Description	Examples
is=	"value"	Use this attribute to reference a value directly.	<tdTypeCd mapField="CHAR_VAL_FK1"> <row mapChild="F1_EXT_LOOKUP_VAL_CHAR"> <CHAR_TYPE_CD **is="CM-TD-TYPE"**/> </row> </tdTypeCd>
	"%Constant( )"	You can configure a flattened element using a schema constant. During a service interaction the value of the schema constant will be used to identify the flattened element in its child row.	An example of a schema constant used in flattening syntax where the Java Value Name of the Lookup field value is 'cmRate'. <unitRate mapField="CHAR_VAL" dataType="number"> <row mapChild= "F1_EXT_LOOKUP_VAL_CHAR"> <CHAR_TYPE is **="%Constant(cmRate)"**/> </row> </unitRate>
	"%n"	The %n substitution value is used to reference a relative list instance. A relative list instance is typically used to configure a flattened element for a child table keyed by sequence number. The value of *n* should be a positive integer value. During a business object read interaction the relative list instance (position) specified by the integer will be returned.	An example with a relative list instance - where the **first** instance of the row is returned. <schema> <mainPhone mapField="PHONE"> <row mapChild="CI_PER_PHONE"> <PHONE_TYPE_CD is="%Constant(mainPhoneType)"/> <SEQ_NUM**is="%1"**/> </row> </mainPhone> </schema>

NOT_SUPPORTED

Additional values for `is=` are used when Flattening an Effective Dated List. Refer to that section for more information.

Flattening a Pre-defined Characteristic Type

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If the flattened field is in a characteristic collection and the characteristic type is a predefined characteristic, automatic UI rendering will generate a dropdown for the list of valid values. For example, the schema below will generate a dropdown for the Usage element showing the valid values of the Status Reason Usage (F1-SRUSG) characteristic type.

```
<usage mdField="STATUS_RSN_USAGE" mapField="CHAR_VAL">
  <row mapChild="F1_BUS_OBJ_STATUS_RSN_CHAR">
      <CHAR_TYPE_CD is="F1-SRUSG"/>
      <SEQ_NUM is="1"/>
  </row>
</usage>
```

Defining Multiple Elements from the List

When attempting to include multiple columns from the same list, the system provide shorthand notation for copying the flattening rules defined on another element so that the flattening rules do not need to be repeated. To do this, the row node includes the **rowRef** attribute and it indicates the other element name that defines the mapping information. The following example illustrates flattening the fields Customer ID and Receives Copy of Bill from the same list of Persons for an Account (where the MAIN_CUST_SW is **true**).

```
<custId mapField="PER_ID">
  <row mapChild="CI_ACCT_PER">
      <MAIN_CUST_SW is="true" />
      <ACCT_REL_TYPE_CD default="MAIN" />
  </row>
</custId>
<copyBill mapField="RECEIVE_COPY_SW" rowRef="custId"/>
```

Note that the above notation also illustrates that the **rowRef** may be defined directly in the element's attribute definition.

> **Note**
>
> Refer to Referencing Other Elements for supported syntax for referring to other elements.

Flattening Two Layers Deep

If your maintenance object or service has nested lists two layers deep, the system supports flattening an element within a flattened element. This technique also uses the **rowRef** attribute. The flattening of the second level refers to the flattened element of the first level. The following example illustrates flattening a characteristic into an element called legalContact for the "main" customer. Notice that the legalContact element has two row nodes: one to refer to the flattening information for its parent record and one to define its child table

```
<custId mapField="PER_ID">
  <row mapChild="CI_ACCT_PER">
    <MAIN_CUST_SW is="true" />
    <ACCT_REL_TYPE_CD default="MAIN" />
  </row>
</custId>
<legalContact mapField="CHAR_VAL_FK1">
  <row rowRef="custId">
```


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```
    <row mapChild="CI_ACCT_PER_CHAR" >
       <CHAR_TYPE_CD is="LEGAL" />
    </row>
  </row>
</legalContact>
```

Note that the above notation also illustrates that the **rowRef** may be defined as an attribute of a row node rather than directly in the element's attribute definition.

Defining a Flattened List

There are times that a list or child table supports multiple values of the same "type" and these should be presented as a list. To continue with the example above, the list of persons for an account may identify one person as the "main" person. This person has been flattened to a single element (with the account relationship type defaulted and suppressed). To maintain the other persons related to an account, you can define a list where each row captures the Person Id and the Account Relationship Type.

Rather than a row node, the flattened list is configured with a **rowFilter** element. The following schema illustrates the described example. The list node defines the child table. The **rowFilter** includes the criteria that identify the rows within the table to include. The elements of the list are defined within the list node outside the **rowFilter** element.

```
<custId mapField="PER_ID">
  <row mapChild="CI_ACCT_PER">
    <MAIN_CUST_SW is="true" />
    <ACCT_REL_TYPE_CD default="MAIN" />
  </row>
</custId>
<miscPersons type="list" mapChild="CI_ACCT_PER">
  <rowFilter>
    <MAIN_CUST_SW is="false" />
  </rowFilter>
  <relType mapField="ACCT_REL_TYPE_CD"/>
  <personId mapField="PER_ID"/>
</custId>
```

Note that the system will validate that if a schema contains flattened single elements and flattened lists from the same child table, the criteria that defines what makes them unique must be analogous.

Flattening an Effective Dated List

There are some lists in the application that are effective dated (and still others that have effective date and time). For example, there are some effective dated characteristic collections. In these collections, the design is to capture a single value for a characteristic type that may change over time. It is not meant to support multiple characteristic values in effect at the same time.

There are some maintenance objects that have effective dated characteristics and no sequence based characteristics. For those entities, implementations may want to use the characteristic to define an additional field that doesn't require effective dates.

When considering designing an element for your schema that represents a value in an effective dated collection, consider if the value is one that is used in processes, like calculating a bill, such that it is important to capture changes to the value over time.

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- If it is not important to track the changes to the value, the recommendation is to set the effective date to a fixed value in the schema. (Examples below).
- If it is important to track the changes to the value, then you need to consider how you want to design the schema.
  - One option is to define a flattened list as described above. Both the value and the effective date are elements in this list. In this use case, you manage the list just like any list. You can add or remove values.
  - Another option is to define a flattened single value in the schema. With this option, when retrieving the record, the latest effective value is returned. In this design, the important question is how is the reference date defined.

> **Note**
>
> Refer to Referencing Other Elements for supported syntax for referring to other elements.

Flattened Elements Where Changes Are Not Tracked

The following is an example of flattening an element in an effective dated collection where the value does not need to be effective dated. The recommendation in this case is to simply hard-code the date in the `is=` attribute.

```
<schema>
  <externalReference mapField="ADHOC_CHAR_VAL" mdField="CM_EXT_REF"
dataType="string">
    <row mapChild="CI_SA_CHAR">
      <CHAR_TYPE is="CM_EXT_REF"/>
      <EFFDT is="2000-01-01"/>
    </row>
  </externalReference>
</schema>
```

Flattened Elements Where Changes Are Effective Dated

If you want the BO schema to flatten an effective dated value that should keep track of changes over time, the flattened value will represent the latest effective entry. In this case, the recommendation is to explicitly define the date or date/time field as an element. Then there is syntax for the `is=` attribute to indicate that the explicit date field is the date to use for the value.

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Mnemonic	Valid Values	Description	Examples
is=	"%effectiveDate( )"	Use this configuration to indicate that the date to use is the value of another element. **Note** Refer to Referencing Other Elements for supported syntax for referring to other elements.	<schema> <price mapField="CHAR_VAL" dataType="number" required="true"> <row mapChild="CI_SA_CHAR"> <CHAR_TYPE is="PRICE"/> <EFFDT is="%effectiveDate(priceEdate)" /> </row> </price> <priceEdate mapField="EFFDT" rowRef="price"/> </schema>

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Mnemonic	Valid Values	Description	Examples
	"%effectiveDateTime()"	Use this configuration to indicate that the date / time to use is the value of another element. **Note** Refer to Referencing Other Elements for supported syntax for referring to other elements.	<schema> <price mapField="CHAR_VAL" dataType="number"> <row mapChild="RATE_CHAR"> <CHAR_TYPE is="PRICE"/> <EFFDTTM is="%effectiveDateTime(priceEdatetime)"/> </row> </price> <priceEdatetime mapField="EFFDTTM" rowRef="price"/> </schema>

You should consider if the explicit date or date/time element should be displayed on the user interface when the flattened field is shown or if that should be suppressed. Designers should also consider the user dialogue for updating the value. It may be more intuitive for the flattened field to be display only and to have a separate dialogue for updating the effective dated value.

For this option, the suggestion is that the maintenance page for the object includes a separate zone that shows the history of the effective dated values over time. The latest value may be included in that zone as well.

Note that for backward compatibility, the system also supports the following options. However, they are not recommended. They implicitly defined the reference date as the current date at all times. The options supported adding new effective dated rows when the value changed. But the technique also caused new effective dated rows to appear when other elements of the same schema were updated. The new rows would have the current date or date/time with the same row value because the reference date or date/time is the current date, which is a

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change. The product does not recommend managing an effective dated characteristic without defining the date or date/time as an explicit element.

Mnemonic	Valid Values	Description	Examples
is=	"%effectiveDate"	This configuration is not recommended	<schema> <price mapField="CHAR_VAL" dataType="number"> <row mapChild="CI_SA_CHAR"> <CHAR_TYPE is="PRICE"/> <EFFDT is="%effectiveDate"/> </row> </price> </schema>
	"%effectiveDateTime"	This configuration is not recommended	<schema> <price mapField="CHAR_VAL" dataType="number"> <row mapChild="RATE_CHAR"> <CHAR_TYPE is="PRICE"/> <EFFDT is="%effectiveDateTime" /> </row> </price> </schema>

Search Zone

A UI Map schema element can be configured to enable an automatic search dialog when the schema is included within a maintenance UI map.

> **Note**
>
> Please note that an fkRef can be configured with a search zone. If a schema element has an fkRef but no explicit search attributes (as described here) then the fkRef search information will be used in the UI map. In other words, if the schema element already has an fkRef, then these explicit search attributes in the schema are only used to override the fkRef search information.

> **Note**
>
> Refer to the UI Map Attributes and Functions for more information on search zone configuration.

search="search zone"

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The search attribute can be used within a UI map schema and is used to automatically generate the oraSearch UI map attribute. The search zone is an explorer zone configured as a search.

```
<person fkRef="PER" search="C1_PSRCH"/>
```

searchField="search field:element|'literal';"

The searchField attribute can only be used in conjunction with the search attribute. The searchField attribute is used to build the oraSearchField UI map attribute. The searchField value is used to populate a search zone filter with an initial value when the search zone is launched. The initial value can be a literal also. The searchField value is used to match to the filter mnemonic also named searchField.

Search field: element|'literal'. The search field represents the search zone filter to populate on launch. The element is the map's schema element used to populate the filter. The element is optional, if left blank, it will default to the element that this attribute is specified on. The searchField also takes 'literal' as input value

> **Note**
>
> Multiple filters can be populated within the search zone at launch, but multiple search field pairs must be constructed within the attribute value. The value specified here will be used to directly build the HTML attribute oraSearchField within the UI map where this schema is specified.

> **Note**
>
> Note that the element reference is *relative*. Refer to Referencing Other Elements for supported syntax for referring to other elements.

```
<person fkRef="PER" search="C1_PSRCH" searchField="PERSON;
PER_TYPE:personType;"/>
```

searchOut="search field:element;"

The searchOut attribute can only be used in conjunction with the search attribute. The searchOut attribute is used to build the oraSearchOut UI map attribute. The searchOut value is used to capture a selected value from the search zone and move it to a UI map element. The searchOut value specified should match the ELEMENT_NAME mnemonic within the search result zone parameter.

Search field: element. The search field represents the search zone result brought back to the UI map. The element is the map's schema element to be populated. The element is optional, if left blank, it will default to the element that this attribute is specified on.

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> **Note**
>
> Multiple elements can be populated as a result of search zone selection, but multiple search field pairs must be constructed within the attribute value. The value specified here will be used to directly build the HTML attribute oraSearchOut within the UI map where this schema is specified.

> **Note**
>
> Note that the element reference is *relative*. Refer to Referencing Other Elements for supported syntax for referring to other elements.

```
<person fkRef="PER" search="C1_PSRCH" searchField="PER_ID"
searchOut="PER_ID;PRIMARY_PHONE:personPhone;"/>
```

Extend Security for Service Script

Application service security will be enforced when either a business object or a service script is invoked from a BPA script or a UI map, but not from a service script. If you want security to be enforced when the business object or a service script is invoked from a service script, you must add the following attribute to the service script's schema.

appSecurity="true"

The appSecurity attribute is only available for service script schemas. If specified, any business object or service script directly invoked by the service script will have their application service evaluated for access.

```
<schema appSecurity="true">
  ...
</schema>
```

Overriding Action for a Business Service

If you want to invoke a business service with an action other than 'read', you need to specify the action attribute on the primary node business service schema.

pageAction="add, change, delete"

The action attribute is used to override the default action of read on a business service schema. Valid values are:

- add
- update (only allowed for maintenance object service)
- change (not allowed for maintenance object service)
- delete
- read (this is the default action if no pageAction specified)

Example:

```
<schema pageAction="change">
  <parm type="group">
```


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```
    <ele1/>
    <ele2/>
  </parm>
</schema>
```

Specifying searchBy for a Search Service

If you want to invoke a search service then you must explicitly specify the searchBy attribute appropriate for the elements mapped in the schema.

searchBy="MAIN"

The value values of the searchBy attribute can be found by viewing the XML schema linked to the business service, use the View XML URL. Typical values are:

- MAIN
- ALT
- ALT2
- ALT3
- etc.

```
<schema searchBy="MAIN">
  <AccountID mapField="ACCT_ID"/>
  <Results type="list">
    <AccountID mapField="ACCT_ID"/>
  </Results>
</schema>
```

Including Other Schemas

There are no limitations on your ability to include a schema into another schema - all types can be included in all other types. Nested includes are also allowed - and at present there is no limitation on the depth of the nesting.

Including a schema requires two parts:

1. The include node
2. The name attribute

The following table highlights the supported include statements.

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Mnemonic	Description	Examples
<includeBO name=" "/>	Including a business object schema into another schema is allowed. Note that the mapping rules of a business object or business service schema may or may not make sense in the context of the parent schema. Include other schemas at your own risk. However, a very useful aspect of XML processing is that the framework ignores non-pertinent attributes. In other words, it will not hurt to have mapping attributes included into a script schema.	<schema> <cust type="group"> <includeBO name="C1-Person"/> </cust> <spouse type="group"> <includeBO name="C1-Person"/> </spouse> </schema>
<includeBS name=" "/>	Used to include a business service schema.	<schema> <includeBS name="F1-ReadMOLog"/> </schema>
<includeDA name=" "/>	Used to include a data area schema.	<schema> <includeDA name="F1CommonSchemaFieldData"/> </schema>
<includeMP name=" "/>	Used to include a UI map schema.	<schema> <includeMP name="F1-DisplayRecordActions"/> </schema>
<includeSS name=" "/>	Used to include a service script schema.	<schema> <includeSS name="F1-ActShowZn"/> </schema>

Compatibility Attributes

These attributes were added as part of upgrades from previous versions of the Framework.

fwRel="2"

This attribute has been added to schemas created in Framework 2 as part of a Framework 4 upgrade. New schemas will not need this attribute. It is not advisable to modify this attribute without understanding the following behavior differences as improper changes could result in errors:

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> **Note**
>
> Schemas created in Framework 2 with the fwRel="2" attribute will store any XML mapped fields under groups as top-level XML elements in the mapXML field. This means that if two or more fields, in different group structures, were to have the same field name, their storage would conflict with one another resulting in errors. The new behavior, without the fwRel="2" attribute, will preserve the group structure and avoid the conflicts.

```
<schema fwRel="2"
    ...
</schema>
```

Schema Designer

The Schema Designer is a user-friendly interface for performing the following common schema editing tasks:

- Displaying existing schemas.
- Creating schema elements.
- Moving elements within a schema.
- Adding attribute values.

The designer provides two view modes:

- **Text** mode shows the schema elements and their attributes written in the proper syntax and allows for direct text entry.
- **Tree** mode is a view showing the elements in a tree format with many of the key attributes of each element in tabular form. While in this mode, the **Node Display** controls allow the user to choose between displaying the elements by their internal identifiers or their associated screen labels while viewing or editing the schema.

> **Note**
>
> Schemas that are not owned by the current installation owner are protected in both view modes.

The following sections provide more information about functionality available in the Tree mode.

- If the schema definition refers to another schema using an 'include' statement, a triangle is visible to the left of the tree area. One can expand that schema by clicking the triangle.
- Detailed information about an element's definition can be displayed and if applicable, updated from the**Tree** view by clicking the edit icon for that element, which appears on the right. Note that the element attributes are only editable if the element is defined in this schema. When viewing the attributes of an element that is part of an 'include' of another schema, the attributes are display only.
- Context-sensitive embedded help is provided for fields and controls in the edit pane by clicking the Help icon

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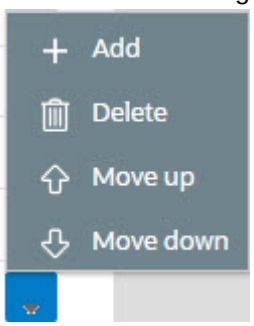
- There is a menu dropdown icon visible to the left of the tree for any element that is defined in the current schema being viewed. It is not visible for elements included from another schema. New elements may be added in the **Tree** mode. Clicking that dropdown displays options to Add, Delete or Move an element. 

Note that not all options are visible, based on what is allowed for the element adjacent to the menu. For example, on the main "schema" node, only the Add option is visible as deleting or moving the "schema" node is not applicable.

When adding a new element, you are prompted first for the element position, which is either a sibling node to the current element or a child node of that element. For either option, the new element is added below the one adjacent to where the menu is clicked. You are then prompted for the element type.

The following lists the possible element types. Most are self explanatory and represent standard schema options.

- Characteristic List. This is a special type of Flattened List element that is used to map list elements that include a sequence and a characteristic value for a given characteristic type. This element is only applicable for maintenance objects that have one or more characteristic child tables where the primary key is the maintenance object's key, characteristic type and sequence. Effective dated characteristic collections are not supported. The user defines the list name, the characteristic value element name and the characteristic type. The system will configure the remaining flattening information accordingly.
- Characteristic. This is a special type of Flattened Field element that is used to map a single element to the characteristic for a given characteristic type. This element is only applicable for maintenance objects that have one or more characteristic child tables where the primary key is the maintenance object's key, characteristic type and sequence. Effective dated characteristic collections are not supported. The user defines the element name and the characteristic type. The system will configure the remaining flattening information accordingly.
- Comment. This adds a comment to the schema.
- Embedded HTML. This is specific to a schema enabled for UI Hints. It is used to include a UI map fragment.
- Field
- Flattened Field
- Flattened List
- Group
- Include BO Schema
- Include BS Schema
- Include DA Schema
- Include Map Schema

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- Include SS Schema
- Input Map Title. This is specific to a schema enabled for UI Hints. It is used to define a title element for the map.
- List
- Nested Flattened Field. This is a flattened field from a child table.
- Raw Element. This element is used to capture text as is. It is typically used to capture an XML structure without any details of the definition of the individual nodes.
- Section. This is specific to a schema enabled for UI Hints. It is used to define a section within the map.
- Simple Field. This is a special type of Field element that is used to define an element that is mapped to a column that supports data defined in an XML structure. (This is either a column with the character large object data type (CLOB) or the XML data type).

The **Schema Designer** is available by choosing the **Schema** tab on the Business Object, Data Area, UI Map, Business Service, and Script pages.

Schema Viewer

The schema viewer shows a tree-view presentation of a schema in its expanded form.

> **Note**
>
> If the schema includes presentation instructions and attributes they are not included in this view. Refer to Understanding UI Hints for more information.

The schema illustrates the structure to be used when communicating with the schema's associated object. The following takes place when a schema is expanded:

- If the schema definition includes references to other schemas, these references are replaced with the corresponding schema definitions.
- Also, if the schema definition contains **private** elements, they are omitted from this view.

Clicking on any node on the tree populates the text box on the top with the node's absolute XPath expression. You will find this feature very useful when writing scripts interacting with schema-based objects. Scripting often involves referencing elements in a schema-based XML document using their absolute XPath expression. You can use this feature on the schema viewer to obtain the XPath expression for an element and copy it over to your script.

Business Event Log

Business Event Log may be viewed as a tool designed to capture any type of business event worth noting. You configure business objects to represent the various types of events your application calls for. The following type of details may be captured for each event:

- The business object representing the type of event.
- The date and time the event took place and who initiated it.
- The business entity for which this event is logged.
- Standard application message to describe the event.

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- Additional context information that is available at the time of the event and varies for each type of event. The Business Event Log maintenance object supports a standard characteristics collection as well as an XML storage (CLOB) field. The event's business object determines where each piece of information resides. Refer to Business Objects for more information.

One common type of event may be the audit of changes made to sensitive data, for example, tracking an address change. Whenever an entity associated with a business object is added, changed, or deleted the system summarizes the list of changes that took place in that transaction and hands them over to **Audit** business object algorithms to process. You may design such an algorithm to audit the changes as business event logs. Refer to a business object may define business rules for more information.

You can also allow users to initiate business event logs to capture important notes about a business entity by exposing a BPA Script to invoke the event's corresponding business object.

Bottom line is that any process can create a business event log by invoking the business object representing the appropriate type of event.

Miscellaneous Topics

The following sections describe miscellaneous system wide topics.

- Javadocs Viewer
- Module Configuration
- Global Context Overview
- System Data Naming Convention
- Accessibility Considerations
- Referencing URIs
- Caching Overview
- Expression Parser
- Debug Mode
- Prepare Issue Details
- System Override Date
- Additional Search Options

Javadocs Viewer

The system provides a Javadocs viewer and a Groovy Javadocs viewer, which are interactive tools that allows you to browse Java documentation files (Javadocs) for Java classes that execute on the application server. For information about how to use Javadocs and navigate within the viewer, refer to Javadocs help.

Javadocs

To launch the Javadocs viewer, open open **Admin**, and then **Implementation Tools**, and then **Javadocs**.

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> **Note**
>
> Proprietary Java Classes. A small number of Java classes have been suppressed due to their proprietary nature.

Additionally, when viewing a record that references a Java program in the algorithm type page, the batch control page or the FK reference page, an icon adjacent to Java program allows you to view the Javadocs for that program.

Groovy Javadocs

The Groovy Javadocs viewer includes the Java classes that are accessible to Groovy code within scripts. Launch this viewer using the 'View Groovy Javadocs' action on the script page.

Module Configuration

The system provides the ability to simplify the user interface based on functionality areas practiced by your organization.

Menu items and other user interface elements are associated with function modules. By default, all function modules are accessible. If a function module is not applicable to your business you may turn it off. Refer to Turn Off A Function Module for more information on how to turn off a module.

If a function module is made non-accessible, i.e. turned off, its related elements are suppressed from the user interface. In addition the system may validate that related functionality is not accessed. This also means that turning off the wrong module may cause any of the following to occur:

- Menu items may not appear. Refer to Menu Item Suppression to better understand how menu item suppression works.
- Entire menus may not appear. Refer to Menu Suppression to better understand how menu suppression works.
- Tabs on pages may not appear.
- Fields may not appear.
- The system may return an error message when you attempt to use a function (indicating the function is turned off).

To correct the above situation, simply remove the module from the turned off list thus making it accessible again.

Your module configuration setup is displayed on the installations record.

- Menu Item Suppression
- Menu Suppression
- Turn Off A Function Module

Menu Item Suppression

The following points describe how your module configuration can suppress menu items.

- Menu items that are owned by the base product (as opposed to those your implementation adds) are associated with one or more function modules. If your module configuration has

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turned off all of the menu item's modules, the menu item is suppressed. If at least one of the modules is accessible, i.e. turned on, the menu item is not suppressed.

- If a menu line doesn't contain any accessible items, the menu line is suppressed.
- If all lines on the Admin Menu are suppressed, the menu itself is suppressed. This is not expected to ever occur for the Main menu as the user preferences is on that menu and the expectation is that all users have access to their preferences.
- Menu items that are suppressed are not visible in the Menu Item Search results.

Menu Suppression

In addition to the above Menu Item Suppression logic, the following points describe how your module configuration can suppress an entire menu.

- Menus that are owned by the base product (as opposed to those your implementation adds) are associated with one or more function modules.
- If your module configuration has turned off all of the menu's modules, the entire menu is suppressed. If at least one of the modules is accessible, i.e. turned on, the menu is not suppressed.

Turn Off A Function Module

The base package is provided with a **Module Configuration** Feature Configuration that allows your organization to turn off base package function modules.

To turn off any of the base package function modules add a **Turned Off** option to this feature configuration referencing that module. Refer to the `MODULE_FLG` lookup field for the complete list of the application's function modules.

Any module not referenced on this feature configuration is considered turned on, i.e. accessible. To turn on a module, simply remove its corresponding **Turned Off** option from this feature configuration.

You may view your module configuration setup on the installation options page.

> **Note**
>
> **Only one**. The system expects only one **Module Configuration** feature configuration to be defined.

Global Context Overview

The framework web application provides each product the ability to nominate certain fields to act as a "global context" within the web application. For example, in Oracle Utilities Customer Care and Billing, the global context fields include Account ID, Person ID and Premise ID. The values of these fields may be populated as a result of searching or displaying objects that use these fields in their keys. If you navigate to the Bill page and display a bill, the global context is refreshed with the Account ID associated with that bill. The global context for Person ID and Premise ID are refreshed with data associated with that account.

The fields designated as global context for the product are defined using the lookup `F1_UI_CTXT_FLDS_FLG`.

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Changing the values of the global context typically cause data displayed in zones on the sidebar to be refreshed to show information relevant to the current values of these global context fields.

When the value of one of the global context fields changes, an algorithm plugged into the installation record is responsible for populating the remaining global context values accordingly. Refer to your specific product for more information about the base algorithm that is provided for that product.

System Data Naming Convention

There are several maintenance objects in the system that include owner flag in one or more of its tables. We refer to the data in these tables as "system data". Some examples of system data tables include Algorithm Type, Batch Control, Business Object and Script. Implementations may introduce records to the same tables. The owner flag for records created by an implementation is set to **CM** (for customer modification), however the owner flag is not part of the primary key for any of the system data tables. As a result, the base product provides the following guidelines for defining the primary key in system data tables to avoid any naming conflict.

- Base Product System Data
- Implementation System Data

Base Product System Data

For any table that includes the owner flag, the base product will follow a naming convention for any new data that is owned by the base product. The primary key for records introduced by the product is prefixed with `xn-` where **xn** is the value of the owner flag. For example, if a new background process is introduced to the framework product, the batch code name is prefixed with `F1-`.

> **Note**
>
> There are some cases where the hyphen is not included. For example, portal codes omit the hyphen.

For most system data, the remainder of the primary key is all in capital case. An exception is schema oriented records. For business objects, business services, scripts, data areas and UI maps, the product follows the general rule of using CapitalCase after the product owner prefix. For example, `F1-AddToDoEntry` is the name of a base product business service.

> **Note**
>
> **Data Explorer Business Services.** For business services used to invoke a data explorer zone, it is recommended to name the Business Service the same name as the related zone rather than defining a different CapitalCase name for the business service.

Please note that this standard is followed for all new records introduced by the base product. However, there are base product entries in many of these system data tables that were introduced before the naming convention was adopted. That data does not follow the naming convention described above.

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> **Note**
>
> **Schema naming conventions.** A context sensitive "Schema Tips" zone is associated with any page where a schema may be defined. The zone provides recommended naming conventions for elements within a schema along with a complete list of the XML nodes and attributes available to you when you construct a schema.

Implementation System Data

When new system data is introduced for your implementation you must consider the naming convention for the primary key. The product recommends prefixing records with **CM**, which is the value of the owner flag in your environment. This is consistent with the base product naming convention. This convention allows your implementation to use the CM packaging tool in the Software Development Kit as delivered. The extract file provided with the tool selects system data records with an owner flag of **CM** and with a **CM** prefix.

> **Note**
>
> If you choose not to follow the CM naming convention for your records and you want to use the CM packaging tool, your implementation must customize the extract file to define the appropriate selection criteria for the records to be included in the package. Refer to the Software Development Kit documentation for more information.

Also note that owner flag may be introduced to an existing table in a new release. When this happens, the CM packaging tool is also updated to include these new system data tables. Your implementation will have existing records in those tables that probably do not follow any naming convention. After an upgrade to such a release, if you want to include this data in the CM packaging tool, you must customize the extract file for the tables in question.

Accessibility Considerations

This section provides information about topics related to accessibility that should be considered when extending the system via configuration tools.

Color Contrast

The HTML color `red` (RGB code #FF0000) when used for text on a white background does not comply with the accessibility color contrast guidelines. When it is desired to use red for text for emphasis in a zone, map or in a text string, the product recommends the shade of red with the RGB code #E0292F.

Note that in addition, the product provides a special CSS class **textColorRedOnWhite** which may be used when HTML references are used for applying the red color. For example, UI map, zone help text and scripting.

Identifying Rows in Grids

When navigating between rows in a grid on the user interface, screen readers will read out the row number and the element name (or names) with an attribute of 'scope=row'. By default, the system assigns this attribute to the non-suppressed primary key element (or elements) or to the first element in the grid if no primary key is defined. This may not be the information that best identifies the row. For example, a sequence number may be less meaningful than the heading of the next element in the list, such as 'Parameter Name'. The product provides a UI

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hint to allow you to specify one or more elements that should be used as the row header for accessibility.

Refer to UI Hint syntax for more details.

Referencing URIs

There are some configuration objects that require a reference to a URI, including file path URIs. The following sections highlight some functionality supported by the product with respect to defining / accessing URIs.

> **Note**
>
> In order for the functionality described below to occur, specific APIs must be used by the underlying code related to the fields that capture or process the file path or URL information. If you find that there is a URI-related field that does not provide the functionality described here, please contact customer support.

> **Note**
>
> For schema elements in a business object that reference a Field with the **URI** data type or define the element with the **URI** data type configured in the schema will automatically use the appropriate API that validates the value that may reference a substitution variable or must be checked against the allowlist if applicable.

- Validation Against an Allowlist
- URI Substitution
- External File Storage

Validation Against an Allowlist

Based on a property setting, your implementation may be configured to define a allowlist of URIs. If this setting is enabled, the system will issue an error if the URI is not defined in the allowlist. Consult your system administrator to verify if this setting is enabled or not for your implementation.

> **NOT_SUPPORTED**
>
> Refer to URI Substitution for information about how defining substitution tokens for URIs using the properties file technique automatically adds the defined URI to the allowlist.

URI Substitution

The system supports the ability to define substitution variables (sometimes referred to as tokens) for both URL values and file path values that reference native file storage locations. For URLs, the system supports defining variables in a Substitution Variable properties file. For native file storage paths, there are two options: the Substitution Variable properties file or via a File Storage configuration extendable lookup. More details on both these options are found below.

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- Substitution variables properties file. A substitution variable for all or part of the URI definition may be configured in a properties file. This allows the system administrators to define the proper URI locations in a properties file whereas the configuration users only need to know the variable name. For example, when defining a location for an extract file in an extract batch job, instead of typing a file path of `h:\oracle\serverName\1.0.0.0\batch\extract\`, the batch user can enter `@FILE_EXTRACT@`, assuming there is an entry in the substitution variables file with a name of `FILE_EXTRACT`, and a value of `h:\oracle\serverName\1.0.0.0\batch\extract\`. Another example is that the batch user could enter `@BATCH_FILES@\extract\`, assuming that the URI variable for `BATCH_FILES` is defined as `h:\oracle\serverName\1.0.0.0\batch\`.

  > **Note**
  >
  > The product automatically populates the value of SPLOUTPUT in the properties file so that this may be used in URI configuration. In addition, the product may supply some pre-defined variable names for other common references. As part of this, the 'advanced' menu in the system installation steps may prompt for installers to define the values of these pre-defined variables, if desired. Installations may opt to define additional substitution variables for various URI references. Refer to the *System Administration Guide* for more information.

- File Storage extendable lookup. Specifically for file paths that reference the native file system, the system also supports the ability to define a path using the **File Storage Configuration** extendable lookup. The following points highlight the steps to take for this option.
  - Navigate to Extendable Lookup and search for the **File Storage Configuration** lookup.
  - Click **Add** to create a new entry. Define a lookup value name. This will be used when configuring a file path that uses this value. Choose the File Adapter value of **Native File Storage**. Enter the desired file path value. The values defined here may in turn refer to values defined in the Substitution Variables properties file. For example, the file path can reference @SPLOUTPUT@.
  - To reference this value in system configuration, use the syntax `file-storage://XXXX`, where XXXX is the extendable lookup value. Using the same example from above, if you define an extendable lookup value of CM-FileExtract with a file path of `h:\oracle\serverName\1.0.0.0\batch\extract\`, then when configuring the extract file path for an extract batch job, enter `file-storage://CM-FileExtract`. Another example is that if the extendable lookup value's file path is configured as `h:\oracle\serverName\1.0.0.0\batch\`, then the user configuring the file path on the batch extract can enter `file-storage://CM-FileExtract/extract`

When should you define substitution variables in the properties file and when you define them in the extendable lookup? The following points highlight differences between the options that may help this decision.

- Substitution variables for URLs are only supported via the properties file.
- The properties file can typically only be modified by a system administrator. If there are values that are set at installation time and don't change, then defining the values in the properties file may be beneficial.
- When defining additional environments, such as test environments or production, the values in the extendable lookup may be copied using CMA. Ideally the values are defined such that they are the same between various regions.

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- When attaching files while Sending Email, if the files are located in native file storage, the file path must be declared in an entry in the File Storage Configuration extendable lookup.

External File Storage

The system supports using Oracle Cloud Object Storage for managing files in cloud implementations and can be configured to read files from or write files to this external location. Refer to Oracle Cloud Object Storage documentation for more information about obtaining an account and defining appropriate file locations or "buckets".

Once your cloud storage information is defined, the following points highlight the configuration steps required in the application.

- Define a signature key ring. When the system tries to communicate with cloud object storage, it must provide a signature key so that cloud storage can confirm that the request is from a trusted source.
  - Navigate to Key Ring in add mode and select the **RSA Signature Key Pair** business object.
  - Define a key ring code, which will be used in the File Storage configuration (below) along with a description.
  - Once the key ring is added, click **Generate Key** to generate a private / public key pair.
  - Click View Public Key to launch a pop-up that displays the public key, allowing the user to copy the key.
- At this point, the user should navigate to cloud object storage and register the public key. Refer to Cloud Services Administration Guide for more information on this step. Once this is done, the key ring is now ready to be configured in file storage configuration.
- Next, confirm that the region where your object storage is defined is configured in the system and if not, define the value.
  - Navigate to Extendable Lookup and search for the **OCI Region** lookup. Review the list of regions already provided.
  - If your region is not listed, click the Add button. Be sure that the Region Key and the Region Identifier match the values defined in the OCI region documentation. The region key is a three digit identifier. For example, the one for Sydney region in Australia is SYD. The region identifier follows a pattern of a two digit realm id followed by the city name, followed by a single digit, all separated by hyphens. For example, the one for the Sydney region is "ap-sydney-1".
- Use a File Storage extendable lookup to define the location and connection information so that you may reference this location in system configuration. The following points highlight the steps to take for this option.
  - Navigate to Extendable Lookup and search for the **File Storage Configuration** lookup.
  - Click **Add** to create a new entry. Define a lookup value name. Note that the lookup value should not have a slash or backslash in its name. This will be used when configuring a file path that uses this value. Choose the File Adapter value of **Oracle Cloud Object Storage**. Provide the following information that identifies the cloud storage options: User, Tenancy, Compartment, Namespace and Region. For the Key Ring, choose the value defined above.
- To reference this value in system configuration, use the syntax `file-storage://XXXX/...`, where XXXX is the extendable lookup value and any additional path information that is appropriate. For example, if you define an extendable lookup value of

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`CM-CloudStorage` and you have a bucket defined in Cloud Storage for processUpload, when configuring the file path for the upload batch job, enter `file-storage://CM-CloudStorage/processUpload`.

- The product supports referencing virtual folders for a bucket. Simply add the virtual folder name(s) after the bucket name. For example, if there is a bucket called 'financials' and a virtual folder for 'paymentUpload', the file path may have this value: `file-storage://CM-CloudStorage/financials/paymentUpload`. For extract processes, if the file path references a virtual folder that does not exist for the referenced bucket, the virtual folder is created as part of the extract process.
- You may optionally use a Bucket Name Prefix on the file storage configuration to support defining different Bucket Names for different environments. For example, imagine you want to have a separate "processUpload" bucket for a development region, a test region and a production region. In the Cloud Storage configuration you can define separate buckets for "DEV_processUpload", "TEST_processUpload" and "PROD_processUpload". If you needed to define the full bucket on each file path reference on various batch jobs, migrating the batch job configuration from one environment to another would require a manual step to change all the bucket references. Instead, the system supports defining a Bucket Name Prefix, which if populated will be prepended to bucket reference before connecting to Cloud Storage. This means that the prefix is defined once and all the references throughout the system can keep the common part of the Bucket name (such as "processUpload"). Then only the File Storage configuration needs to differ between the different regions.
- If your implementation integrates with an external reporting tool that can write the report output to specific delivery channels (buckets) check the Reporting Configuration switch. Define one or more Bucket Names for the buckets that the reporting tool may use for delivery channel options.

> **Note**
>
> Refer to the Key Ring documentation for information about practicing key rotation.

Caching Overview

A great deal of information in the system changes infrequently. In order to avoid accessing the database every time this type of information is required by an end-user or a batch process, the system maintains a cache of static information on the web server and in the batch thread pool worker. These are referred to as the "application caches". Some examples of application caches include

- System messages
- Field label and other field information
- Security Information

The framework product provides many specific caches for commonly used (and infrequently changed) data. In addition, specific edge applications may introduce additional caches as appropriate.

Information may also be cached on each user's browser.

The following topics highlight information about refreshing the various caches.

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Server Cache

The server cache refers to data that is cached on the web server. An important use of this cache is for users' online access to the application. The caches aid in better performance while navigating throughout the system, allowing for data to be accessed from the cache rather than by always accessing the database. Besides user access to the web server cache, other functionality deployed to the web server uses caches in a similar way. For example, web services are deployed to the web server and access their own version of the cache.

The contents of the cache are cleared whenever the web server is restarted. This means that fresh values are retrieved from the database once users and web services start using the application again.

The product also supplies a flush command that one can issue in the browser's URL to immediately clear the contents of the cache. The command `flushAll.jsp` flushes every cache (with an exception noted below).

For example, assume the following:

- the web server and port on which you work is called `OU-Production:7500`
- you add a new record to a control table and you want it to be available on the appropriate transactions immediately

You would issue the following command in your browser's address bar: `http://OU-Production:7500/flushAll.jsp`. Notice that the command replaces the typical cis.jsp that appears after the port number.

If your system has been configured correctly, the **flushAll** command will submit a request to do a "global" flush of caches (including the web services cache and the thread pool worker cache). This functionality uses a JMS Topic to publish the flush request. Refer to the *Server Administration Guide* for details on how to configure the JMS topic.

> **Important**
>
> For a cloud / production environment, the flushAll command will not flush the script cache. This is because flushing the script cache requires an entire recompilation of all the scripts. You don't want to inadvertently cause script recompilation in production when a script hasn't been changed. When a script has actually been updated in production, the script cache can be explicitly flushed by adding "?cacheNames=ScriptCache" to the URL. For example: `http://OU-Production:7500/flushAll.jsp?cacheNames=ScriptCache`

Also note that the system provides a business service `F1-FlushAllService`, which is equivalent to the flushAll command (except that it does not restart your browser session). This may be useful for any processes that are built to orchestrate updates to configuration data where you want to ensure that the cache is immediately flushed. This business service is also exposed as a REST web service.

> **Note**
>
> This business service does not flush the script cache in a cloud production environment. You need to use the browser command noted above to flush the script cache in this case.

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Batch Cache

When submitting a batch job, the batch component uses a Hibernate data cache to cache administrative data that doesn't change very often. The tables whose records are included in this cache are configured using the Caching Regime value of **Cached for Batch**. This is often referred to as the "L2 cache". Refer to Tables for more information. When starting a thread pool worker, data in tables marked as cached is loaded and cached for as long as that thread pool is running.

In addition batch jobs may also access application caches when applicable. When starting a thread pool worker, application data that is cached is loaded and cached for as long as that thread pool is running.

If there are any batch jobs that update any tables that are marked as **Cached for Batch**, you must run that batch job using a special thread pool that is configured with the caching disabled. Contact your system administrator to confirm the thread pool that is configured this way.

If there is a change in cached data that should be available for the next batch job, the following points highlight how the cache can be refreshed:

- By default the system is configured to automatically refresh the Hibernate cache every 60 seconds. However, an implementation may override the configuration to either change the number of seconds between intervals or to disable the automatic caching altogether. Application caches used by the batch jobs are not impacted by this refresh.
- Restart the thread pool workers.
- Run the `F1-FLUSH` (Flush all Caches) background process. This background process will flush the application data cached for all thread pool workers for all thread pools.
- If your the region has configured the thread pool workers to "listen" to requests for global flush as described in the Server Cache section, the thread pool worker caches are also refreshed when a **flushAll** command is issued.

> **Note**
>
> The Flush all Caches background process does not flush the script cache in a cloud production environment. You need to use the browser command noted above to flush the script cache in this case.

Client Cache

In addition to the web server's cache, information is also cached on each user's browser. After clearing the cache that's maintained on the web server, you must also clear the cache that's maintained on your client's browser. To do this, follow the following steps (note that depending on the browser you use, the steps may vary slightly):

- Select **Tools** on your browser's menu bar
- Select **Internet Options...** on the menu that appears.
- Click the **Delete Files** button on the pop-up that appears.
- Turn on **Delete all offline content** on the subsequent pop-up that appears and then click **OK**.
- And then enter the standard URL to re-invoke the system.

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> **Note**
>
> **Automatic refresh of the browser's cache.** Each user's cache is automatically refreshed based on the **maxAge** parameter defined in the web.xml document on your web server. We recommend that you set this parameter to `1` second on development / test environments and `28800` seconds (8 hours) on production environments. Please speak to system support if you need to change this value.

Expression Parser

The product provides support for defining expressions that may be of a mathematical or logical/boolean nature. The expression may include variables and functions.

The data explorer column parameter is an example of where this may be used. That parameter supports the definition of a formula. Edge applications may include support for a formula or expression using this parser as well. For example, several application include a type of 'rule' object (calculation rule, form rule or usage rule) that is used for validation or calculation that may support applying a formula.

The following tables highlight what is supported in the expressions that use this parser.

Category	Supported in Expression	Description
Data types	Number	
	String	
	Boolean	
	List	
Literals	Numbers	
	Strings surrounded with either single quote or double quote. **Note** 'Escaping' special characters is not currently supported.	
	Boolean values: **true** and **false**.	
Operations	+	Plus
	—	Minus
	/	Division
	*	Multiplication
	^ or **	Power
	%	Modulus
Logical operations	=	Equal
	>	Greater than
	>=	Greater than or equal to
	<	Less than
	<=	Less than or equal to

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Category	Supported in Expression	Description
	!= or <>	Not equal to

This table identifies the functions that are supported. Note that several of the functions are applicable to a list of values. Note that although the functions are listed in lower case, the column parameter syntax in data explorer indicates referencing the functions as all capital letters. The system converts the data explorer column formula to lowercase before being evaluated.

Function	Parameter	Results	Comments
`size( )`	List element	Number of elements in the list.	
`isEmpty( )`	List element	Returns true if the list is empty.	
`sum( )`	List element of type 'number'	Returns the sum of the numbers in the list.	
`avg( )`	List element of type 'number'	Returns the average of the numbers in the list.	
	One or more numbers separated by commas	Returns the average of the number arguments.	
`max( )`	List element	Returns the largest value in the list.	
	One or more comparable elements.	Returns the largest value of the number arguments.	
`min( )`	List element	Returns the smallest value in the list.	
	One or more comparable elements.	Returns the smallest value of the number arguments.	
`abs( )`	Number	Returns the absolute value.	
`ceiling( )`	Number	Rounds the number to the ceiling.	
`exp10( )`	Number	Raises 10 to the number power.	
`acos( )`	Number	Returns the arc cosine of the number in radians.	The result will lose precision, as it uses the system's double float based functions.
`asin( )`	Number	Returns the arc sine of the number radians.	The result will lose precision, as it uses the system's double float based functions.
`atan( )`	Number	Returns the arc tangent of the number radians.	The result will lose precision, as it uses the system's double float based functions.
`cos( )`	Radian	Returns the cosine of the radian angle input.	The result will lose precision, as it uses the system's double float based functions.
`exp( )`	Number	Raises e to the number power.	The result will lose precision, as it uses the system's double float based functions.
`log10( )`	Number	Takes the log, base 10, of the number.	The result will lose precision, as it uses the system's double float based functions.

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Function	Parameter	Results	Comments
`log( )`	Number	Takes the natural log (base e) of the number.	The result will lose precision, as it uses the system's double float based functions.
`sin( )`	Radian	Returns the sine of the radian angle input.	The result will lose precision, as it uses the system's double float based functions.
`sqrt( )`	Number	Returns the square root of the number.	The result will lose precision, as it uses the system's double float based functions.
`tan( )`	Radian	Returns the tangent of the radian angle input.	The result will lose precision, as it uses the system's double float based functions.
`floor( )`	Number	Rounds the number to the floor.	
`round( )`	Number	Assumes a scale of 0. The default rounding mode of “round half up” is applied.	
	Number, Scale	The default rounding mode of “round half up” is applied.	
	Number, Scale, Mode	The mode must be set to one of the following: • `“ROUND_CEILING”` • `“ROUND_DOWN”` • `“ROUND_FLOOR”` • `“ROUND_HALF_DOWN”` • `“ROUND_HALF_UP”` • `“ROUND_HALF_EVEN”` • `“ROUND_UP”` • `“ROUND_UNNECESSARY”`	
`negate( )`	Number	Returns the negative value of the number.	Only available in data explorer.

The following are special functions supported in the application for a list of values. In each case, the syntax is *function* [*indexVariable* in *listName* | *expression using indexVariable*], where the *indexVariable* is chosen by the formula writer to represent each entry in the list and the expression used to evaluate each entry must reference that variable.

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> **Note**
>
> The syntax supported for a given use of the formula in a functional area is driven by that particular functional area. For example, in Oracle Public Sector Revenue Management, a formula is supported in the “conditional element validation” form rule. In that form rule all variables including lists are declared in the form rule using letters and the formulas in turn use these letters. In that scenario, the functions below would reference the declared variable letter as the “listName”. Other specific functional area that use this expression parser may support different syntax for referencing elements or lists.

Function	Description	Examples
`any [ ]`	This function returns the value **true** if any of the entries in list satisfies the expression.	The following returns **true** if any entry in the Balance list is greater than 0. `any [ i in list/Balance | i > 0 ]`
`all [ ]`	This function returns the value **true** if all of the entries in the list satisfy the expression.	The following returns **true** if all phone numbers are populated. `all [ i in list/phoneNumber | i != ' ' ]`
`collect [ ]`	This function returns a new list of elements from the referenced list where the value of each entry of the new list is the result of the expression applied to each original value.	The following returns a new list with the tax rate applied to each amount. `collect [ i in list/amount | i * taxRate ]`
`select [ ]`	This function returns a list of all the values of the original list that satisfy the Boolean expression.	The following returns a new list with only the amounts that are negative numbers. `select [ i in list/amount | i < 0 ]`
`reject [ ]`	This function returns a list of all the values of the original list that do not satisfy the Boolean expression.	The following returns a new list with only the amounts that are not negative numbers. `reject [ i in list/amount | i < 0 ]`

Debug Mode

Your implementation team can execute the system using a special mode when they are configuring the application. To enable this mode, enter `?debug=true` at the end of the URL that you use to access the application. For example, if the standard URL was `http://CD-Production:7500/cis.jsp`, you'd enter `http://CD-Production:7500/cis.jsp?debug=true` to enable configuration mode.

In addition, if you have security access to the application service `F1OUDBUG`, you can enable this mode without changing the URL via the Help Menu - Enable Debug option. If debug mode

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is enabled, the help menu entry shows a Disable Debug option, allowing you to turn it off without changing the URL.

When in this mode certain debugging oriented tools become available via an icon visible. Clicking the icon displays a slide-out panel with options defined below.

The following are related to the advanced debugger:

- **Start Debug** starts a logging session. During this session the processing of various configuration tools objects are logged. For example, the log will show the data areas that are passed in at each step and the data areas returned after the step is processed.
- **Stop Debug** stops the logging session.
- **Show Trace** opens a window that contains the logging session. All of the steps are initially collapsed.
- **Clear Trace** clears your log file.

> **Note**
>
> **The buttons are secured.** An application service `F1CONFIGLOG` has been provided for this functionality to allow implementations to restrict user access to these buttons. An additional application service `F1DEBUG` is checked when the environment is not a 'development' environment and is only applicable on premises. This allows implementations to provide an additional layer of security for their production users. (For cloud customers, the advanced debugger is only available in a development environment).

The following are available to view log entries captured while using the system.

- **Show User Log** allows you to view your own log entries. The number of "tail" entries to view may be specified in the adjacent **Log Entries** field before clicking the button. Limiting the number of entries to view allows the user to quickly and easily see only the latest log entries without having to manually scroll to the end of the log.
- **Show Log** allows for advanced settings. It provides for a date / time range to allow a user to target the output for a specific period. In addition, administrative users may request to view logs of other users. The following are examples of when this capability is needed:
  - Batch and integration logs are captured by special user codes created for this type of processing. These users typically do not represent a human and therefore wouldn't access logs using "show user log". Instead someone else would be accessing these logs.
  - Customer admins would like to retrieve logs for an end user possibly for support reasons. An end user might not have technical skills to gather or assess the logs nor would they be given the privilege to access the logs for security reasons
- Checking the **Global Debug** indication starts various tracing options that are added to the user log.

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> **Note**
>
> **Show User Log button is secured.** An application service `F1USERLOG` has been provided for this functionality to allow implementations to restrict user access to this button. Only users with access to the **Administrative** access mode of the application service are allowed to view logs of other users. Such restrictions may be called for in production environments.

> **Note**
>
> If your environment configures redaction rules, personal identifiable information may be redacted in the log output. Refer to Data Redaction for Export and Logging for more information.

For Cloud implementations only, the following buttons are available in this mode:

- **Show Access Logs** - Clicking this button launches a window allowing you to define a date / time range and the number of "tail" entries to view. Click 'Save' to view the access logs that satisfy the criteria.

  > **Note**
  >
  > **Show Access Log button is secured.** This button is secured using the application service `F1ACCLOG` and **Administrative** access mode.

- **Restart TPWs** - This button forces batch containers to terminate, interrupting all running batches. New containers will spin up and the interrupted batches resume. Refer to the Batch Best Practices technical reference paper for more information about this button and when to use it.
- **Restart CM Jar Servers** - This button is provided to aid with support in the cloud for custom Java code in certain use cases. Refer to the Cloud Services Implementation Guide for more information.

Other parts of the system may show additional configuration oriented icons when in this mode. For example, explorer zones may provide additional tools to assist in debugging zone configuration. These icons are described in the context of where they appear.

Also, in debug mode drop down lists in data explorer and UI map zones will contain the code for each item in addition to the item's display string.

Prepare Issue Details

When a user encounters an error with the product and submits a service request, information about the environment, the release and the configuration of the user is often very helpful in understanding the cause of the problem. The system provides a script to capture the environment details and issue description for reporting purposes.

To access the script use **Menu**, and then **Tools**, and then **Prepare Issue Details**. The option is also available in the help menu in the toolbar.

A pop-up window is provided to display the details that are being captured, including a generated Issue ID to uniquely identify the report. The pop-up allows the user to add additional information describing the specific issue. When the user presses Save, the details are added

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to the system log with the issue ID, which can be searched when investigating the problem. A message will be displayed to either confirm the details were successfully logged or indicate that an error occurred.

> **Note**
>
> **The script and menu item are secured.** An application service `F1-PREPISSUEDTLS` has been provided to allow implementations to restrict user access to this functionality.

System Override Date

The system provides a way to override the system date used for online operations. This feature is available if the server administrator has enabled it in the environment properties. For instructions on configuring environment properties see the *Server Administration Guide*. The system date override feature is not recommended for production environments.

Under the **General System Configuration** Feature Configuration, the **System Override Date Option Type** holds the date the application will use as the global system date instead of retrieving the same from the database. This feature can be especially useful in running tests that require the system date to be progressed over a period of time.

The system override date feature is also available at the user level. This is useful when a user wants override the system date to run tests without affecting the system date for other users in the environment. In order to override the system date for the user, open the User — Characteristics page, add the **System Override Date** characteristic type with a characteristic value set to the desired date in the YYYY-MM-DD format.

If system override dates are defined at both the feature configuration level and the user level, the date set at the user level will take precedence.

Additional Search Options

The product supports fuzzy searching in explorer zone types using the Oracle Text CONTAINS operator.

Refer to the DBA guide for details on setting up the database to support fuzzy searching. Note that there are some implementations where fuzzy searching will not be possible. For example, it's only available for implementations using the Oracle database. Additionally, not all languages are supported. Refer to the Oracle Database documentation for more information about fuzzy searching.

For information about the particular syntax to use in the explorer zones, refer to SQL Statement in the zone parameter details section.

Extensions Dashboard

This portal provides a high level summary of configuration entities that have been customized and extended to meet your business requirements. Included are customer owned entities and extended product owned entities. The portal is intended to be used by your implementation team to get an appreciation of areas that have been customized and may need to be reviewed or retested for various reasons.

Use **Admin**, and then **Implementation Tools**, and then **Extensions Dashboard** to navigate to the portal.

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The following zones may appear as part of the portal's **Main** tab page

- **Extensions Summary.** This zone provides a summary of customized entities by maintenance object. You may select a specific maintenance objects to review entities of this type.
- **Extension Entities.** This zone lists customized entities of the selected maintenance object. It is only visible when a maintenance object is selected on the Extensions Summary zone.
- **Extension Details.** This zone provides additional information as to which specific tables contain the custom owned content for the selected entity. It is only visible when a specific customized entity is selected.
- **Revision Control.** This zone lists revisions made to the selected entity. It is only visible when revision information exists for the selected entity.
- **Configuration Migration.** This zone lists CMA migration objects that applied changes to the selected entity. It is only visible when import information exists for the selected entity.

The following zone may appear as part of the portal's **Review** tab page

- **Duplicate Configurations.** This zone highlights duplicate configuration issues that may rarely arise after an upgrade. Customers should use this information to adjust thir configuration accordingly.

To Do Lists

Certain events that occur within the system will trigger messages describing work that requires attention. For example, if a bill segment has an error, the system generates a To Do message to alert the person responsible for correcting such errors.

Each type of message represents a To Do list. For example, there are To Do lists for bill segment errors, payment errors, customer contact reminder, etc.

We refer to each message as a **To Do Entry**. Each To Do entry is assigned a specific **To Do Role**. The role defines the users who may work on the entry. A To Do entry has a **To Do log** that maintains record of the progress on the To Do entry. For example, the To Do log indicates when the To Do entry was created, when it was assigned to a user and to whom it was assigned, and when and by whom it was completed.

NOT_SUPPORTED

Refer to To Do Processing for a description of end-user queries and tools assisting in reviewing, assigning and processing To Do entries.

- The Big Picture of To Do Lists
- Setting Up To Do Options

The Big Picture of To Do Lists

The topics below provide more information about To Do configuration.

- To Do Entries Reference A To Do Type
- To Do Entries Reference A Role

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- The Lifecycle Of A To Do Entry
- How Are To Do Entries Created?
- Refining a To Do Entry's Details at Creation Time
- The Priority Of A To Do Entry
- What Happens When You Work A To Do Entry
- Monitoring A To Do Entry
- To Do Entries Have Logs
- Implementing Additional To Do Entry Business Rules
- To Do Entries May Be Routed Out Of The System
- To Do Information May Be Formatted By An Algorithm
- Periodically Purging To Do Entries

To Do Entries Reference A To Do Type

Every To Do entry references a To Do type. The To Do type controls the following functions:

- The page into which a user is taken when they drill down to the related object on an entry.
- The message associated with the To Do that appears on various pages. Note this message can be overridden for specific To Do messages by specifying a different message number in the process that creates the specific To Do entry. For example, the process that creates To Do entries associated with bill segments that are in error displays the error message rather than a generic "bill segment is in error" message.
- The To Do entry sort keys. Note that the processes that create To Do entries are responsible for populating the sort key values.
- Whether (and how) the To Do entry is downloaded to an external system (e.g., an email system).
- The roles to which an entry may be reassigned.
- The default priority of the To Do entry. Note that this value may be overridden by a **Calculate Priority** algorithm.
- An indication of whether a To Do of that type may be created manually by a user.
- The algorithms used to perform specific business rules for To Do entries of this type.
- The characteristics applicable to the To Do.

To Do Entries Reference A Role

Every To Do entry references a role. The role defines the users who may be assigned to **Open** entries.

The permissible roles that may be assigned to a To Do entry are defined on the entry's To Do type. After an entry is created, its role may be changed to any role defined as valid for the entry's To Do type.

The base package determines the initial To Do Role as follows:

- The system checks if an entry's message category / number is rerouted to a specific role. If so, it defaults this role. Refer to Adjusting the To Do Role for more information.

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- There may be some other condition related to the object linked to your To Do entry that warrants an override role. A To Do pre-creation plug-in would be used to check the conditional logic and override the role, if applicable.
- If a Role wasn't determined in one of the previous steps and a Role is provided by the initiating process (algorithm or background process), the entry is created with that Role.
- If the entry does not have a role after the above takes place, the entry's To Do type's default role is assigned to the entry.

> **Note**
>
> At installation time, the system provides a default role assigned to the system To Do types when first installed called `F1_DFLT`. This is done to allow testing of the system prior to implementing of appropriate To Do roles for your organization. The recommendation is to configure all the To Do Types with appropriate business oriented To Do roles once they are defined.

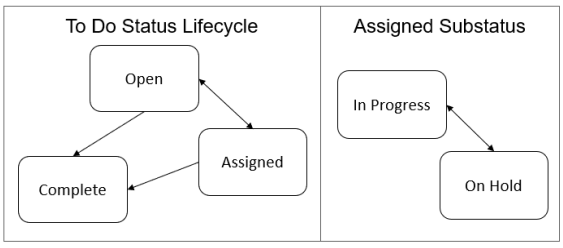
Supervisors for a Role

Most organizations have the notion of a supervisor who is responsible for all entries assigned to a given role. A user that is considered a supervisor should be a valid user in a role. In addition, application security is used to provide supervisors access to additional capabilities, namely the ability to review To Do entries assigned to other users and the ability to assign To Do entries to other users.

The pages listed in To Do Supervisor Functions are meant for supervisors only. So security for these pages should be restricted to those users that are considered supervisors. The To Do Management portal and the To Do Search page are available to all users. There is a special access mode for Supervisors to allow those users the ability to assign To Do entries to other users.

The Lifecycle Of A To Do Entry

The following state transition diagram will be useful in understanding the lifecycle of a To Do entry.



A To Do entry is typically created in the **Open** state. Entries of this type can be viewed by all users belonging to the entry's role. Refer to How Are To Do Entries Created? for information about how entries are created.

An **Open** entry becomes **Assigned** when it is assigned to a specific user or when a user proactively assumes responsibility for the entry. While an entry is **Assigned**, it is visible on the To Do Summary page only by the user who is assigned to it.

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> **Note**
>
> **To Do entries may be created in the Assigned** state. Some To Do background processes may create To Do entries in the **Assigned** state. When a user adds a To Do entry online and assigns the To Do to a user (as opposed to a role), the To Do entry is also created in the **Assigned** state.

An **Assigned** entry may be forwarded to a different user or role. If the entry is forwarded to a role, it becomes **Open** again. This may also be referred to as "reopening" or "unassigning" a To Do entry.

While a To Do Entry is in the **Assigned** state, if your implementation has configured it, you may further indicate the substatus of **In Progress** or **On Hold**.

- When you are ready to start work on an entry you can put it in the **In Progress** state. Refer to Working On A To Do for more information on how to do this.
- If you are not able to complete the To Do entry, you can put it **On Hold**, or stop working on it to put it back to the **Assigned** state (basically resetting the substatus). In either case, the To Do entry is still assigned to you.
- You may only have one To Do entry in the **In Progress** state. If you already have an entry in this state and you perform any action that puts a new To Do entry in **In Progress**, the other To Do entry will automatically be put into the **On Hold** state.

> **Important**
>
> To configure the system to allow users to use the substatus capability, you simply need to give users security for the Start Progress and Hold Progress and Stop Work access modes on the To Do Entry application service (**CILQTDEP**). The recommendation is that an implementation either grants all To Do users access to these access modes or grants no users access to these access modes.

> **Note**
>
> The substatus values are captured in a separate field (`TD_SUB_STATUS_FLG`). They are only populated if the main status field (`ENTRY_STATUS_FLG`) is in the Assigned status (`W`). But most pages in the system treat these substatus values as another status value. You typically won't see both values Assigned and In Progress or Assigned and On Hold. You'll just see In Progress and On Hold.

When an entry becomes **Complete**, it is no longer visible in various To Do queries (but it remains on the database for audit purposes). There are several ways an entry can become **Complete**:

- A user can manually indicate it is **Complete**.
- There are some background processes provided that create To Do entries based on the condition of some object. When subsequently running the same background process, the system automatically marks the To Do entry **Complete** when the object is no longer in the given condition. For example, an entry that's created when an account doesn't have a bill cycle is completed when the account has a bill cycle.

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> **Important**
>
> The automatic completion of To Do entries occurs when the background process responsible for creating entries of a given type is executed. Therefore, depending on how often that process is run, there may be a delay where a To Do entry remains in a non-complete state even if the reported condition no longer exists.

- Algorithms are provided for lifecycle based objects that can create a To Do entry when entering or exiting a status. And corresponding algorithms may be used to complete the To Do entry when entering or exiting a status.

> **Note**
>
> The base product provided algorithm to complete a To Do Entry when entering or exiting a status includes the ability to configure that To Do entries of a certain type should not be automatically completed. These algorithms rely on a characteristic type of F1-EXLTD configured on the To Do Types that should not be auto-completed.

- The To Do monitor process may be used to evaluate whether or not the To Do entry can be closed automatically. Refer to Monitoring a To Do Entry for more information.

How Are To Do Entries Created?

A To Do Entry may be created in the following ways:

- A background process can create To Do Entries.
- An algorithm can create entries of a given type. Because the use of algorithms is entirely dependent on how you configure the control tables, the number of types of such entries is indeterminate.
- A user can create entries of To Do types that have a **Manual** usage. Refer to To Do Entries Created Manually for information about setting up manual To Do types.

For any base product process that includes logic to create a To Do entry, the system supplies a sample To Do type that may be used. Although the To Do types provided by the product are system data, the following information related to each To Do type may be customized for an implementation and is not overwritten during an upgrade:

- The creation process. If the To Do is created by a background process where the background process is referenced on a To Do type. Refer to To Do Entries Created By Background Processes for more information.
- The routing process. Refer to To Do Entries May Be Routed Out of the System for more information.
- The priority. Refer to To Do Type for more information.
- The roles that may be associated with the To Do type. Refer to To Do Entries Reference a Role for more information.
- The message override information. Refer to Suppress the Creation of the To Do Entry, Adjusting the To Do Role and What Happens When You Work A To Do Entry for more information.
- Suppress the Creation of the To Do Entry
- To Do Entries Created By Background Processes

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- To Do Entries Created By Algorithms
- To Do Entries Created Manually

Suppress the Creation of the To Do Entry

The system provides the ability to indicate that a To Do Entry should not be created based on conditions. When the system detects that no To Do should be created, there is no error. The system simply returns to the caller with an indication that no To Do was created. This functionality only applies to automatic To Do Entries created by an algorithm or background process. It does not apply to manually created To Do Entries.

Suppress Based on To Do's Message

There are some types of To Do Entries that are generated with a message that is specific to a condition that was found for a record. For example, business errors found when trying to update a record through a system process will generate a To Do entry using the error message as the To Do Entry's message. There may be some use cases where the error reported is not something that a user needs to address and it may be beneficial to your organization to suppress the To Do Entry. Note that this is only appropriate if the message generated is for informational or warning purposes and doesn't require action or if you know that the error will be resolved by a subsequent step.

The configuration to suppress a To Do entry based on its message is on the To Do type's message overrides page.

> **Note**
>
> **Message Category / Message Number.** Every error in the system has a unique message category / number combination. Refer to The Big Picture of System Messages for more information about message categories and numbers.

We do not supply documentation of every possible message that can be handled by a given To Do type. The best way to build each To Do type's reroute list is during the pre-production period when testing the system. During this period, compile a list of the messages that warrant special behavior described here.

Note that if the To Do type is configured to reference a specific message category / number, it means all To Do entries have the same message. If your organization does not want To Do entries created for this To Do type, then rather than using this suppression technique, you should identify the background process or algorithm that generates the To Do entries of this type and change the configuration there such that it does not try to create the To Do in the first place.

Suppress Based on a Condition

There may be use cases where a To Do entry should be suppressed based on some conditional logic. For example, consider the billing process in Oracle Utilities Customer Care and Billing. There is typically a bill cycle schedule that allows for attempting to bill all the accounts for the bill cycle over a multi-day window. There are some errors that occur on day 1 of the window that may be resolved by day 2 or 3. An implementation may choose to suppress To Do entries for this condition if this is day 1 or day 2 of the bill cycle. If the error still occurs on day 3, then the To Do entry should be generated. This type of condition needs to be determined using an algorithm. The To Do pre-creation plug-ins support returning an indication to suppress the To Do entry. Refer to To Do Pre-creation Plug-ins for more information.

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To Do Entries Created By Background Processes

There are different types of To Do entries created by background processes:

- To Do entries created by dedicated To Do background processes
- To Do entries created for object-specific errors detected in certain background processes
- To Do entries created based on a specific condition
- Dedicated To Do Background Processes
- To Dos Created for Object-Specific Error Conditions
- To Dos Created by Background Processes for Specific Conditions

Dedicated To Do Background Processes

There are To Do entries that are created by system background processes whose main purpose is to create To Do entries based on a given condition. For these background processes, the To Do Type indicates the creation background process.

Note that the Plug-in Driven batch program cannot be used for this purpose. This program assumes that any To Do Type that references it as a creation process is using the link for the Object-Specific Error Condition use case. If you want to use the plug-in driven batch process to create To Do entries based on a given condition, then you need to follow the pattern described in To Dos Created by Background Processes for Specific Conditions.

> **Note**
>
> **If you don't schedule the background process, the entries will not be created!** The To Do entries of this type will only be created if you have scheduled the associated background process. Therefore, if you want the system to produce a given entry, schedule the background process.

To Dos Created for Object-Specific Error Conditions

A system background process may create a To Do entry when an error is detected during object-specific processing. This is applicable for processes that do not have built in error handling, for example where there is an explicit "error" state or where the record has an explicit "exception" record.

For these background processes, the To Do Type must reference the creation background process.

To have the system create To Do entries for some or all of the errors generated by one of these processes, you must do the following:

- If you want the system to generate To Do entries for errors detected by one of the background processes below, go to the appropriate To Do type and populate the creation background process.
- If you want the system to generate To Do entries for some errors for the process, but not for all errors, populate the creation background process and then proceed to the message overrides tab to suppress certain messages. Do this by indicating the message category and message number you want to suppress. Any error that is suppressed is written to the batch run .

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The functionality will only create a new To Do entry if there is not already an existing (non-complete) To Do for the same To Do type, drill key and message category / message number. It will also check for an existing To Do for a successfully processed record and complete that To Do.

If you do not populate the creation background process, the errors are written to the batch run .

> **Note**
>
> **Errors received while creating a To Do entry**. If the background process cannot successfully create a To Do entry to report an object-specific error, the error is written to the batch run along with the error encountered while attempting to create the To Do entry.

> **Note**
>
> **System errors are not included**. To Do entries are not created for a system error, for example an error related to validation of input parameter. These errors are written to the batch run . Refer to Processing Errors for more information.

To Dos Created by Background Processes for Specific Conditions

There are some system background processes that create a To Do entry when the process detects a specific condition that a user should investigate. For each background process, the To Do type is an input parameter to the process. The system provides To Do types for each base package background process that may create a To Do entry.

> **Note**
>
> **No Creation Process.** These To Do types do not need (and should not have) a **Creation Process** specified.

To Do Entries Created By Algorithms

There are To Do entries that are created by algorithm types supplied with the base package. The system supplies a To Do Type for each of these To Do entries that you may use.

If you want to take advantage of these types of entries for system algorithm types, you must do the following:

- Create an algorithm:
  - This algorithm must reference the appropriate Algorithm Type.
  - These algorithms have a parameter of the To Do Type to be created. You should specify the To Do Type indicated in the table.
- Plug the algorithm into the respective control table.

To Do Entries Created Manually

You must set up manual To Do entry types if you want your users to be able to create To Do entries online. Users may create a manual To Do entry as a reminder to themselves to

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complete a task. Online To Do entries may also be used like electronic help tickets in the system. For example, if a user is having a problem starting service, the user can create a To Do that describes the problem. The To Do can be assigned to a help resolution group that could either resolve the problem or send the To Do back to the initiating user with information describing how to resolve the problem.

If you want to take advantage of manual To Do entries, create a To Do type and specify the following information.

On the Main tab:

- Set the **To Do Type Usage** flag to **Manual**.
- Set the **Navigation Option** to **toDoEntryMaint** (To Do entry maintenance).
- Set the **Message Category** and **Message Number** to the message you want to be used for To Do entries of this type. The system will populate the message parameter with the Subject. To show only the subject in the To Do's message, use a message with "%1" as its text.

On the Roles tab:

- Specify the To Do roles that may be assigned to To Do entries of this type.
- Indicate the To Do role that should be defaulted when you create To Do entries of this type.

On the Sort Keys tab:

When a user adds a manual To Do entry, the system creates an entry with three sort key values. (Sort keys may be used on the To Do list page to sort the entries in a different order.) The To Do type should be set up to reference the sort keys as follows:

Sequence	Description
1	Created by user ID
2	Created by user name
3	Subject

We recommend that the keys have an **Ascending** sort order and that the Subject is made the default sort key.

> **Note**
>
> It is possible to define additional sort keys and use a To Do Post Processing algorithm to populate the values. In this case, the base sort keys defined above should still be defined.

On the Drill Keys tab:

When a user adds a manual To Do entry, it is created with a drill key value equal to the To Do entry's ID. When the user clicks the Go To button next to the message in the To Do list, the system uses the drill down application service (defined on the main tab) and the drill key to display the associated To Do entry.

The To Do type must be set up with a drill key that reference the To Do entry table and the To Do entry ID:

Sequence	Table	Field

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Refining a To Do Entry's Details at Creation Time

When a To Do Entry is created, the key information provided to the system are the To Do Type and the drill key, which is the identifier of the object related to the To Do entry. With this information, system logic along with algorithms called at creation time can add details to the To Do entry or update important attributes so that the To Do can be worked on by the right team in the right priority.

The topics in this section will highlight the features provided to further refine a To Do Entry at creation time.

Linking Additional Information to a To Do Entry

Additional information may be linked to a To Do entry using characteristics. This may include master data so that the To Do entry is associated with one or more specific main objects in the system. It may also include other information that is helpful to any user that may be working on the To Do entry.

For **manual** To Do entries, the valid characteristic types that may be linked to the To Do entry must be defined on the To Do Type for that To Do entry. When create a manual To Do entry, the user populates the related characteristics as part of creating the To Do.

For **automatic** To Do entries, the program that generates the To Do may link related data to the To Do using characteristics.

In addition, the system To Do Pre-creation plug-ins can be used to link additional characteristics. These algorithms would use the drill key, which is the related object for the To Do entry. Based on the drill key, it can look up other information and create appropriate characteristics. Your specific product may be providing one or more algorithms to determine key master data records associated with the related object. For example, Oracle Utilities Customer Care and Billing provides an algorithm that attempts to link a related person, account, premise, service agreement and service point for that drill key. Other edge applications provide a similar algorithm for their relevant entities.

Any information that your user may need to have to help work a To Do entry should be linked to the To Do via a characteristic. For example, if the Rate Class of an account is important or the amount of the previous bill will help determine the priority of the To Do entry, this information may need to be linked as a characteristic.

> **Note**
>
> With the volume of To Do entries in the system, it is recommended to carefully consider what information you are linking to the To Do as a characteristic. Users can drill down on details when investigating a To Do entry. Only very important and critical information that would help users in reviewing To Do entries in the To Do Management portal and make decisions about prioritization and assignments should be linked as characteristics.

Note, before you can set up these algorithms, you must define the characteristic types that you'll use to hold each of these entities. Also note that it is not necessary to define these characteristics as valid characteristic types on the To Do type.

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If your To Do entries reference characteristics that are related to your global context data, you may want to configure an alert algorithm to display an alert if a related entry is **Open** or **Assigned**. Refer to Installation Options for more information.

> **Note**
>
> Count of related To Do entries. There are some user interfaces that display a count of related To Do entries. This logic looks at foreign key characteristics linked to the To Do entry where the underlying object is a master or transaction object. It counts the distinct list of other non-closed To Do entries that reference the same characteristic(s).

Adjusting the To Do Role

When creating a To Do entry, for a To Do type, there may be attributes of the To Do entry that require that a special set of users work on it. This is sometimes referred to as 'rerouting the To Do entry' to a different role. This section highlights ways to override the role based on conditions specific to a To Do entry.

The information in this section only applies to automatic To Do Entries created by an algorithm or background process. It does not apply to manually created To Do Entries.

Refer to To Do Entries Reference A Role for the hierarchy used to determine the role .

Reroute Based on To Do's Message

As described in Suppress the Creation of the To Do Entry, To Do entries created for a given To Do type may have different messages based on the specific condition for a record. You may decide that based on the message, the To Do should be routed to a specific Role that is more knowledgeable about a specific error condition. The same message override configuration that may be used for suppression of a To Do entry, may alternatively be used to assign a specific Role. For example, if certain bill segment errors are always resolved by the rate specialist team, you can indicate the role for that team on the To Do type, message override.

Reroute Based on a Condition

The To Do Pre-creation plug-ins may be used to assign a specific role based on some condition related to the To Do entry's specific data.

The product provides configuration on access group to define To Do assignment overrides. The override list defines a To Do type and To Do role. This is useful if your product associates access groups with specific master data for row level security purposes and you would also like to direct To Do entries related to this data to a specific role.

Oracle Utilities Customer Care and Billing also defines similar To Do assignment override configuration on CIS division and Account Management Group.

A pre-creation algorithm is responsible for checking if data linked to the To Do entry is related to a configuration object that supports an assignment override and then looks for an override for the To Do type. You can decide if this algorithm should be plugged in at the To Do Type level or the Installation level. The decision is based on how many To Do types you define overrides for. If it's a small number, then it makes more sense to plug the algorithm in for each To Do type that you define an override for. This ensure that the configuration is only checked for To Do entries that will have an override. However, if the number of To Do types that are eligible for overrides is larger or if the list changing or growing often, it may be better to plug the algorithm in at the Installation level to ensure that every To Do is checked for a possible override.

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> **Note**
>
> Note that your product may already provide a base delivered pre-creation algorithm that is checking for this override. If so, that can be used by your implementation. If not, your implementation can provide an appropriate algorithm.

To Do Pre-creation Plug-ins

The system provides two To Do Pre-creation plug-in spots that allow for functionality to add or update information on the To Do Entry that is about to be created. The two plug-in spots are To Do type and installation options. In general, the installation option To Do pre-creation algorithms would be used for logic that applies to many To Do types and the To Do type pre-creation algorithms would be used for logic that is specific to that To Do type.

If at least one To Do pre-creation algorithm is plugged in on the To Do type, only those algorithms are executed when creating the To Do entry and the installation option algorithms are ignored. The system provides a base delivered To Do type pre-creation algorithm that executes the Installation option To Do pre-creation algorithms. This allows you to control whether the installation algorithms should also be executed for a To Do type that has specific algorithms and if so, when.

The following points highlight functionality supported by both To Do pre-creation plug-in spots.

- Indicate that the To Do entry should be suppressed (not created). The expectation is that this type of algorithm is configured on the To Do type rather than at the installation options level, as this allows for more granular conditions to be checked for a given To Do entry. Refer to Suppress the Creation of the To Do Entry for more information.
- Linking context specific data to the To Do entry using characteristics. Refer to Linking Related Information to a To Do Entry for more information.
- Overriding the Role of a To Do entry based on specific configuration related to the To Do's characteristic data. Refer to Adjusting the To Do Role for more information.

Assigning a Priority

As described in The Priority of a To Do Entry, a To Do type may reference a Calculate Priority algorithm. If so, this algorithm is called as part of the steps to create a To Do entry. The algorithm may use the drill key or any of the related information linked to the To Do as described above to determine priority information.

The Priority Of A To Do Entry

Some To Do entries may be more urgent to resolve than others. A To Do entry is associated with a priority level representing its relative processing order compared to other entries.

Priority level is assigned as follows:

- If one or more **Calculate Priority** plug-ins are defined on the To Do entry's type, the system calls them to determine the entry's priority. They are called initially when a To Do entry is created and each time it gets updated. You may want to use this method if an entry's priority is based on context or time-based factors. For example, when priority takes into consideration account specific attributes. The system also provides a batch process (`F1-TDCLP`) that calls the calculate priority algorithms "at will" for non-closed To Do entries. This is useful when the priority should be reassessed periodically based on factors external to the To Do entry's information. Refer to To Do Type for more information on

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priority calculation algorithms. When the priority is determined by one of the algorithms, a log entry is created indicating that the priority was calculated.

- If a priority value has not been determined by a plug-in, the system defaults a To Do entry's initial priority to the value specified on its type.

A user may manually override a To Do entry's priority at any time. When a user overrides the priority, a log entry is created indicating that the priority was overridden. Notice that once a To Do entry's priority is overridden, **Calculate Priority** plug-ins are no longer called so as to not override the value explicitly set by the user.

> **Note**
>
> The system does not use priority values to control order of assignment nor processing of To Do entries. Priority is available to assist your organization with supporting a business practice that ensures higher priority issues are worked on first.

What Happens When You Work A To Do Entry

Many user interface tools allow the user to indicate that they will start working on a To Do entry. Refer to Working On A To Do for more details. When a user works on an entry, the user is transferred to the maintenance page associated with the entry (the To Do entry's drill key). The page to which the user is taken is configured on the To Do type.

It is also possible to configure the To Do type to launch a script when a user works on a To Do entry rather than taking the user to a specific page. The script can check conditions related to the To Do entry to determine a more appropriate page or could be configured to walk the user through the steps required to resolve the To Do entry.

A script is linked to a To Do type based on its message number using the To Do type's message overrides. Refer to Executing A Script When A To Do Is Selected for more information.

In certain pages, taking an action to work on a To Do entry automatically assigns the To Do entry to the user. For users in implementations that also take advantage of the assignment substatus values, the To Do entry is also updated to the **In Progress** substatus. Refer to The Lifecycle Of A To Do Entry for information about configuring the system to use the substatus values.

Monitoring A To Do Entry

A To Do type may reference a To Do monitor algorithm. The algorithms are executed by the To Do monitor background process (F1-TDMON). The process executes the monitor algorithms for any non-complete To Do entry whose To Do type references at least one monitor algorithm.

Monitor algorithms may be useful if there are business requirements where a To Do could be automatically completed based on criteria that the algorithm can review. For example, an algorithm may be used to detect if the situation that caused the To Do Entry to be generated has been remedied in the meantime, allowing for the To Do Entry to be completed.

To Do Entries Have Logs

Each To Do entry has a To Do log that maintains a record of the To Do's progress in the system. For example, the To Do log indicates when the To Do entry was created, when it was assigned to a user and to whom it was assigned, and when and by whom it was completed.

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Users can view the log to see who assigned them a particular To Do and whether any work has already been done on the To Do.

A log entry is created for all actions that can be taken on a To Do entry. Log entries are created for the following events:

- A To Do entry is created (either by the system or by a user)
- A To Do entry is completed (either by the system or by a user)
- A user takes an open To Do entry
- A supervisor assigns a To Do entry
- The To Do entry's status is updated and the event is not already covered by another log entry type
- A user forwards an entry to another user or role
- A user sends back a To Do to the user who forwarded it
- A user manually adds a log entry to record details about the To Do's progress
- A user manually overrides the To Do entry's priority
- The To Do entry's priority was updated as a result of a calculate priority algorithm.

> **NOT_SUPPORTED**
>
> For information about the contents of log entries for each of the events, refer to Log Entry Events.

Implementing Additional To Do Entry Business Rules

If your business practice calls for additional validation rules or processing steps to take place after a To Do Entry is created or updated, you may want to take advantage of the **To Do Post Processing** plug-ins defined on To Do type.

For example, you may want to validate that To Do entries are only assigned to users with the proper skill levels needed to resolve them. Refer to `F1-VAL-SKILL` for a sample algorithm handling such validation.

To Do Entries May Be Routed Out Of The System

A To Do type can be configured so that its entries are interfaced to another system.

For example, a given To Do type can be configured to create an Email message whenever a new To Do entry is created. The following points describe how to do this:

- Define the name of the background process responsible for interfacing the new To Do entries to another system on the respective To Do type. The base package contains a batch process called `F1-TDEER` that can be used for most situations. This batch process invokes the **External Routing** algorithms defined on each entry's To Do type.
- Plug in an appropriate **External Routing** algorithm on the respective To Do type. The logic in this type of algorithm performs the interface efforts for a specific To Do entry. For example, if an Email message should be created for a To Do entry, the logic in the algorithm would compose and send the Email message(s) for a specific To Do entry.

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To Do Information May Be Formatted By An Algorithm

A **To Do Information** algorithm may be plugged in on the installation record to format the standard To Do information that appears throughout the system. This algorithm may be further overridden by a corresponding plug-in on the To Do Type.

Periodically Purging To Do Entries

The To Do Entry is configured for Information Lifecycle Management . This is the recommended tool for managing older records.

A purging batch process is also supplied `F1-TDPG`. However, it has some limitations that should be considered. The purging process does not perform any referential integrity. As such, if you are proactively purging records that are not very old, they could be referenced by other objects that are still active.

The process purges **Completed** To Do entries. This background process offers you the following choices:

- You can purge all To Do entries older than a given number of days.
- You can purge To Do entries for a specific list of To Do types that are older than a given number of days.
- You can purge all To Do entries except for a specific list of To Do types that are older than a given number of days.

> **Note**
>
> **Different retention periods for different types of To Do entries.** Keep in mind that the purge program allows you to retain different types of entries for different periods of time.

Setting Up To Do Options

The topics in this section describe how to set up To Do management options.

- Installation Options
- Messages
- On Demand Assignment Configuration
- Defining To Do Roles
- Defining To Do Types
- Implementing The To Do Entries

Installation Options

There are a number of installation options that may be configured to govern various aspects of To Do processing.

- A **To Do Information** algorithm may be plugged in on the Installation record. Refer to To Do Entries My be Formatted By An Algorithm for more information.

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- A **To Do Pre-creation** algorithm may be plugged in on the Installation record to set additional information for a To Do entry before it is created. Refer to To Do Pre-creation Plug-ins for more information.
- A **Next To Do Assignment** algorithm must be plugged into the Installation record if your organization opts to use the on demand assignment feature.
- If your To Do entries reference characteristics related to your global context data and your product supports sidebar alerts generated by algorithms, you may want configure an algorithm to display an alert if an entry is **Open** or **Assigned** for the data currently in context. Refer to your product's documentation to determine if these types of alerts are supported.

Messages

You need only set up new messages if you use algorithms to create To Do entries or prefer different messages than those associated with the base package's To Do types.

On Demand Assignment Configuration

The base package provides configuration related to allowing your users to click the "Assign me a To Do" button on the Current To Do Zone on the sidebar. If your organization plans to use this feature, be sure that users are granted the **Get Next Assignment** the Current To Do Zone application service (FWLCTDEP).

Next Assignment Plug-in

In order for the user to get an assignment on demand, a Next Assignment algorithm needs to be plugged in on installation options. The algorithm is responsible for determining the next To Do entry the user should work on.

The product provides an algorithm out of the box (`F1-NEXT-TDNS`) that can assign work solely based on priority. Another algorithm (`F1-NEXT-TDSK`) may be used to only consider To Do entries the user has the proper skills to resolve. Your implementation may provide a different algorithm based on your own business rules.

Skills

To use the algorithm that attempts to match a user's skills to the To Do Type's skills, the product provides additional configuration that is needed.

- Define skills. You need to define one or more measurable skills so that you can assign a skill level to both the To Do Types and to your users. The algorithm expects you to use predefined characteristic types, one for each different type of skill needed. Define the characteristic values as numeric, where the higher the number, the higher the experience / skill level. The characteristic type should configure both the To Do Type and the User characteristic entities.
- Define message overrides, if applicable. If your To Do Type is used for exceptions, you may refine the skill needed for a given message. Do this by using an ad-hoc characteristic on the
- Update your To Do types with the characteristic types that indicate the skills needed and the minimum skill level for each.
- Skill requirements may also be overridden on a message level. The algorithm assumes an ad-hoc characteristic on To Do Type is used to capture skill override for a given message. The ad-hoc value format is as follows: msg=12,12011 skill=BILL-EXC level=1 where msg is the message number, skill is the characteristic type defining the type of skill and level is the minimum skill level.

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- Update your users that work on To Dos to indicate all their capable skills and skill levels. Create a characteristic entry for each skill defined and use the characteristic value to indicate the user's skill level. The algorithm provided will ensure that the user's skill is equal to or higher than the required skill for the To Do Type.
- Register the characteristic types you are using for skills so that the algorithm knows which ones to evaluate. Go to Feature Configuration and find (or create) the feature with the **To Do Options** feature configuration type. Define an entry with the option type **Skill** for each characteristic type defined.
- Register the characteristic type you are using to indicate the Override Skills for a message level override on the same feature option. Define an entry with the option type **Override Skill** for the characteristic type.

The base **To Do Post Processing** To Do Type algorithm `F1-VAL-SKILL` validates that a user has the necessary skill levels required to work on a given To Do entry.

Defining To Do Roles

This section describes the control table used to maintain To Do roles.

- To Do Role - Main
- To Do Role - To Do Types

To Do Role - Main

The **Main** page is used to define basic information about a To Do role.

To maintain this information, select **Admin**, and then **General**, and then **To Do Role**.

Description of Page

Enter a unique **To Do Role** and **Description** for the To Do role.

The grid contains the ID of each **User** that may view and work on entries assigned to this role. The First Name and Last Name associated with the user is displayed adjacent.

> **Note**
>
> **System Default Role**. The system supplies a default role `F1_DFLT` linked to each system To Do type. This is done so that To Do functionality may be tested prior to the creation of appropriate business oriented To Do roles.

In addition, various "type" objects or algorithms may reference a To Do role to use when creating a To Do for a given business scenario. This is dependent on your specific product.

To Do Role - To Do Types

The **To Do Types** page defines the To Do types that may be viewed and worked on by users belonging to a given To Do role.

To maintain this information, select **Admin**, and then **General**, and then **To Do Role** and navigate to the **To Do Types** page.

Description of Page

Enter the ID of each **To Do Type** whose entries may be viewed and worked on by the role.

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Use As Default is a display-only field that indicates if the role is assigned to newly created entries of this type. You may define the default role for a given To Do type on the To Do Type maintenance page.

> ⚠ **Caution**
>
> If you remove a To Do type where this role is the default, you must define a new role as the default for the To Do type. You do this on the To Do Type maintenance page.

Defining To Do Types

Use this page to define basic information about To Do types.

You can access the portal from the **Admin**, and then **General**, and then **To Do Type**. You are brought to a query portal with options for searching for a specific To Do Type. Once a To Do Type has been selected you are brought to the maintenance portal to view and maintain the selected record.

> ⚠ **Caution**
>
> Important! If you introduce a To Do type, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page.

- **To Do Type.** This zone provides information about the selected To Do Type.
  - The **drill keys** used to navigate to the To Do entry's related page are defined on To Do Type.

    > ⚠ **Caution**
    >
    > Do not change this information unless you are positive that the process / algorithm that creates entries of a given type stores this information on the entries.

  - **Sort Keys** define attributes that may be used to sort To Do entries of this type. Note that this information is captured as a string and is meant for sorting purposes. The system does not capture data type information to be able to format the information for display. For example, dates are not going to display as per the user's display profile configuration.
    - The To Do Information zone on the To Do Management portal provides the ability to search for To Do entries using sort keys and includes up to five sort key values as columns in the results, which may be used for sorting as required.
    - The To Do list page includes an 'Extra Information' option to allow To Do entries to be sorted by a selected sort key. Note the default sort key for this type of sorting is also defined on To Do type.
  - Refer to To Do Entries Reference A Role for more information about **roles** and To Do entries.

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  - Refer to The Priority Of A To Do Entry for more information about **priority** related setup.
  - Refer to To Do Entries Created By Background Processes and To Do Entries May Be Routed Out Of The System for more information about associating a To Do Type with **batch processes**.

- **To Do Type Characteristics.** This zone lists characteristic types and values common to all To Do entries of this type.

The following zones may appear as part of the portal's **To Do Characteristics** tab page.

- **To Do Characteristics.** This zone is used to maintain the valid list of characteristics that can be defined for To Do entries of this type. The characteristic types for characteristics that are linked to the To Do entry as a result of a pre-creation algorithm do not need to be defined here.

The following zones may appear as part of the portal's **Override Messages** tab page.

- **Override Messages.** If you want To Do entries that reference a given message category / number to be routed to a specific To Do role or suppressed altogether or if you want to associate a script to a given message category / number, use this zone to specify these rules.
  - Refer to Suppress the Creation of the To Do Entry for more information on suppressing To Do creation.
  - Refer to To Do Entries Reference A Role and Adjusting the To Do Role for more information about overriding roles.
  - Refer to What Happens When You Work A To Do Entry for more information on user guidance.

The following zones may appear as part of the portal's **Algorithms** tab page.

- **Algorithms.** This zone is used to maintain the algorithms associated with the selected To Do Type.

Actions

The page supports the following special actions:

- **Create an Algorithm.** Use this action, on the Algorithms tab to creates a script based algorithm related to the selected To Do Type. You are prompted for information regarding the system event, the name, description, etc. Once all the information is provided, the system creates an algorithm type, a script, an algorithm and links the algorithm to the To Do Type. You may then navigate to the script to adjust it as needed.
- To Do Type Algorithms

To Do Type Algorithms

The following table describes all the system events that control important To Do functions. If you haven't already done so, you must set up the appropriate algorithms in your system.

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System Event	Optional / Required	Description
Calculate Priority	Optional	Algorithms of this type may be used to calculate a To Do entry's priority. Refer to The Priority of a To Do Entry for more information on when this plug-in is called. Note that it is not the responsibility of the algorithms to actually update the To Do entry with the calculated priority value but rather only return the calculated value. The system carries out the update as necessary. If more than one algorithm is plugged-in the system calls them one by one until the first to return a calculated priority.
External Routing	Optional	Algorithms of this type may be used to route a To Do entry to an external system. The base package `F1-TDEER` background process invokes the algorithms for every To Do entry that its type references the process as the **Routing Process** and that the entry was not already routed. The background process marks an entry as routed by updating it with the batch control's current run number. If more than one algorithm is plugged-in the batch process calls them one by one until the first to indicate the To Do entry was routed.
To Do Information	Optional	We use the term "To Do information" to describe the basic information that appears throughout the system to describe a To Do entry. The data that appears in "To Do information" is constructed using this algorithm. Plug an algorithm into this spot to override the "To Do information" algorithm on installation options or the system default "To Do information" if no such algorithm is defined on installation options.

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System Event	Optional / Required	Description
To Do Monitor	Optional	Algorithms of this type are executed by the To Do Monitor background process and may be used to periodically review a To Do entry and perform actions, if needed. Refer to Monitoring a To Do Entry for more information.
To Do Post-Processing	Optional	Algorithms of this type may be used to validate and/or further process a To Do entry that has been added or updated.
To Do Pre-Creation	Optional	Algorithms of this type are called when a To Do entry is being added. Refer to Refining a To Do Entry's Details at Creation Time for more information. To Do Type pre-creation algorithms override the Installation level pre-creation algorithms.

Implementing The To Do Entries

To enable the To Do entries visible in the To Do Type page, you must configure the system as follows:

- Define the To Do roles associated with each To Do type and link the appropriate users to them. Once you have defined the roles appropriate for your organization's To Do types, remove the reference to this system default role `F1_DFLT`. Refer to To Do Entries Reference A Role for more information.
- For any To Do Type that is provided for a specific background process, the To Do simply needs to reference the appropriate Creation Background Process. When the background process is scheduled, To Dos are created based on the logic of the related background process. This applies to To Dos Created for Object-Specific Error Conditions and Dedicated To Do Background Processes.
- For any To Do Type that is provided for creation by an algorithm or other process, there may be configuration required to populate that To Do type as an algorithm parameter or as an attribute on a control table.

> **Note**
>
> Refer to the description of the To Do type for more information.

Background Processes

This chapter covers various topics related to background processes. Besides providing an overview of background process functionality, the various tools available within the application to define, submit and monitor background processes are covered.

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> **Note**
>
> Your specific source application may have additional background process topics. Please refer to the documentation section that applies to your source application for more information.

- Understanding Background Processes
- Defining Batch Controls
- Defining File Integration Types
- Defining File Integration Records
- On-Line Batch Submission
- Tracking Batch Processes
- Requests

Understanding Background Processes

This section describes various topics related to the background processes that perform many important functions throughout your product such as:

- Processing To Do Entries
- Monitor processes that select records in a given state to progress them to their next state in their lifecycle
- Processes that purge data
- Processes that extract data
- And many more...

- Background Processing Overview
- Batch Categories
- Parallel Background Processes
- Parameters Supplied To Background Processes
- Processing Errors
- Error Post-Processing Logic
- Post-Processing Logic
- Timed Batch Processes
- Monitor Background Processes
- Plug-in Driven Background Processes
- How to Re-extract Information
- How to Submit Batch Jobs
- How to Track Batch Jobs
- How to Restart Failed Jobs and Processes
- Assessing Level of Service
- Batch Resource Groups

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- Batch Control Options

Background Processing Overview

While the system relies on a scheduler to secure and execute its background processes, there are additional issues that you should be familiar with:

- Batch control records are used for the following purposes:
  - Define the code that executes the logic associated with the background process.
  - For processes that extract information, the batch control record defines the next batch number to be assigned to new records that are eligible for extraction. For example, the batch control record associated with the process that routes To Do entries to an external system defines the next batch number to be assigned to new To Do entries that are configured with this batch control. When this To Do external routing process next runs, it selects all To Do entries marked with the current batch number (and increments the next batch number).
  - The batch control record for each background process organizes audit information about the historical execution of the background process. The system uses this information to control the restart of failed processes. You can use this information to view error messages associated with failed runs.
  - Many processes have been designed to run in parallel in order to speed execution. For example, the process that applies updates for a migration data set import for CMA can be executed so that multiple "threads" are processing a different subset of records (and multiple threads can execute at the same time). Batch control records associated with this type of process organize audit information about each thread in every execution. The system uses this information to control the restart of failed threads. Refer to Parallel Background Processes for more information.
  - Some processes define extra parameters. These parameters are defined with the batch control. Default values may also be captured for each parameter. They will be used when the background process is submitted on-line.

The following diagram illustrates the relationships that exist for batch control records.

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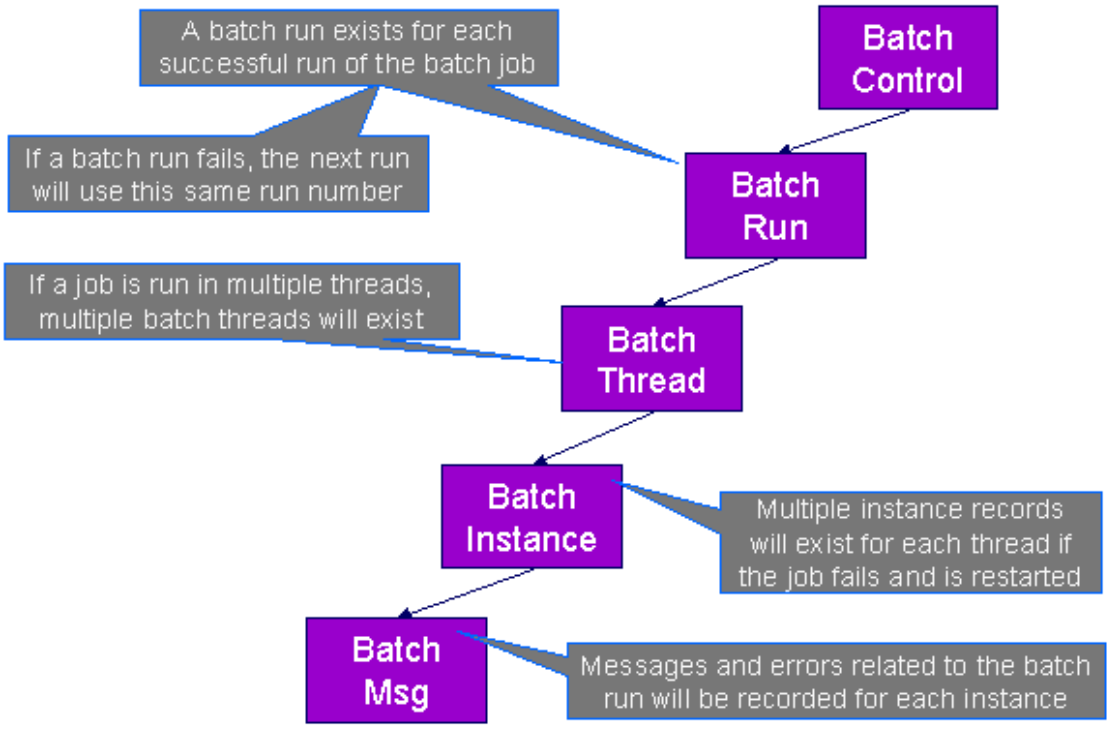

Results of each batch run can be viewed using the Batch Run portal.

Batch Categories

A batch process may be categorized for documentation purposes. The base values provided are as follows:

- **Ad Hoc**. Processes of this type are run on an ad hoc basis, only when needed. For example, if there is a process to do a mass cancel / correction of data, it would only be run when a situation occurs requiring this.
- **Extract**. Extract processes extract information that is interfaced out of the system. Processes of this type typically extract records marked with a given run number. If the requester of the process does not supply a specific run number, the system assumes that the latest run number should be extracted. If you need to re-extract an historical batch, you simply supply the respective run number when you request the batch process.
- **ILM**. Information Lifecycle Management jobs are crawler background processes that are associated with the ILM based storage solution.
- **Monitor**. Processes of this type are processes related to business objects with a lifecycle state that defines monitor algorithms. The monitor process selects records in a given state and executes its algorithms, which may cause the record to transition to another state or may trigger some other logic to occur. Using configuration, the monitor process may target only specific records. Refer to Monitoring Batch Processes for more information. Note that these types of background processes can be considered a subset of **Process What's Ready**
- **Process What's Ready**. Processes of this type create and update records that are "ready" for processing. The definition of "ready" differs for every process. For example, a payment upload process creates payments for every record that is **pending**. An overdue event monitor activates pending overdue events that have reached their trigger date.

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- **Purge**. Processes of this type are used to purge historical records from certain objects that generate a large number of entries and may become unwieldy over time.
- **To Do Entry**. Processes of this type are used to detect a given situation and create or complete a To Do Entry. Refer to To Do Entries Created by Background Processes for more information.
- **Upgrade**. Processes of this type are typically run only one time and are used to populate data in a table based on information that can be determined elsewhere in the system. These are processes that could have been done through an upgrade script, but perhaps due to data volume or timing, the upgrade logic warranted a separate stand-alone process.
- **Upload**. Processes of this type are used to upload data from a file into the system.
- The following categories are related to the data conversion / migration processes:
  - **Conversion**. Processes of this type are dedicated to converting or migrating data from external applications into the product.
  - **Object Validation**. Processes of this type are dedicated to validate data within objects for conversion or migration purposes.
  - **Referential Integrity**. Processes of this type are dedicated to validate referential integrity within objects for conversion or migration purposes.

> **Note**
>
> Additional categories may be introduced by your specific product.

Parallel Background Processes

Many processes have been designed to run in parallel in order to speed execution. This is referred to as running the process with multiple “threads”.

The Submission Details section on the Batch Control page indicates whether the process is multi-threaded or not.

The system provides the following strategies for distributing the data to the multiple threads.

- **Thread Level SQL Select** (THDS). This strategy is sometimes referred to as the “thread iterator” strategy. In this strategy, the batch job uses the primary key to figure out how to evenly distribute key ranges to each thread. Each thread is then responsible for selecting the records. In this strategy, the threads should also re-select the data periodically to release the cursor, which aids in performance. Note that this strategy is preferred but may only be used under the following conditions:
  - The data from only one maintenance object is being processed.
  - The primary key for the maintenance object is a single, numeric system generated key.

  > **Note**
  >
  > Parameters may be used to override the low and high id. Refer to Parameters Supplied to Background Processes for more information.
- **Key Ranges** (KEYS). This strategy is similar to the **Thread Level SQL Select** strategy, and follows the same maintenance object and prime key conditions, but uses actual key values to calculate thread ranges. Such strategy may be needed in situations where keys

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do not evenly distribute across threads, resulting in uneven thread completion times. For example, conversion entities in the staging schema have legacy keys, which are typically not evenly assigned. This impacts the Object Validation and XML resolution batch processes that thread by legacy keys.

> **Note**
>
> This strategy should not be widely used and as such is only supported by the Monitor and Ad-hoc Plug-in Driven batch programs.

- **Job Level SQL Select** (JOBS). This strategy is sometimes referred to as the “standard commit” strategy. In this strategy, the keys for the records to be processed by the batch job are all selected first and stored in a temporary table. The batch job then supplies each thread with a range of keys that it should process. This strategy is used if multiple maintenance objects are being processed by the batch job; if the primary key of the maintenance object has multiple parts or if the primary key is non-numeric.

The multi-threading logic relies on the fact that primary keys for master and transaction data are typically system generated random keys. In addition, if the data is partitioned, it is expected to be partitioned based on the primary key.

> **Note**
>
> The detailed description in the metadata for each batch control provided with the system should indicate if it may be run in parallel. Note that the strategy used is not typically indicated in the detailed description.

> **Note**
>
> **Overriding the thread ranges**. Your implementation has the ability to override the thread ranges if certain data in your system takes longer to process. For example, imagine you have a single account in Oracle Utilities Customer Care and Billing that has thousands of service agreements (maybe the account for a large corporation or a major city). You may want to set up the thread ranges to put this large account into its own thread and distribute the other accounts to the other threads. To do this, you should create the appropriate batch thread records ahead of time in a status of **Thread Ready** (`50`) with the key ranges pre-populated. Note that the base product does not provide the ability to add batch thread records online. If you are interested in more information about this technique, contact Customer Support.

- Optimal Thread Count

Optimal Thread Count

Running a background process in multiple threads is almost always faster than running it in a single thread. The trick is determining the number of threads that is optimal for each process.

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> **Note**
>
> A good rule of thumb is to have one thread for every 100 MHz of application server CPU available. For example if you have four 450 MHz processors available on your application server, you can start with 18 threads to begin your testing: (450 * 4) / 100 = 18.

This is a rule of thumb because each process is different and is dependent on the data in your database. Also, your hardware configuration (i.e., number of processors, speed of your disk drives, speed of the network between the database server and the application server) has an impact on the optimal number of threads. Please follow these guidelines to determine the optimal number of threads for each background process:

- Execute the background process using the number of threads dictated by the rule of thumb (described above). During this execution, monitor the utilization percentage of your application server, database server and network traffic.
- If you find that your database server has hit 100% utilization, but your application server hasn't one of the following is probably occurring:
  - There may be a problematic SQL statement executing during the process. You must capture a database trace to identify the problem SQL.
  - It is also possible that your commit frequency may be too large. Commit frequency is a parameter supplied to every background process. If it is too large, the database's hold queues can start swapping. Refer to Parameters Supplied to Background Processes for more information about this parameter.
- It is normal if you find that your application server has hit 100% utilization but your database server has not. This is normal because, in general, all processes are CPU bound and not IO bound. At this point, you should decrease the number of threads until just under 100% of the application server utilization is achieved. And this will be the optimal number of threads required for this background process.
- If you find that your application server has not hit 100% utilization, you should increase the number of threads until you achieve just under 100% utilization on the application server. And remember, the application server should achieve 100% utilization before the database server reaches 100% utilization. If this proves not to be true, something is probably wrong with an SQL statement and you must capture an SQL trace to determine the culprit.

Another way to achieve similar results is to start out with a small number of threads and increase the number of threads until you have maximized throughput. The definition of "throughput" may differ for each process but can be generalized as a simple count of the records processed in the batch run. For example, in the Billing background process in Oracle Utilities Customer Care and Billing, throughput is the number of bills processed per minute. If you opt to use this method, we recommend you graph a curve of throughput vs. number of threads. The graph should display a curve that is steep at first but then flattens as more threads are added. Eventually adding more threads will cause the throughput to decline. Through this type of analysis you can determine the optimum number of threads to execute for any given process.

Parameters Supplied To Background Processes

This section describes the various types of parameters that are supplied to background processes.

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General Parameters

The following information is passed to every background process.

- **Batch code.** Batch code is the unique identifier of the background process.
- **Batch thread number.** Thread number is only used for background processes that can be run in multiple parallel threads. It contains the relative thread number of the process. For example, if the billing process has been set up to run in 20 parallel threads, each of the 20 instances receives its relative thread number (1 through 20). Refer to Optimal Thread Count for Parallel Background Processes for more information.
- **Batch thread count.** Thread count is only used for background processes that can be run in multiple parallel threads. It contains the total number of parallel threads that have been scheduled. For example, if the billing process has been set up to run in 20 parallel threads, each of the 20 instances receives a thread count of 20. Refer to Optimal Thread Count for Parallel Background Processes for more information.
- **Batch rerun number.** Rerun number is only used for background processes that download information that belongs to given run number. It should only be supplied if you need to download an historical run (rather than the latest run).
- **Batch business date.** Business date is only used for background processes that use the current date in their processing. For example, a billing process may use the business date to determine which bill cycles should be downloaded. If this parameter is left blank, the system date is used. If supplied, this date must be in the format YYYY-MM-DD. Note: this parameter is only used during QA to test how processes behave over time.

  > **Note**
  >
  > There may be a slight lag in submission time for batch jobs submitted online. If the desired execution date/time is close to midnight, it is possible that your batch job will run on the day after you submit it. If you have left the business date blank in this case, keep in mind that your business date would be set to the day after you submit the job.

  > **Note**
  >
  > When rerunning a batch for a given run number, the system uses the batch business date of the original run.

- **Override maximum records between commits.** This parameter is optional and overrides each background process's Standard Commit. You would reduce this value, for example, if you were submitting a job during the day and you wanted more frequent commits to release held resources. You might want to increase this value when a background process is executed at night (or weekends) and you have a lot of memory on your servers.
- **Override maximum minutes between cursor re-initiation**. This parameter is optional and overrides each background process's Standard Cursor Re-Initiation Minutes. You would reduce these values, for example, if you were submitting a job during the day and you wanted more frequent commits to release held resources (or more frequent cursor initiations). You might want to increase these values when a background process is executed at night (or weekends) and you have a lot of memory on your servers.
- **User ID.** Please be aware of the following in respect of user ID:

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- Both the user submitting the job and the user ID recorded on the batch submission should have access to the application service for the batch control that secures execution.
- Any batch process that stamps a user ID on a record it creates or updates uses this user ID in applicable processing.
- This user ID's display profile controls how dates and currency values are formatted in messages.
- When submitting a batch job online, the batch user, language and email address are defaulted to the details of the user submitting the job. Only users that are granted the User Override access mode on the Batch Job Submission application service can override the batch user ID.
- If the submission user has user override privileges, they have the ability to retain the original batch user details when duplicating or rerunning a batch job from online submission. If the 'Run as original user' box is checked, the batch user, language and email address from the original batch run will be copied to the new batch job. If not, the user details are defaulted from the submission user.

- **Password.** Password is not currently used.
- **Language Code.** Language code is used to access language-specific control table values. For example, error messages are presented in this language code.
- **Trace Program Start**, **Trace Program Exit**, **Trace SQL** and **Trace Output**. These switches are only used during QA and benchmarking. If trace program start is checked, a message is displayed whenever a program is started. If trace program exit is checked, a message is displayed whenever a program is exited. If trace SQL is checked, a message is displayed whenever an SQL statement is executed. If trace output is checked, special messages formatted by the background process are written.

> **Note**
>
> The information displayed when the trace output switch is turned on depends on each background process. It is possible that a background process displays no special information for this switch.

Common Additional Parameters

Each batch control supports the definition of additional parameters. There are some additional parameters that are common to all batch processes or common to a specific type of batch process. The batch control should be delivered with the appropriate additional parameters. However, when new additional parameters are introduced, existing batch controls may not be updated with the new additional parameter.

The following table highlights the common parameters that may be linked to a batch control. Note that for batch parameters, although there is a sequence number that controls the displayed order of the parameter, the batch process does not use the sequence to identify a particular parameter but rather uses the parameter name. In some cases multiple parameter names are supported (a ‘camel case’ version and an ‘all caps’ version).

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Parameter Name	Description	Additional Comments
MAX-ERRORS / **maxErrors**	Each of the batch processes has, as part of its run parameters, a preset constant that determines how many errors that batch process may encounter before it is required to abort the run. A user can override that constant using this parameter.	The input value must be an integer that is greater than or equal to zero. The maximum valid value for this parameter is 999,999,999,999,999.
DIST-THD-POOL	Each batch process executes in a thread pool. This parameter is only necessary if the batch process should execute in a different thread pool than the default thread pool.	The default thread pool name is **DEFAULT**.
emailMode	When the batch job is submitted with an associated email address, the default logic is to send an email when the job completes regardless of success or failure. Use this parameter to limit the email based on the status of the job when it ends.	Valid Values • **ERROR** — send an email only when the job ends in Error status. • **SUCCESS** — send an email only when the job ends in successfully. • **ALL** — always send an email only when the job ends. (This is the default.)
The following parameters are only applicable to jobs that use the **Thread Level SQL Select** method of distributing work to threads as described in Parallel Background Processes.		
overrideLowIdValue	Specifies a new low id to use in calculating the range for a thread. The framework by default assumes that the Id is between 0's (e.g. 000000000) and 9's (e.g. 9999999999), but this parameter will override the low value.	The parameter value can be an actual number or it can be set to **auto**. If **auto** is configured, it is set to the lowest current value on the database table associated with the background process.
overrideHighIdValue	Specifies a new high id to use in calculating the range for a thread. The framework by default assumes that the Id is between 0's (e.g. 000000000) and 9's (e.g. 9999999999), but this parameter will override the high value.	The parameter value can be an actual number or it can be set to **auto**. If **auto** is configured, it is set to the highest current value on the database table associated with the background process.
idRangeOverrideClass	Use this parameter to specify a custom class to do thread range calculation. During batch execution, this override class is instantiated and the setter methods called to initialize the Ids as required. The low and high getter methods are called to retrieve the high and low ids to be used for the run.	The class name specified must implement interface com.splwg.base.api.batch.BatchIdRangeOverride.

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Parameter Name	Description	Additional Comments
batchStrategy	Use this parameter to override a THDS batch strategy with either JOBS - Job-Level or KEYS - Key Ranges strategy.	This parameter is only supported by the Monitor and Ad-hoc Plug-in Driven batch programs.
The following parameters are only applicable to jobs that perform a single commit, for example for extract batch jobs.		
numRecordsToFlush	This parameter defines how frequently to flush the Hibernate cache to prevent high heap consumption and Out Of Memory Errors.	

Specific Batch Parameters

Some background processes define additional parameters that are specific to their functionality. When a process receives additional parameters, they are defined and documented in the batch control entry in the application.

When submitting a batch job online, any default parameter values configured on the batch control record will be defaulted and may be overridden. Note that if the parameter value is configured to be Encrypted on the batch control configuration, the value will be shown encrypted.

- Indicating a File Path or File Name
- Encrypting and Signing Files
- Manifest File
- File Exchange through Oracle Cloud Storage

Indicating a File Path or File Name

Some of the system background processes use extra parameters to indicate a File Path and/or File Name for an input file or an output file. For example, most extract processes use File Path and File Name parameter to indicate where to place the output file.

For the file path parameter, refer to Referencing URIs for several points related to populating the file path and the supported syntax.

For the file name parameter, there are extract processes that support defining a file name that ends in ".zip" or ".gz", which will automatically result in writing the file with zip or gzip compression (based on the suffix). Similarly, there are upload processes that support decompression of files using the appropriate method based on the file name ending in ".zip" or ".gz". If the extract or upload process supports compression / decompression, it should be indicated accordingly in the description of the File Name parameter. If a batch control doesn't explicitly indicate that it supports compression or decompression in its description, the assumption should be that it is not supported.

In addition, there are extract and import processes that support automatic signing, encryption and decryption of the file content using PGP standards. File names ending in .pgp will be parsed to determine whether encryption, signing, compression or a combination of the three applies. If the file has a .pgp extension and requires decryption or signature verification, a run time error will be issued if no encryption or signing key ring parameters are supplied.

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> **Note**
>
> File name / extension validation. The system ensures that the file name for any file being uploaded does not contain special characters and uses only standard UTF-8 supported characters. In addition, the system validates that the file's extension is referenced in the base delivered allow list F1-FileExtensionAllowList, defined as a managed content record.

> **Note**
>
> Custom file extensions. If your implementation has defined custom file extensions that are not found in the base product delivered allow list, you may create a custom managed content record to define your additional valid extensions. To do this, duplicate the F1-FileExtensionAllowList record and give it the name CM-FileExtensionAllowList. Change the description as desired. Remove the base delivered extensions and add your valid extensions using the <extension></extension> tags.

Encrypting and Signing Files

Some files created by data export related batch processes, may need to be encrypted and/or digitally signed for security purposes. Similarly, batch upload processes may need to verify the signature and/or decrypt the content of the file being imported.

New batch parameters control whether encryption or digital signing applies to files extracted or uploaded by the process. Both encryption and signing use Pretty Good Privacy (PGP) standards.

Processes that include a file name parameter, such as those using the plug-in driven extract template, support a file name extension of '.pgp'. Files ending with this extension are encrypted and/or signed using the encryption key parameters described in the next section.

Processes that have an internally constructed format for the file name, such as those using the generalized initial export template, perform encryption and/or signing according to whether the encryption parameters are supplied. An extension of '.pgp' is added to the constructed file name.

Extract Process Encryption Parameters

Parameter Name	Description	Additional Comments
`encryptExternalKey`	Use this key ring parameter to configure the external key provided by the recipient of the file.	If populated, the batch output file will be encrypted using a runtime generated key. The generated key will be encrypted using the active public key stored on the key ring. The recipient will use their private key to decrypt the generated key so the file may be decrypted. Only external public key rings may be used.

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Parameter Name	Description	Additional Comments
encryptSignatureKey	Use this key ring parameter to configure the internal key used to sign the file.	If populated, the batch output file will be signed using the active private key stored on the key ring. The assumption is that the corresponding public key has been shared with the recipient. Only internal file encrypting / signing key rings may be used.

Upload Process Encryption Parameters

Parameter Name	Description	Additional Comments
decryptInternalKey	Use this key ring parameter to configure the internal key to be used to decrypt the file to be uploaded.	If populated, the generated key received with the input file will be decrypted using the active private key stored on the key ring. The data is then decrypted using the generated key. Only internal file encrypting / signing key rings may be used.
decryptSignatureKey	Use this key ring parameter to configure the public signature key provided by the sender of the file.	If populated, the input file signature will be verified using the active public key stored on the key ring. Only external key rings may be used.

You may use the Batch Control Query portal to find all batch controls supporting these options.

Refer to File Encryption and Signing Keys for more information on maintaining internal and external encryption keys.

Manifest File

Batch processes that create files, for example data export related batch processes, may create one or more files in each processing thread. External applications that consume these files need to process them only when the entire batch process is successfully completed. To automate the consumption of such files, the external application may leverage a function to be triggered upon the creation of a manifest file to process all the files referenced by the manifest. The manifest file includes details such as content hash value, file size information etc that assist in confirming that file content is completed and has not been tampered with prior to processing the files.

The following sections provide additional information about manifest files.

The Manifest Option Batch Parameter

Manifest file creation is supported on certain base product extract related batch controls only. These batch controls include the **Manifest Option** batch parameter that controls whether a manifest file should be created or not upon successful completion of the batch process. You may use the Batch Control Query portal to find all batch controls supporting this option.

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Manifest File Information

Manifest file content is provided in JSON format and includes the following information:

- The version of the manifest details structure.
- The batch control code, run number and rerun number identifying the batch run producing the files
- Total number of files created by the batch run.
- Total number of records processed by the batch run.
- The manifest creation timestamp in ISO format.
- The previously completed batch run number, if any.
- The manifest file produced by the previously completed batch run, if any. This may be used to ensure files are processed in a proper order and assist in detecting potential situations of missing files.
- A list of files created by the batch run that includes the following details for each file: the file name, its size in bytes, and the SHA-256 hash value of the file's content.

The manifest file name is constructed as follows:

```
[batch control]_[batch run number]_[batch rerun number]_manifest.json
```

The following is an example of the manifest file structure.

```
{
  "version": 1,
  "batchCode": "HD-PDE",
  "batchRunNumber": 106,
  "batchRerunNumber": 0,
  "totalFiles": 3,
  "recordsProcessed": 10,
  "timeStamp": "2020-05-02T16:55:43.000353Z",
  "previousBatchRunNumber":"105"
  "previousManifestFileName":"HD-PDE_105_0_manifest.json",
  "fileDetails": [
    {
      "fileName": "SOME_FILE_NAME_001.json.gz",
      "fileSize": 1543,
      "hashAlgorithm": "SHA-256",
      "hashValue":
"ff7d4e466f93cadc4a18ab009080916baff631e03b728e2f2684c4a4f92ccbe1"
    },
    {
      "fileName": "SOME_FILE_NAME_002.json.gz",
      "fileSize": 1182,
      "hashAlgorithm": "SHA-256",
      "hashValue":
"78869e7ce971f28a70f5b35693a05726ba66109fecf492edb60291a62ae1ba9f"
    },
    {
      "fileName": "SOME_FILE_NAME_003.json.gz",
      "fileSize": 1182,
      "hashAlgorithm": "SHA-256",
```


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```
      "hashValue":
"78869e7ce971f28a70f5b35693a05726ba66109fecf492edb60291a62ae1ba9f"
    }
  ]
}{
```

Verifying The Manifest File

The **Verify Manifest File** web service may be used by an external system to validate that the manifest file it has received for a specific batch run is not corrupted or tampered with. The service returns the manifest file name and the hash value of its content for the requested batch run allowing the caller to compare their file details with the returned values.

File Exchange through Oracle Cloud Storage

Oracle Utilities Cloud Services can exchange files bidirectionally with Opower Cloud Services and Energy and Water Cloud Services through an Oracle Utilities Cloud Service-managed Object Storage bucket. Specific base product integrations may be configured to write files to a cloud service managed bucket or to read information from a file found in a cloud service managed bucket. (Integrations that support these use cases document the capability directly in the description of the batch control delivered for each use case.)

> **Note**
>
> This option is only available in a cloud installation.

Sharing Customer Exported Data

Some data export related batch processes support an option that streamlines the process by which customer extracted data may be routed to and shared with Oracle so it can be uploaded to Oracle's data lake for analytic purposes.

Implementations may choose to share data with Oracle in addition to exporting data for their own purposes. For this use case, you could configure the batch control parameters as follows:

- Define the file path / file location parameter with the appropriate configuration for extracting the data to your location. Refer to Indicating a File Path or File Name for more information.
- The batch controls that support this include the **Copy to Oracle** batch parameter. Use this parameter to indicate that you want to also share the data with Oracle.

You may have a use case where you only want to extract the data to Oracle and you do not need to write this data to any extract location for your own use. For this use case, configure the batch control parameter for file path / file location with the mnemonic %ORACLE%. This mnemonic signals to the program to extract the data to the configured Oracle location only. There is no need to populate anything in the Copy to Oracle parameter.

Processing Errors

When a background process detects an error, the error may or may not be related to a specific object that is being processed. For example, if the program finds an error during batch parameter validation, this error is not object-specific. However, if the program finds an error while processing a specific bill, this error is object-specific. The system reports errors in one of the following ways:

- Errors that are not object-specific are written to the error message log in the Batch Run.

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- Some batch processes create entries in an "exception table" for certain object-specific errors. For example, an error detected in the creation of a bill in Oracle Utilities Customer Care and Billing may be written to the bill exception table. If an error is written to an exception table, it does not appear in the batch run portal. For each exception table, there is an associated to do entry process that creates a To Do Entry for each error to allow a user to correct the problem on-line.
- For some background processes, errors that do not result in the creation of an exception record may instead generate a To Do entry directly. For these processes, if you wish the system to directly create a To Do entry, you must configure the To Do type appropriately. Refer to To Do entry for object-specific errors for information about configuring the To Do type. If the background process detects an object specific error and you have configured the system to create a To Do entry, the error is not written to the batch run. If you have configured your To Do type to not create To Do entries for certain errors, these errors are written to the Batch Run.

> **Note**
>
> **Some processes create exceptions and To Do entries**. It is possible for a background process to create entries in an exception table and create To Do entries directly, depending on the error. Consider batch billing in Oracle Utilities Customer Care and Billing; any conditions that cause a bill or bill segment to be created in **error** status result in a record added to the bill exception table or the bill segment exception table. However, any object-specific error that is not related to a specific bill or bill segment or any error that prevents a bill or bill segment from being created may result in a To Do entry for the object-specific error.

Error Post-Processing Logic

The product supports executing one or more algorithms when a batch process encounters an error that causes execution to stop. This allows for some special processing to occur to handle the failure of the batch job. Algorithms for this plug-in spot receive the batch control, batch run number, batch processing business date, number of threads and the list of the ad hoc parameters of the batch job.

> **Note**
>
> This plug-in spot is available for all Java based batch programs. For programs of type **Java (converted)**, the individual batch programs need to explicitly support this plug-in spot. Unless otherwise noted, assume that a **Java (converted)** program does not support it.

The following are some examples of functionality that may be executed when a batch job fails:

- Another object or record that is monitoring the batch job may have its status updated to reflect the batch status.
- An outbound message service may be invoked to perform a task related to the failure.

Note that the units of work for all threads are committed prior to executing the error post-processing logic.

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Post-Processing Logic

The product supports executing one or more algorithms after all the threads of a given batch job have completed. This allows for some special processing to occur at the end of a batch job. Algorithms for this plug-in spot receive the batch control, batch run number, batch processing business date, number of threads and the list of the ad hoc parameters of the batch job.

> **Note**
>
> This plug-in spot is available for all Java based batch programs. For programs of type **Java (converted)**, the individual batch programs need to explicitly support this plug-in spot. Unless otherwise noted, assume that a **Java (converted)** program does not support it.

The following are some examples of functionality that may be executed at the end of a batch job:

- Another dependent batch job can be kicked off. Note that this use case is only needed when the multiple dependent jobs are not part of a scheduler (which can also detect the successful end of one batch job so as to submit the next job).
- Statistics for the batch run may be analyzed and based on results, a To Do Entry may be sent to an administrator.
- If the current batch job is processing a large number of child records in multiple threads, a parent record could be updated to a different status or with some other audit information.

Note that the units of work for all threads are committed prior to executing the post-processing logic. The algorithm should perform standard error handling. If an error occurs in one of the post-processing algorithms, the overall batch job's status is set to Error so that it can be re-submitted to retry the logic in the finalize step.

Timed Batch Processes

Most batch jobs are submitted via a batch scheduler. In the absence of a scheduler, a batch control may be configured as "timed" triggering the framework to monitor and schedule these batch jobs as defined by the timer interval. The timer interval defines the desired interval between starts (in seconds). The system schedules new batch runs at each interval if the last instance of the job has completed.

When configuring a batch control as "timed", other default information must be provided, including the User ID and Language to use for submitting the job and the email address for notification, if desired.

Timed batch controls also include an Active setting, allowing for an implementation to temporarily stop further executions of the batch job (but retain the other timer settings).

Timed jobs are controlled by the default threadpool and not by a scheduler. When the **DEFAULT** threadpoolworker starts it will start executing any job for a Batch Control configured as **Timed** with the Timer Active set to **Yes**. This is whether the batch daemon or batch server is enabled or not.

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Monitor Background Processes

In many areas of the system, functionality is driven from business object configuration as a BO driven record progresses through its lifecycle. Refer to Business Object Lifecycle for details. As part of that functionality, it is possible that a background process, called a monitor batch process, is used to execute functionality for the record.

Monitor processes are designed to support parallel threads processing. When the number of records to process is unpredictable and can range from zero or few records to a many, submitting the batch with a fixed number of threads that fits the higher volumes means waste of threads with each run. Monitor processes are therefore designed to not create any batch run, and none of the thread level artifacts associated with a batch run, when there is no data to process. The batch job submission record is completed as usual but indicates that no batch run was needed.

> **Note**
>
> In an on-premise installation, monitor batch processes may be submitted via the command line, i.e. without creating a batch job submission record. In this situation, a monitor batch run will still be created even if there is no data to process because without a batch job record there is no way to communicate the reason for not creating a batch run.

The following sections further expand on concepts and features associated with monitor rule processing.

- Monitor Batch Template
- Deferred Requests Queue

Monitor Batch Template

A single batch program is provided for the BO monitor functionality. The product also provides a batch control template (`F1-MNTPL`) that should be used as a starting point. Parameters are used to limit the records processed by maintenance object and other optional parameters that may further limit the records. The product typically provides at least one monitor batch control for each maintenance object that supports a configurable lifecycle on its business object.

This topic highlights the parameters supported by the monitor batch job. Not all parameters are applicable to all maintenance objects and therefore may not be configured on a given base monitor batch control.

Parameter Name	Description	Comments
`maintenanceObject`	Maintenance Object	For most base delivered batch controls, this parameter is delivered already populated with the value of the maintenance object value. Note that it is supported to leave this value blank, at which point, the program will determine the maintenance object (objects) to process by looking for an MO that refers to this batch control record as an option.

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Parameter Name	Description	Comments
isRestrictedByBatchCode	Restrict by Batch Code	Set this to **true** to indicate whether the process should only select records that explicitly refer to this batch control on its current BO state. This is also referred to as "deferred" mode. If set to **false**, the program includes all records that refer to the current batch control in its BO state and records that don't refer to any batch control in its current state (but monitor algorithms exist in the current state). This is commonly referred to as "periodic" mode. Note that if the value is not set at all, the program will determine whether to run it as "deferred" or "periodic" based on whether the batch code is configured on the MO option as a **State Monitor Process** (“deferred”) or a **Periodic Monitor Process**.
restrictToType	Restrict by Related Type	This parameter is only applicable to maintenance objects that have a related 'type' object and the maintenance object has configured an option indicating the field for the related type column. This parameter may be used to limit the processing to records that are in the indicated type.
restrictToBusinessObject	Restrict by Business Object	This parameter may be used to limit the processing to records that are in the indicated business object.
restrictToBOStatus	Restrict by Status	This parameter may be used to limit the processing to records that are in the indicated status.
restrictToDate	Restrict By Date	Enter a valid date on the record's primary table to limit processing to records that are have a value in this field that is on or before the batch business date. Optionally, enter "+" or "-" followed by a number to shift the comparison date to the batch business date plus or minus the given number. For example, entering REVIEW_DT -3 will retrieve all records whose review date is on or before the batch business date minus 3 days.
sampleRecordNumber	Sample Record Number	This is not a commonly used parameter. It is only applicable when the monitor is used for a business use case that supports processing a subset of the records during a testing phase. For example, if the process is validating a large number of records, it may be an option to only validate every 100 records to determine if there are repeated validation errors that may indicate a common problem that may be solved to fix many errors.
minimumRecordsPerThread	Minimum Records Per Thread	Enter a number to force the batch framework to dynamically adjust the number of threads used by the batch program, ensuring that threads are not created for a small number of records. For example, • If the batch is submitted with 100 threads, the parameter is set to 50 records per thread, and there are 1M records to process, then there is no change to the number of allocated threads. • If the batch is submitted with 100 threads, the parameter is set to 50 records per thread, and there are 109 records to process, then the number of allocated threads is set to 3.

Also note that when submitting a monitor process with multiple parallel threads, the program will use a **Thread Level SQL Select** strategy unless any of the following are true (in which case it will use the **Job Level SQL Select** strategy:

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- The input maintenance object is left blank and the program finds more than one maintenance object that refers to this batch control in its options.
- A single MO is applicable but it has a multi-part primary key.
- A single MO is applicable and it has a single primary key, but it is a user defined key instead of a system generated key.
- The sample record number parameter is populated.

In the rare situation when the **Thread Level SQL Select** (THDS) strategy should be used but actual prime keys are not evenly distributed you may override the strategy to use actual key ranges by setting the **Batch Strategy** general batch parameter to **Key Ranges** (KEYS).

Deferred Requests Queue

There are use cases where an entity is set to a status that waits for a subsequent task to be performed asynchronously before it can progress in its lifecycle. Such task is implemented using monitor rules plugged into the entity's business object status definition along with a batch control. These monitor rules are not processed right away when the record enters that status but rather get deferred to when the associated batch runs next.

When the deferred task should be processed as soon as possible, a message can be added to the Deferred Requests Queue to perform the task near real-time. This mechanism offers a managed queue of messages, each representing a request to perform the deferred monitor rules of a given entity, similar to how these rules are processed in batch.

> **Note**
>
> This mechanism is only available in a cloud installation.

> **Caution**
>
> This feature should only be used to support business flows with time dependent events that require near real-time processing. All other asynchronous flows should remain deferred to batch processing.

The following sections describe concepts and features of the near real-time processing mechanism.

Requesting Near Real-time Processing

When an entity enters a status that is associated with time dependent deferred monitor rules, a request can be made to process these rules as soon as possible after the current transaction is committed.

The product supports the following options for requesting near real-time monitoring of an entity:

- To always send the entity for near real -time processing when it reaches a specific status, add the 'Add a Deferred Request' (`F1-DFREQADDN`) 'Enter' algorithm to the respective business object status definition. Refer to the algorithm detailed description for more information.
- You may use the **DeferredRequestAPI** function in a Groovy based algorithm to implement custom rules around when and how to add such request to the queue.

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- When applicable, the Generic Data Synchronization functionality also supports an option for near real-time processing that uses the Deferred Requests queue.

Exception Handling

When the deferred request is successfully processed by the real-time queue agent, the related entity is updated as per its business object rules. However, if the request keeps failing after several retries, the queue agent discards the request and the related entity stays in its current status, waiting to be picked up by the corresponding deferred monitor batch. At that point, if the error still persists the batch reports the issue as usual.

> **Warning**
>
> Do not remove the deferred batch control from the business object status definitions. These flows must remain deferred to batch as designed for data integrity reasons.

When applicable, sending entities to be processed near real-time allows the corresponding monitor batch to be scheduled less often as it no longer needs to meet near real-time frequency requirements. With most of the records successfully processed by the near real-time mechanism, the monitor batch is mainly used to handle exceptions.

Correlated Requests

By default, messages in the queue are processed in no particular order. In situations where multiple messages update the same resource there may be a need to process them serially to prevent concurrency errors.

When adding a message to the queue, the message can optionally reference the main entity it updates for the purpose of correlating it with other messages that update the same entity. Messages explicitly referencing the same main entity are processed serially.

Apply Polling Delay

When an entity's current status is associated with monitor rules that wait for a specific condition to be met in order to determine the next status the entity should transition to, it is not enough to perform these monitor rules once. The condition may not be met initially but could be met within a short period of time. In this situation, the deferred request placed in the queue could indicate that it requires polling delay.

When polling delay is requested, the deferred request message in the queue is processed as follows:

- When the message is added to the queue the current status of the related entity is noted.
- After successfully processing the message, if the related entity's status remains unchanged, the queue agent completes the current message and adds another message to the queue along with a short time delay, i.e. sets the entity to be processed again later.
- This process repeats itself for a limited number of attempts. With each attempt the delay in seconds increases.
- If the related entity's status remains unchanged after all attempts then the message is discarded with no exception. The related entity would be monitored as usual by the next scheduled batch run.

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Plug-in Driven Background Processes

Although the product is delivered with a rich library of background processes, implementations may have business requirements that require new processes to be introduced. It is possible for an implementation to write a background process from scratch using a base process as a template. However, the product also provides base background processes that call algorithms to do the work that is needed. These are called plug-in driven background processes. There are three major types of plug-in driven batch processes:

- Processes that act on records that are stored in the database in the system. These types of processes require SQL to select the records along with the logic to process the records.
- Processes that extract information to a file. These types of processes require SQL to select the records along with the logic to select the information and return it such that the process can write the information based on various settings.
- Processes that import data from a file and store new records in the system as a result. These types of processes require an algorithm that is able to map the data from the file to appropriate new records in the system

The subsequent sections provide more detail about the three types of plug-in driven background processes.

- Ad hoc Processes
- Extract Record Processing
- Uploading Records

Ad hoc Processes

A process that retrieves records in the system and does some action on them requires an algorithm to select the records to be processed and another algorithm to process the records. We refer to this type of process as an Ad hoc Process. The base batch control Plug-in Driven Generic Template (`F1-PDBG`) may be used as a template.

The base processes implement standard background process functionality including parallel background process logic and the ability to create To Do entries for errors. This allows for an implementation to take advantage of the pre-built support and provide plug-ins that include the logic that is unique to the specific use case.

The following sections provide more information about the functionality for ad hoc processes. Note that extract processes share some of the same functionality. Refer to Extract Record Processing for additional information specific to extract processes.

Select Records Algorithm

The first important algorithm to design when implementing a plug-in driven batch process is the Select Records algorithm, plugged in on the batch control page. This algorithm type must define the first parameter as the SQL. The batch job will directly access the SQL parameter value in the metadata (rather than invoking the algorithm). All other parameters are available for the algorithm to use for its own logic.

In addition, when invoking the algorithm, it must return the strategy to use (**Thread Level SQL Select** or **Job Level SQL Select**. Refer to parallel background processes for more information about the two strategies and when to use each. When choosing the **Thread Level SQL Select** strategy, the algorithm should return the name of the primary key in the Key Field parameter. In addition, the SQL should include a **BETWEEN** clause that includes the bind variables for the low and high ID for the ranges. See below for the bind variable syntax.

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> **Note**
>
> In the rare situation when the **Thread Level SQL Select** (THDS) strategy should be used but actual prime keys are not evenly distributed the strategy may be overridden at batch submission time to use actual key ranges by setting the **Batch Strategy** general batch parameter to **Key Ranges** (KEYS).

If the SQL statement includes variables that are determined at execution time, it must use bind parameters. Bind parameters are referenced in the SQL statement using a colon and a parameter name (for example `:parameter`). There are some variables provided by the system that are populated by the batch job at execution time. These have `f1_` as its prefix.

The system supports the following pre-defined bind parameters:

- **:f1_lowID** and **:f1_highID** - these should be used in the **BETWEEN** clause for the **Thread Level SQL Select** strategy. They should be selecting data from the Key Field that is returned as part of the Select Records algorithm. The batch job will substitute the appropriate ID range as required.

  > **Note**
  >
  > The table where this key field is selected from should be the first table in the FROM clause.

- **:f1_batchCode** and **:f1_batchNumber** - these are common attributes of the batch control that are referenced on a record for selection purposes. Note that the batch run number is set according to whether the batch job is a re-run of a previous run or not.
- **:f1_businessDate** - the batch job will populate the input batch business date, if populated otherwise the current date.

> **Note**
>
> The system supports both "f1." and "f1_" as a prefix for the bind variables. However, the "f1." prefix will result in an error if the SQL security property setting is turned on. As such, the underscore syntax is recommended. The period syntax remains for backwards compatibility.

For any other custom parameters, the Select Records algorithm may return one or more sets of field name / variable name / value where the variable name matches a bind variable in the SQL. The field name provides information about the length that assists the SQL binding logic to properly substitute the values. Note that the variable name cannot start with `f1.` as its prefix. The batch job will use the value returned by the algorithm to set the bind parameter in the SQL statement. Also note that the logic binds all variables as a string, so for date variables the SQL must include the "TO_DATE" function.

The plug in spot receives a list of the ad hoc parameters for the batch job as name / value pairs. If the list includes parameters whose values are to be used in selecting records, your algorithm may be used to identify the relevant batch parameter passed as input and populate the field name and output bind variable appropriately.

The product provides a base algorithm type for this plug-in spot that simply defines a parameter for the SQL. It also includes parameters for the strategy and the key field name.

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This algorithm type may be used by any custom batch process where the SQL does not rely on any special bind variables that must be determined. Simply create an algorithm for the algorithm type and provide the appropriate SQL. Refer to the algorithm type Select Records by Predefined Query (F1-PDB-SR) for more information.

Process Records Algorithm

The other important algorithm to design when implementing a plug-in driven batch process is the Process Record algorithm, plugged in on the batch control page. This algorithm is called for each record selected for the process. It receives all the information that was selected from the Select Records plug-in.

For the ad hoc processing batch process, algorithms plugged into this spot are responsible for doing the work for each record based on the desired logic.

For the extract batch process, algorithms plugged into this spot are responsible for returning the data that should be written to the file. Many of the parameters for this plug-in spot are only applicable to extract processes. Refer to Extract Record Processing for more information on the functionality specific to extract processes.

Also note that algorithms for this plug-in spot will be passed two Booleans, isFirst and isLast, to indicate if the current work unit is the first and/or last for that thread. This allows for the plug-in to do additional work if needed. Note that the isFirst indication is available for both types of batch processes, ad hoc and extract. However, the isLast indication is only applicable for the file extract batch. For the ad hoc batch process this value will always be set to **false**. Extracts will always execute in a single database transaction. In a single transaction run, any error causes the run to be aborted so that it restarts from the beginning when resubmitted. This is done to avoid partial files being written along with inaccurate setting of the isLast element.

Parameter Validation Algorithm

Plug-in driven batch processes may require batch parameters specific to that process. The Parameter Validation algorithm is responsible for checking the parameters at run time and issuing errors if any values are invalid. The algorithm is invoked prior to the Select Records and Process Records algorithms. It is plugged in on the batch control portal. If multiple algorithms are configured, the one with the highest sequence is used. Algorithms for this spot should use standard error message reporting.

Configuring a New Process

The following points summarize the steps needed to implement a new background process that acts on records in the system using plug-ins for the specific functionality:

- Verify the SQL that the background process should execute. Keep in mind that all the data selected in the SQL is available to pass to the plug-in that processes the records. If the performance of the background process is important, be sure to consult with a DBA when designing the SQL.
  - If the SQL does not require any custom variables to substitute at runtime, create an algorithm for the base algorithm type F1-PDB-SR and configure the SQL. In addition, configure the strategy and the primary key name (for the **Thread Level SQL Select** strategy).
  - If the SQL requires custom variables, a new plug-in script must be designed and coded to populate the variable names and values using the algorithm entity **Batch Control - Select Records**. Besides defining the variables, the algorithm must also indicate the strategy and the primary key name (for the **Thread Level SQL Select** strategy). Define the algorithm type for the newly created script. The first parameter of the algorithm type must be the SQL as illustrated in the base algorithm type. Note that

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the other parameters are available for use by this algorithm type if needed. Define the algorithm, populating the SQL as appropriate (using the custom variables).

- Design the logic required to process each record. If your edge product does not deliver a suitable plug-in, create a plug-in script where the algorithm entity is **Batch Control - Process Record**. Note that the plug-in receives all the information selected in the SQL defined in the Select Records plug-in. For an ad hoc process, the algorithm should perform whatever process is required based on the business use case. Note that the background process is responsible for committing the records.

  In either case, if a new processing script is required, define the algorithm type and algorithm for the newly created script.
- If the process has special parameters, create a script to determine if the parameters passed at run time are valid. Define the algorithm type and algorithm for the newly created script.
- Create a batch control by duplicating the base template `F1-PDBG`. Plug in the algorithms created above and configure the parameters as appropriate. Note that you may configure custom ad hoc parameters on the batch control if required. Both base and custom batch parameter values are available to the Select Records and Process Records plug in algorithms.

Extract Record Processing

A process that selects records and produces output for each record to write to a file to integrate with external systems is called an Extract Process. The base batch control Plug-in Driven Extract Template (`F1-PDBEX`) may be used as a template.

> **NOT_SUPPORTED**
>
> Please read the topic Ad hoc Processes. Its information about the Select Records plug-in and some of the information about the Process Record plug-in apply to extract processes. This topic focuses on aspects that are unique to extract processes.

The system provided process includes parameters to configure the file path and file name for the created file. The file path supports all the functionality described in the topic Referencing URIs. The file name supports system substitution variables, such as run number, thread number, user and date / time. The process also supports compression if an appropriate extension is used. Refer to the File Name parameter description in the batch control for more information. Also see sections below for additional information for XML or JSON ouput formats.

> **Note**
>
> Refer to Flexible File Name / Writing Multiple Files for information about support for substituting a business value into the file name.

For extract processes, the Process Record algorithm is responsible for returning the data that should be written to the file in one or more XML instances along with the schema name(s) that describes the XML instance(s). The program will write the data to the file as per the format indicated in the File Format batch parameter.

By default the service uses the OUAF format for date and time. To override this and use XSD format, configure the Date Time Format batch parameter to 'XSD''.

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If an existing schema satisfies the output requirements, it may be used. Otherwise, you should define a data area to indicate the output format of the records as appropriate. Note that you should define an appropriate Field for each element in the schema. This is needed for the fixed position and for JSON / JSON lines formats, but is good practice for any output format. Refer to `F1-PDBGenProcExtractRecord` for an example of a data area with fields defined for each schema element.

There are two options for designing and configuring the Process Record algorithm:

- Create a specific **Process Record** algorithm type that encapsulates the extract logic. The product provides a base algorithm type that illustrates the basic technique to follow. Refer to the algorithm type General Process - Sample Process Record Extract (`F1-GENPROCEX`) for more information.
- Create a file integration type that defines the records to be included in the extract and configure a plug-in driven batch control that references that integration type. Refer to Extract Using File Integration for more information about implementing this type of functionality.

Your specific edge product may provide other Process Record algorithm types out of the box. Use the Algorithm Entity portal to find examples.

XML Format - Additional Considerations

When using XML format for the output, the batch process includes a parameter to define the Grouping Name. This is the root node to use to surround the whole output file. Refer to the batch parameter description for more information. When requesting a Multi-threaded Extract and using the concatenation option, the Grouping Name surrounds the full content of the concatenated output.

Each call to the Process Record plug-in returns one or more schemas with content. The content is written within a node using the schema name.

Your Process Record plug-in may return multiple schemas with information that is all part of the same overall record. For example, the output could include account information and related service agreement details:

```
<root>
...
<CM-AccountRecord>
<account type="group"
    <accountId>1234567890</accountId>
    ...
</account>
</CM-AccountRecord>
<CM-SAInfo>
<sa type="group"
    <saId>123457665</saId>
    ...
</sa>
</CM-SAInfo>
<CM-SAInfo>
<sa type="group"
    <saId>1234588913</saId>
    ...
</sa>
</CM-SAInfo>
```


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```
...
</root>
```

In this case, it may be desired to wrap all that information in a grouping XML tag so that all the information for one record is grouped together. Because the Process Record plug-in could be returning header or footer records that are not part of a given selected record's extract information, the batch process doesn't know what schemas returned by the Process Record plug-in belong together logically. The output parameter 'record XML node' in the schema collection should be used to indicate the outer XML node to use to group related information together. In this example, one call to the Process Record plug-in returns results with the node 'record' populated for the account and service agreement schemas:

```
<SchemaInstance>
<recordXMLNode>record</recordXMLNode>
<schemaName>CM-AccountRecord</schemaName>
<schemaType>F1DA</schemaType>
<data><account><accountId>1234567890</accountId>...</data>
</SchemaInstance>
<SchemaInstance>
<recordXMLNode>record</recordXMLNode>
<schemaName>CM-SAInfo</schemaName>
<schemaType>F1DA</schemaType>
<data><sa><saId>123457665</saId>... </data>
</SchemaInstance>
<SchemaInstance>
<recordXMLNode>record</recordXMLNode>
<schemaName>CM-SAInfo</schemaName>
<schemaType>F1DA</schemaType>
<data><sa><saId>1234588913</saId>... </data>
</SchemaInstance>
```

All schemas returned from a single call to the Process Record plug-in that have the same record XML node will be grouped in the written output within that XML tag. This snippet shows the results of two calls to the Process Record plug-in.

```
<root>
<record><CM-AccountRecord>
<account>
    <accountId>1234567890</accountId>
    ...
</account>
</CM-AccountRecord>
<CM-SAInfo>
<sa>
    <saId>123457665</saId>
    ...
</sa>
</CM-SAInfo>
<CM-SAInfo>
<sa>
    <saId>1234588913</saId>
    ...
</sa>
</CM-SAInfo>
</record>
```


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```
<record>
<CM-AccountRecord>
<account>
    <accountId>987654320</accountId>
    ...
</account>
</CM-AccountRecord>
<CM-SAInfo>
<sa>
    ...
</sa>
</CM-SAInfo>
</record>
</root>
```

JSON / JSON Lines Format - Additional Considerations

The extract process supports two types of JSON output.

- **JSON Document**. This format produces a valid JSON document. This output format supports returning a single JSON object with the records defined as an array or as an array of records.
- **JSON Lines**. The format produces a series of JSON objects. Each output record is a separate JSON object.

> **Note**
>
> These output formats do not support including a header or footer as part of the extract.

> **Note**
>
> The recommendation is to return only one schema instance for each call to the Process Record plug-in spot. This is because the service that converts from XML to JSON must have a schema name that describes the payload. If multiple schema instances are returned, it treats each returned instance independently and doesn't support nesting or other relationships between the data. For example, if the output returns one instance with Account data and then 3 instances with Service Agreement (SA) data (related to the account), in delimited, fixed position and XML, those four instances can be written one after the other. However, in JSON, the data for the 3 SA instances should be returned as an array within the Account object. In order to support this, the Process Record plug-in should have a governing schema that has the Account and the SA list all defined within it.

JSON Document - Single JSON Object

If you provide a Grouping Name in the batch parameter, the program will produce a JSON object which contains an array of the output records using the grouping name as the array name.

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For example, imagine the Grouping Name is 'records' and the output from one call to Process Records is this:

```
<SchemaInstance>
<schemaName>CM-FileInfo</schemaName>
<schemaType>F1DA</schemaType>
<data><files><fileName>file1.txt</fileName><externalReferenceId>1234</
externalReferenceId></files></data>
</SchemaInstance>
```

Now imagine three calls to the Process Record plug-in with separate results. In this case the 'files' node is the group node for the content of each call. This is mapped to the 'records' array name.

```
{
 "records": [
  {"fileName": "file1.txt", "externalReferenceId": "1234"},
  {"fileName": "file2.txt", "externalReferenceId": "3456"},
  {"fileName": "file3.txt", "externalReferenceId": "5678"}
 ]
}
```

The following are points related to how the schema returned by Process Records may be defined and how the JSON output format handles the use case. In all cases, the assumption is that the batch parameter Grouping Name is defined as 'records'. And in each case, the Resulting File Output imagines three calls to Process Records.

Table JSON Output

Use Case	Schema Definition	Resulting File Output

If the output schema contains a single group, output returned by the plug-in is grouped by the a group node. This node does not have importance when writing the record to file and the group node is removed. The record is written directly inside the JSON array.	<schema>
	  <group1 type="group">
	  <fileName dataType="string"/>
	<externalReferenceId dataType="number"/>
	  </group1>
	</schema>
		The 'group1' node is dropped and its contents are mapped to the 'records' array.
		
		{
		"records": [
		{"fileName":"file1.txt",
		"externalReferenceId":"1
		,234"},
		{"fileName":"file2.txt",
		"externalReferenceId":"1
		,234"},
		{"fileName":"file3.txt",
		"externalReferenceId":"1
		,234"}
		]
		}

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Table (Cont.) JSON Output

Use Case	Schema Definition	Resulting File Output

If there is an outer group node in the schema which contains nested group(s) within it, the program skips the topmost group node.	<schema>
	  <group1 type="group">
	  <group2 type="group">
	  <fileName dataType="string"/>
	
	<externalReferenceId dataType="number"/>
	  </group2>
	  </group1>
	</schema>
		{
		"records": [
		{"group2":
		{"fileName":"file1.txt",
		"externalReferenceId":"1
		,234"}},
		{"group2":
		{"fileName":"file2.txt",
		"externalReferenceId":"1
		,234"}},
		{"group2":
		{"fileName":"file3.txt",
		"externalReferenceId":"1
		,234"}}
		]
		}

If schema contains more than one group or a group along with other types like list, field or raw then it does not skip any group node name.	<schema>
	  <group1 type="group">
	  <fileName dataType="string"/>
	
	<externalReferenceId dataType="number"/>
	  </group1>
	  <list1 type="list">
	  <fileDetails dataType="string"/>
	  </list1>
	  <fileSize dataType="number"/>
	</schema>
		All nodes are included in each entry in the array.
		
		{
		"records": [
		{"group1":
		{"fileName":"file1.txt",
		"externalReferenceId":"1
		,234"},"list1":
		[{"fileDetails":"Test
		file"}],"fileSize":"1,02
		4"},
		{"group1":
		{"fileName":"file2.txt",
		"externalReferenceId":"1
		,234"},"list1":
		[{"fileDetails":"Test
		file"}],"fileSize":"1,02
		4"},
		{"group1":
		{"fileName":"file3.txt",
		"externalReferenceId":"1
		,234"},"list1":
		[{"fileDetails":"Test
		file"}],"fileSize":"1,02
		4"}
		]
		}

JSON Document - Array of Output

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If you choose the JSON document output format and populate 'suppress' for the Grouping Name, the program will produce an array instead of an object.

To illustrate, we assume the same definitions used in the above Single JSON object format examples. The following is the output of one call to the Process Records plug-in.

```
<SchemaInstance>
<schemaName>CM-FileInfo</schemaName>
<schemaType>F1DA</schemaType>
<data><files><fileName>file1.txt</fileName><externalReferenceId>1234</
externalReferenceId></files></data>
</SchemaInstance>
```

Now imagine three calls to the Process Record plug-in with separate results. In this case the 'files' node is the group node for the content of each call. This node is dropped and the output from each call is an object within the array.

```
[
  {"fileName": "file1.txt", "externalReferenceId": "1234"},
  {"fileName": "file2.txt", "externalReferenceId": "3456"},
  {"fileName": "file3.txt", "externalReferenceId": "5678"}
 ]
```

The same considerations in the JSON Output table above apply to this configuration.

JSON Lines

For the JSON Lines output format, the Grouping Name is not applicable (and ignored). Each call to the Process Record plug-in spot is written as an object. All the considerations in the JSON Output table above apply to this configuration.

To illustration, here is the output for a single call to the Process Record plug-in spot.

```
<SchemaInstance>
<schemaName>CM-FileInfo</schemaName>
<schemaType>F1DA</schemaType>
<data><files><fileName>file1.txt</fileName><externalReferenceId>1234</
externalReferenceId></files></data>
</SchemaInstance>
```

Then this is an example after three calls to Process Record. The output is written out as objects with no commas.

```
{"fileName": "file1.txt", "externalReferenceId": "1234"}
{"fileName": "file2.txt", "externalReferenceId": "3456"}
{"fileName": "file3.txt", "externalReferenceId": "5678"}
```

Multi-threaded Extract

When extracting data, it's possible that the volume of data warrants running the job multi-threaded. In this case, a separate file is produced with the thread number included in the file name. You may proactively include the thread number as a substitution variable when indicating the file name. If not, the system appends the thread number.

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As a convenience, the system supports concatenating the extract files produced by the various threads at the end. The system does this by finding files whose file names match except for the thread number. As such, the file name may not contain date or time if the concatenation parameter is true. Please note the following with respect to the concatenation feature:

- The content of each file is concatenated together "as is". If the individual files have header, footer or summary information, there is no logic to consolidate that information in the concatenated file. If you want a single header, footer or summary, you must run the extract single threaded.
- Concatenation is not supported if the file name indicates the zip compression should be used.
- The individual thread files are retained.
- If the file format is XML, the files written for the individual threads will be written with an extension of ".tmp". The final concatenated file is surrounded by the Grouping Name defined on the batch job as a parameter (if not suppressed).
- If the file format is JSON Document, the files written for the individual threads will be written with an extension of ".tmp". The final concatenated file is treated as an object with an array defined by the Grouping Name, or treated as a single array (if the grouping name is configured as "suppress").

Skipping Records

By default, the extract process expects one or more schemas to be returned by each call to the Process Record plug-in. (Ideally when designing any process, the Select Records algorithm only selects records that should be processed and the Process Record algorithm does not need to confirm whether the record should be part of the processing or not.) If however there is a need to check a condition in the Process Record plug-in and it is found that no data needs to be extracted for this record, the process record algorithm should return the 'is skipped' output parameter to **true** so that the program doesn't write an empty row.

Note that the base process records algorithm for file integration types `(F1-FILEX-PR)` will set the ‘is skipped’ parameter to **true** if the file integration record extract record algorithm returns no data.

Configuring a New Process

The points documented in the topic related to configuring a new process with respect to the Select Records algorithm apply to extract processes.

For the Process Records algorithm, it is responsible for returning one or more schema instances populated with information that should be written to the file. If your edge product does not deliver a suitable plug-in, create a plug-in script where the algorithm entity is **Batch Control - Process Record**. Note that the plug-in receives all the information selected in the SQL defined in the Select Records plug-in.

Refer to Configuring an Extract Process Using File Integration Type for information on designing extracts using this configuration.

If a new processing script is required, define the algorithm type and algorithm for the newly created script. Create a batch control and refer to the batch template Plug-in Driven Extract (`F1-PDBEX`). Plug in the algorithms created above and configure the parameters as appropriate. Note that you may configure custom ad hoc parameters on the batch control if required. Both base and custom batch parameter values are available to the Select Records and Process Records plug in algorithms.

- Flexible File Name / Writing Multiple Files

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- Extract Using File Integration

Flexible File Name / Writing Multiple Files

By default, the data is written to the File Name defined in the batch parameter. The file name supports several dynamic substitution variables as defined in the detailed description for the batch parameter in the Plug-in Driven Extract Template batch control (F1-PDBEX). Also refer to Extract Record Processing for information about the file name and multi-threaded processes.

The system also supports more advanced file creation for a single batch run. Consider the following use cases

- An extract is for data associated with multiple service providers where each service provider should receive its own file. In this use case, the unit of work is the service provider so a file is produced for each work unit.
- An implementation operates with multiple jurisdictions represented by CIS Division. A certain extract should result in a file per division so that each division only gets its relevant data.
- An extract of Person information should separate individual person data from business person data. In addition, for each person, the contact information should result in a separate file. In this use case, one unit of work includes data to be written to more than one file.

To support the above use cases, the Process Record algorithm supports returning the File Name in the output:

- The file name is included in the output Schema Instance group. You would populate this if you want the data for a specific Schema entry to go to this file name. In the person extract example above, the schema that includes the contact information would indicate the specific contact file.
- The file name is an output field outside the schema list. You would populate this if you don't have different files for different schemas but you still want to override the file name defined in the batch parameter. The service provider and division examples above would populate this parameter with the desired file name. The person extract example could populate this field for all the non-contact information.

The batch process checks the output after each call to the Process Records algorithm. For each schema, if there is a specific File Name associated with the schema, the data for that schema is written to that file. Otherwise, if the output file name is provided, the data is written to that file. Otherwise, the File Name in the batch parameter is used.

> **Note**
>
> **Substitution Variables.** After the call to Process Records, if there are any system variables in the file name, they are resolved at this time.

Managing File Names

This type of requirements means that the Process Record algorithm needs to provide a file name that has some business value to distinguish the individual files. For example, the service provider or the division or the person type value must be part of the file name. However, the recommendation is not to have the file name entirely determined by the algorithm. Rather the suggestion is that you still allow the user submitting the batch job to provide a desired file name as a batch parameter. That way, it can include any of the supported substitution variables for system information (such as batch run number, or date /time stamp) that ensure

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your files are unique for a given batch run. The algorithm can designate a substitution variable that it looks for to replace with the business value.

For example, using the files per division use case, imagine the user indicates the file name EXTRACT_FILE_<DIV>_{BN}_{RN}_{TN}.csv. The process record algorithm receives this parameter. It knows to look for "<DIV>" and replace it with the actual division. Imagine the division code is A100, it would return the file name EXTRACT_FILE_A100_{BN}_{RN}_{TN}.csv in its output, along with the data to write to that file for this unit of work.

For the person information use case above, where two files are written, the suggestion is to use the File Name parameter for one of the files, for example the person information file. An additional parameter should be used to define the second file, the contact information file. So the users submitting the batch job would define the following parameters:

Parameter Name	Description	Value	Comments
fileName	File Name	persons_<personType>_{BN}.txt	This is the file name parameter provided with the extract.
contactFileName	Contact File Name	contacts_{BN}.txt	This is a special parameter defined by the CM extract batch control.

The Process Record algorithm would look for the File Name parameter provided as input, find the text "<personType>" and replace it with the person type value and return that file name in the output. When building the list of schemas to return in the output, the one that includes the person contact information would include the file name found in the Contact File Name parameter provided as input.

> **Note**
>
> If an extract uses file integration types, the file integration record's extract process algorithm would have the above responsibility for indicating the file name and pass it back to the Process Record algorithm.

Multiple Threads

This functionality works as expected with multiple threads. Based on the use case and the implementation of the Select Records algorithm, each thread could be producing files for the same business value. Let's use the division use case. Imagine an implementation has three divisions: A100, B200, C300. Now imagine that the extract is for financial information for an account. The select records algorithm should be threading by account id so that the data is evenly distributed across the multiple threads. But within each thread, accounts could be in any of the 3 implementation's divisions. So each thread could produce 3 files for each of the 3 divisions.

As described in Multi-threaded Extract, the system supports an option to concatenate, allowing you to consolidate the files such that you have 3 complete files for the 3 divisions. The same features and limitations described in that topic apply for this use case.

Closing Files

An important consideration when using this functionality is that attention should be paid to how many files are open during the batch process. Each open file takes some memory to manage it. As such, the product has imposed a limit of only 10 open files (per thread) during the run of

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the batch job. When designing a batch to write to multiple files, the product strongly encourages you to design the process so that whenever possible, all the data for one file can be written and that file can be closed before going on to the next file.

Let's look at our examples.

- For the service provider example, the unit of work for the batch process is service provider. In this case, after each call to process records, the data can be written to the file and then the file can be closed.
- For the division example, the data selected should be threaded by the proper unit of work related to the purpose of the extract, such as Account or Asset. But the data should be ordered by division so that all the data for each division is processed before the next division's data. Each division's file can be closed once the next division's data starts getting processed.
- For the person extract example, the contact file is used for all the data so that file needs to remain open throughout the duration of the job. However, the person information gets segrated by person type. The Select Records could order the data by person type so that all the data for one type could be written and then all the data for the other type could be written. However, given that for any run no more than 3 files will ever be open, this use case is one where there is no need to actively manage closing files during the process.

How will the batch program know when to close a file? Since the batch program is agnostic and does not know what type of data is being processed nor when files should be closed, the Process Record algorithm should provide this information.

> **Note**
>
> The batch process will issue an error if Process Records indicates that the file to write to is one that was already closed. Reopening closed files is not allowed. The design of the process needs to be reviewed if this error is received.

To manage this, the batch process provides the Process Record algorithm with the list of open files (with the system substitution variables unresolved) and a Boolean to mark whether the file should be closed.

> **Note**
>
> If an extract uses file integration types, the file integration record's extract process algorithm receives this list of open files and would have the responsibility described here to manage closing files.

To explain further, we'll use our examples.

File Per Division Example

This use case is that there are 4 divisions in the implementation: NORTH, EAST, SOUTH, WEST and that the data (account data) should be grouped in separate files by division.

The recommendation is that the Select Records algorithm selects the data ordered by Division.

The batch process passes to the Process Record algorithm the list of open files (there should be only be zero or one). In this case, the only indication that the data for one division is finished is if the Process Record algorithm sees that its data is for one division and the open file listed is for a different division. Each call should prepare its file name. Then it should see if its file

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name is in the list of open files. If not, it should indicate that the other open file should be closed. (Note that it doesn't need to add itself to the 'open list'. The batch program is only looking for entries marked as closed. It will ignore entries that are not marked as closed).

Assume the file name in the batch parameter is myFile_<DIV>_{BN}.txt

The data is sorted so that the accounts in the EAST division are processed first. Let's imagine this is a work unit that is also in the EAST division. It receives the file name and the list of open files.

```
...
<hard>
<batchParms>
  <BatchParm>
    <name>fileName</name>
    <value>myFile_<DIV>_{BN}.txt</value>
  </BatchParm>
  ...
</batchParms>
<openFiles>
  <OpenFile>
    <closeFile></closeFile>
    <fileName>myFile_EAST_{BN}.txt</fileName>
  </OpenFile>
</openFiles>
...
</hard>
```

The algorithm substitutes its division into the <DIV> portion of the file and populates that in the output. It then compares its file name with the current list of open files. It finds its file so it doesn't need to do anything else.

```
<hard>
...
<fileName>myFile_EAST_{BN}.txt</fileName>
...
<openFiles>
  <OpenFile>
    <closeFile></closeFile>
    <fileName>myFile_EAST_{BN}.txt</fileName>
  </OpenFile>
</openFiles>
...
</hard>
```

If we then imagine a call to the process records algorithm where the division is NORTH and it's the first entry for that division, here is what it receives:

```
<hard>
<batchParms>
  <BatchParm>
    <name>fileName</name>
    <value>myFile_<DIV>_{BN}.txt</value>
```


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```
  </BatchParm>
  ...
</batchParms>
<openFiles>
  <OpenFile>
    <closeFile>true</closeFile>
    <fileName>myFile_EAST_{BN}.txt</fileName>
  </OpenFile>
</openFiles>
...
</hard>
```

The algorithm substitutes its division into the <DIV> portion of the file and populates that in the output. It then compares its file name with the current list of open files and doesn't finds its file name. So it indicates that the existing open file should be closed.

```
<hard>
...
<fileName>myFile_NORTH_{BN}.txt</fileName>
...
<openFiles>
  <OpenFile>
    <closeFile>true</closeFile>
    <fileName>myFile_EAST_{BN}.txt</fileName>
  </OpenFile>
</openFiles>
...
</hard>
```

File Per Service Provider Example

In this use case, the unit of work is service provider and each service provider should have its own file. In this case, as the Process Record algorithm is preparing the data and the file name unique to its service provider, it can also indicate that the file can be closed. There is no need to wait for the next call to Process Record to indicate that the previous file can be closed. Let's assume the file name is MYFILE_<serviceProvder>_{BN}_{TN}.txt. Each call to Process Records will pass the batch parm file name and no open files.

```
<hard>
<batchParms>
  <BatchParm>
    <name>fileName</name>
    <value>MYFILE_<serviceProvider>_{BC}_{TN}.txt</value>
  </BatchParm>
  ...
</batchParms>
<openFiles>
  <OpenFile>
    <fileName></fileName>
    <closeFile></closeFile>
  </OpenFile>
</openFiles>
```


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```
...
</hard>
```

The algorithm is processing data for service provider A100. It returns the following information related to the file name, namely the single File Name in the output related to this service provider and adds its file to the open file list and indicates that it should be closed. (Note that file-per-work-unit is the only known use case where the algorithm will know that it is the last entry for a file and to close itself.)

```
<hard>
...
<fileName>MYFILE_A100_{BC}_{TN}.txt</fileName>
...
<openFiles>
  <OpenFile>
    <closeFile>true</closeFile>
    <fileName>MYFILE_A100_{BC}_{TN}.txt</fileName>
  </OpenFile>
</openFiles>
...
</hard>
```

Multiple Open Files Example

This example assumes that the file names are defined as per the Managing File Names section above. We'll assume that the algorithm designer chose to not actively close the person information file since there are never more than three files open. Similarly, we'll assume that they chose not to order the data by person type. Here is what is passed in in the middle of the run:

```
<hard>
<batchParms>
  <BatchParm>
    <name>fileName</name>
    <value>persons_<personType>_{BN}.txt</value>
  </BatchParm>
  <BatchParm>
    <name>contactFileName</name>
    <value>contacts_{BN}.txt</value>
   </BatchParm>
  ...
</batchParms>
<openFiles>
  <OpenFile>
    <fileName>persons_P_{BN}.txt</fileName>
    <closeFile></closeFile>
  </OpenFile>
   <OpenFile>
    <fileName>persons_B_{BN}.txt</fileName>
    <closeFile></closeFile>
  </OpenFile>
  <OpenFile>
    <fileName>contacts_{BN}.txt</fileName>
    <closeFile></closeFile>
  </OpenFile>
```


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```
</openFiles>
...
</hard>
```

An instance of one call to Process Records algorithm that has details for an individual ("P" person type).

```
<fileName>persons_P_{BN}.txt</fileName>
<fileOutput>
  <listValue>
    <SchemaInstance>
      <recordXMLNode>person</recordXMLNode>
      <schemaName>CM-PersonDetail</schemaName>
      <schemaType>F1SS</schemaType>
      <fileName></fileName>
      <data>LotsOfData</data>
    </SchemaInstance>
  </listValue>
  <listValue>
    <SchemaInstance>
      <recordXMLNode>person</recordXMLNode>
      <schemaName>CM-AddressDetail</schemaName>
      <schemaType>F1SS</schemaType>
      <fileName></fileName>
      <data>LotsOfData</data>
    </SchemaInstance>
  </listValue>
  <listValue>
    <SchemaInstance>
      <recordXMLNode></recordXMLNode>
      <schemaName>CM-ContactDetail</schemaName>
      <schemaType>F1SS</schemaType>
      <fileName>contacts_{BN}.txt</fileName>
      <data>LotsOfData</data>
    </SchemaInstance>
  </listValue>
</fileOutput>
```

This XML example illustrates the following points:

- There is an override file name in the fileName element.
- The first two schemas don't have any value in the fileOutput\listValue\SchemaInstance\fileName so they should be written to the file in fileName. Note that these two schemas also include a Record XML Node. That will ensure that if the output is XML format, the data from both of those schemas will be wrapped by the 'person' XML Node. This is not functionality related to this epic. It's just trying to illustrate multiple features.
- The third schema has an entry in fileOutput\listValue\SchemaInstance\fileName . So that data is written to a separate file.

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Extract Using File Integration

The product provides separate configuration that may be used to define how to extract the data and how to format it. This configuration provides more metadata related to defining how to get the data to extract and how to format the data. You may have many use cases where using this configuration rather than having all the logic directly in the Process Records algorithm is beneficial.

The configuration can support simple extracts, containing a single record type and possibly a header or footer record. It also supports more complex integrations, involving multiple record types and parent/child relationships between the records.

File Integration Type Configuration

The framework supplies two objects that work together to define the processing needed to create a specific type of extract:

- The file integration type which describes and classifies the extract configuration.
- The file integration record where the sequence, format and logic to extract the data required for a given record type are captured.

File Integration Type

The file integration type defines the integration classification. Currently, only **Extract** is supported. In addition, the file integration type can be assigned to a category. The category may be used to identify extracts with a common purpose or target such as collection agency referrals. Your edge product may deliver a number of categories or you may define your own.

The system provides a business object for extract file integration types (**`F1-ExtractFileIntegrationType`**) that is expected to be used for most use cases

File Integration Record

The file integration record is the object that is responsible for defining a record's format and capturing the record details. A separate integration record must be defined for each record type included in the extract.

The record sequence defines the order that records are processed by the system. The parent sequence defines the record type of which this record is a child. Child records may also be referenced as a parent of lower level child records. The base Process Records algorithm provided by the framework processes all child records of a record type before processing the next record type in sequence.

For extracts that are XML format, the system supports creating a grouping node surrounding all the output that belongs to the same entity. File integration records define a record XML node that will be used as the grouping node. Each record type in the list that belongs within the same group would indicate the same value in the record XML node. Refer to theXML Format - Additional Considerations section for more details.

> **Note**
>
> The system does not support nested record XML nodes. All child records of a record type must define the same record XML node as the parent.

Each file integration record references a data area that defines the extract record’s format, allowing the data to be extended. The **Extract Records** algorithms are responsible for

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populating the data area. The file integration record supports multiple extract processing algorithms so that the custom information can also be populated.

The extract record plug-in also supports the functionality described in the Flexible File Name / Writing Multiple Files topic.

The system provides a business object for extract file integration records (**`F1-ExtractFileIntegrationRec`**) that is expected to be used for most extract record use cases.

Configuring an Extract Process Using File Integration Type

The following points summarize the additional steps needed to implement a new extract background process that uses a file integration type to define the specific functionality:

- Choose or create data area objects to define the extract record formats.
- Define the logic required to populate each extract record type. Your edge product may deliver suitable plug-ins or you may need to create a plug-in script where the algorithm entity is **File Integration Record - Extract Record**. Note that the Extract Record plug-in receives most of the information defined in the Batch Control - Process Records plug-in.
- Define the algorithm type and algorithm for each newly created script.
- Choose or create a category for the file integration type using lookup `FILE_INT_OBJ_FLG`.
- Create the file integration type and configure the file integration records using the defined data areas and algorithms.
- Create a batch control by duplicating the appropriate base template for an extract background process. Include the File Integration Type parameter (fileIntegrationType) on the batch control and reference the appropriate file integration type.
- Plug in a Process Records algorithm that reads the file integration type configuration and processes the record types. The system provides a base file integration record extraction algorithm (`F1-FILEX-PR`) that is expected to be used for most file integration plug-in extract processes.

Extending a File Integration Extract Process

Your edge product may deliver file integration types and batch controls designed for standard extract processes. However, extending the delivered extracts to add custom data is common practice for most implementations. You can customize the output from a delivered extract by:

- Identifying the record types that need additional details
- Creating a data area that defines the additional details and using that to extend the data area configured on the record type
- Creating a File Integration Record — Extract Record plug-in script, algorithm type and algorithm that populates the extra details
- Adding the algorithm to the integration record's extract algorithms collection

In some cases, you may wish to extend the extract by adding additional record types. To do this, add your custom file integration records to the file integration type, following the steps described in Configuring an Extract Process Using File Integration Type.

Uploading Records

The base product provides a background process to upload data from a file. The batch control Plug-in Driven File Upload Template (`F1-PDUPL`) may be used as a template. The process

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includes parameters to configure the file path and file name for file to upload along with other parameters to control how to handle missing files and how to rename the file once processed. The process supports uploading multiple files and may be run multi-threaded to process multiple files. Refer to the description of the batch control and its parameters for more information.

The following sections describe concepts and features related to this process.

A Step in the Overall Upload Process

This step in the upload of data is only one part of a typical upload end-to-end process. This step is sometimes referred to in the product as "Process X". The goal of this step is to get records from a file into database records, with minimal validation and processing. The data should be stored in records that are then processed by a second step (often referred to in the product as the "upload" step, for example "Payment Upload"). The second step, independent of the plug-in driven batch process described here, is responsible for validating the data and should be able to be threaded by individual records and have proper error handling for individual records.

Depending on the type of data being uploaded, the product may already supply appropriate tables that the plug-in driven upload process may populate. These could be staging tables, such as payment upload staging. Or they may be records with business objects that have a lifecycle designed to handle uploaded data, for example Business Flag. In such cases, the product will typically supply out-of-the-box background processes to validate and further process the data and finalize the upload. If the data to upload does not already have a base provided staging table, be sure to work with your implementation team to identify an appropriate table to use for the plug-in driven batch upload. In addition, confirm the design for the second step that is responsible for the detailed validation and finalization of the data.

> **Note**
>
> Designing your upload process to directly update data, as opposed to using a staging table, increases the likelihood of data validation exceptions. Refer to the **Exception Handling** section for more information and guidelines to be considered when designing such upload process.

The File Upload Algorithm

This background process requires an algorithm plugged into the plug-in spot **File Upload**. By default, this plug-in is called once for a given file but it can also be designed to process records in multiple unites of work.

The batch process opens the file and passes to the algorithm the file reader element. The algorithm is responsible for using provided APIs to read the content of the file and store the data in appropriate table(s). The algorithm can be designed to process all the records in the file as a single unit of work. Alternatively, it can be designed to process a smaller set of records and request to be called again to process the next set etc, until all records are processed.

The batch process commits the records uploaded by each call to the algorithm and keeps track of the position in the file of the last processed record. That position is provided to the algorithm with each subsequent call, allowing it to reposition the file to that record and continue processing from there. When all records in the file are processed the batch process closed the file and proceeds to the next file if any.

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> **Note**
>
> Plug-in scripts written to implement this type of algorithm must use the Groovy script engine version as the APIs are not accessible using the XPath scripting language. Refer to Additional Coding Options For Server Scripts for more information.

Sample Algorithms

The product supplies sample algorithms to illustrate calling the supplied APIs for processing different types of source data: comma delimited, fixed position and XML. In every case, the sample data supported by the upload uses 'degree day' information to illustrate the process. The system provides sample target records (based on the Fact maintenance object) in order to illustrate the step to store records based on the input data. Note that only sample plug-in scripts have been provided. No algorithm, algorithm type or batch control is configured to use the sample plug-in scripts. To view the scripts, navigate to the Script page, search for a Script Type of **Plug-in Script** and Algorithm Entity of **Batch Control - File Upload** and look for the 'Sample' scripts.

Note that the sample plug-in scripts provided by the product are supplied to illustrate use of the provided APIs. They should not be considered a template for how to implement a plug-in script for a real use case. The following highlight some points to consider when designing a file upload algorithm:

- **Error handling / resolution.** The sample plug-in scripts do some basic error handling related to the data to illustrate error handling. However, any errors found in this step require processing of the whole file to stop. As such, this plug-in should only report errors that are not possible to fix, but where the whole file should be rejected. If there are errors that can be adjusted in the data, then the recommendation is to not check for those errors at this step. Rather, this plug-in should simply populate the appropriate staging tables and let the next step check for validity. As described above, the next step should include the ability to mark individual records in error, allowing for users to fix the data and retry.
- **Target tables.** The sample plug-in scripts use Fact as the target for the resulting insert statements. As mentioned above, the decision of where to store the uploaded data must be carefully considered. There may already be existing tables that are specific to a given use case. If the data being uploaded does not have existing tables to use, review the product to verify what existing tables may be useful, such as Inbound Sync Request or Service Task. Be sure that the tables chosen support error handling, either out-of-the box or via designing an appropriate business object with a lifecycle that supports an error status and the ability to resolve the error. Also note that the Sample Flat File Upload plug-in illustrates a header record / detail record scenario. In this case, the header record is linked to the child record via a CLOB element. This is not the recommended technique. In a real use case, the header record should be linked to the child record via a separate database column to allow for searching.

Exception Handling

By default, any error that occurs while uploading a file causes the entire file to be skipped. The upload batch program managed an exception as follows:

- A rollback is issued to reverse updates since last commit.
- The error message is reported as part of the batch run.
- The file is skipped from further processing and its name remains unchanged.
- Since the default unit of work for an upload process is a file, and not an individual record within it, an error counts as one file unit in error towards the **Override maximum errors (maxErrors)** limit if specified as a batch parameter. If a limit was not specified or not

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reached, the batch run is considered completed regardless of how many files were successfully uploaded. If a limit has reached, the upload process is stopped and the batch run status is set to error.

If your upload process requires a more granular row level exception handling, your upload algorithm should be designed accordingly. With this approach, errors are fully trapped, managed and reported by your algorithm and never reach the upload batch program. In other words, to the batch process there were no errors.

Trapping errors by your custom upload algorithm is not trivial and should consider the following guidelines:

- Use the 'Savepoint Script Dispatcher' (F1-SavePointDispatcher) business service to perform all your updates along with a request to trap any errors. The service adheres to standard rollback and data integrity rules and as such is the recommended approach for trapping application errors.
- When the business service traps an error, your algorithm may report it as a batch run message or any other option that meets your business requirements.

> **Note**
>
> Do not report the number of errors as part of the algorithm's plug-in spot response 'unitsInError' element. Any value provided in this element counts as if the entire file is in error, i.e. increments the total number of errors by one towards the 'maxErrors' limit if specified.

- The upload batch process is not aware of errors trapped by your algorithm and will rename the file as successfully processed even if no record was successfully processed. It is the responsibility of your algorithm to determine when a file should be considered as not processed and issue an explicit error for the batch program to handle.

Splitting Large Files Prior to Upload

A single file is processed by a single thread of this batch process. Splitting a large file into smaller files allows the smaller files to processed by multiple threads of the upload process.

The base product provides a background process to split large files prior to upload. The batch control File Split Template (`F1FSPLIT`) may be used as a template. The process supports splitting multiple files and may be run multi-threaded to process multiple files. The process can also be set up to submit the subsequent upload process once the files are split.

Note that not all file contents can be split using this batch process. Basic XML, json and flat file records separated by a new line may be supported.

Refer to the description of the batch control and its parameters for more information.

Configuring a New Process

The following points summarize the steps needed to implement a new file upload background process:

- Verify the details of the data in the upload file and map the data to fields in one or more appropriate tables in the system.
- Design the logic required for reading the record details and identifying each record to properly create the insert statements for storing the data. The sample plug-in scripts provided by the product illustrate using the various APIs available for use. Create a plug-in

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script where the algorithm entity is **Batch Control - File Upload**. Create an appropriate algorithm type and algorithm for this plug-in script.

- Create a batch control by duplicating the base template. Plug in the algorithm created above and configure the parameters as appropriate. Note that you may configure custom ad hoc parameters on the batch control if required. Both base and custom batch parameter values are available to the File Upload algorithm.

How to Re-extract Information

If you need to recreate the records associated with an historical execution of an extract process, you can - simply supply the desired batch number when you request the batch process.

How to Submit Batch Jobs

Most batch jobs are submitted via a batch scheduler. For cloud customers, refer to the Batch Scheduler for Cloud Implementations topic in the Oracle Utilities Cloud Service Foundation documentation for more information. For on premises customers, refer to your third party scheduler documentation for more information.

Batch jobs may be configured as Timed, which means they will automatically be run based on the timer frequency.

You can manually submit your ad hoc background processes or submit a special run for one of your scheduled background processes using the online batch job submission portal.

The system provides a service script `F1SubmitJob` to create a batch job submission request. Notes about this service:

- No parameter defaulting occurs when submitting a record using this script. All the desired parameter values must be provided.
- If the requested batch control is defined as part of a pool of batch controls using the **Batch Group** option then the batch job request is created for a batch control within the pool that has a low number of in progress requests. This technique allows for a more balanced load of submission requests across pool-based batch controls.

The script is also exposed as a REST web service (using the inbound web service `F1-SubmitJob`) to support batch job submission requests from an external system.

How to Track Batch Jobs

You can track batch jobs using the batch process pages, which show the execution status of batch processes. For a specified batch control id and run id, the Batch Run portal shows information about each thread, the run-instances of each thread, and any messages (informational, warnings, and errors) that might have occurred during the run.

> **NOT_SUPPORTED**
>
> For more information, refer to Tracking Batch Processes.

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How to Restart Failed Jobs and Processes

Every process in the system can be easily restarted if it fails (after fixing the cause of the failure). All you have to do is resubmit the failed job; the system handles the restart.

Assessing Level of Service

For some background processes, an implementation may wish to supply one or more algorithms that check some conditions to assess whether or not the process is performing as expected. An algorithm could be used to check the performance of the job to see if it is running as efficiently as expected. Or it could analyze the data processed by the background process to assess whether there may be some problem with the quality of the data.

The system provides a Level of Service plug-in spot on batch control to configure the appropriate algorithms for a given background process, if desired. Each algorithm is expected to return a value to indicate the 'level of service' determined along with a message indicating the reason for the value. The following Level of Service values are supported:

- **Normal**. Indicates that the algorithm did not detect any issues.
- **Warning**. Indicates that the algorithm found some issues that may or may not indicate a problem.
- **Error**. Indicates that the algorithm found some issues that should be investigated.
- **Disabled**. Indicates that the algorithm could not properly execute the level of service logic.

When multiple Level of Service algorithms are plugged in on the batch control, the overall Level of Service assessment for a batch control is populated as follows: if any algorithm returns Error, that value is returned; otherwise, if any return a Warning, that value is returned; otherwise Normal is returned. The results returned by each algorithm are also made available for review.

When viewing a batch control record, use the **Level of Service** action to display this information. The level of service is also part of the Health Check service.

Batch Resource Groups

Batch resource groups may be configured to prioritize resource allocation between various batch processes. For example, export type of processes may have a lower resource allocation priority relative to billing related processes.

The **Batch Resource Configuration (F1-BatchResourceConfig)** extendable lookup associates certain batch processes with one of three priority resource groups: 10 (High), 20 (Medium), 30 (Low). No setting for a batch control means it received the default priority relative to other processes.

Resource group information may be leveraged as follows:

- Database resource management tools may be configured to allocate resources to batch processes by their association to resource groups.
- In a Cloud installation, thread allocation prioritization can be fine-tuned by associating batch processes to batch resource groups.

The following sections provide additional information on these features.

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Batch Thread Prioritization

In a Cloud installation, batch processing functionality supports the capability of submitting batch jobs with high thread counts which leads to many threads of work being initially queued by the system. Batch resource groups are used to promote fair queuing of batch work such that batch controls associated with a higher priority resource group receive more service relative to those associated with lower priority resource groups.

Database Resource Management Tools

Database resource management tools may be used to prioritize resource allocation between various batch processes. For example, export type of processes may have a lower resource allocation priority relative to billing related processes. These tools allocate resources to groups of consumers, not to an individual batch process. They use rules that are based on certain session variables, to associate a batch process with a resource group.

In a Cloud installation, if a batch control is associated with a resource group the latter is included by default as part of the MODULE database session variable as follows: '<batch control>,R=<resource group>'. This allows DBAs to potentially take advantage of this information for resource prioritization purposes. On premise, this feature needs to be explicitly opted in using the **Expose Batch Resource Group** option in the **General System Configuration** feature configuration.

With this configuration enabled, DBAs can set up rules that parse the MODULE variable to identify the resource group for a batch process and apply prioritization rules accordingly. Note that most batch controls may not be associated with a resource groups so default allocation rules should be considered.

Note. This configuration does not include nor enforce the database resource management configuration. It only allows for such tool to be leveraged by DBAs as needed.

Batch Control Options

A batch control supports defining options. An option allows the product or your implementation to mark a batch control with additional information to be used for special processing or reporting.

Note. You can add new option types. Your implementation may want to add additional batch control option types. To do that, add your new values to the customizable lookup field **BATCH_CTRL_OPT_FLG** .

Defining Batch Controls

The system is delivered with all necessary batch controls. Implementations may define default values for parameters. In addition, implementations may define their own background processes.

To view background processes, open **Admin**, and then **System**, and then **Batch Control.**

Use the **Batch Control Query** portal to search for an existing batch control. Once a batch control is selected, you are brought to the maintenance portal to view and maintain the selected record.

Refer to Background Processing Concepts and Online Batch Submission for more information.

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> **⚠ Caution**
>
> Important! If you introduce a new batch process, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page

- **Batch Control.** This zone provides information about the selected batch control.

The following zone may appear as part of the portal's **Algorithms** tab page

- **Algorithms.** This zone is used to maintain the algorithms that control important functions for instances of this batch control. Refer to the table that follows for a description of all possible system events. If the algorithm is implemented as a script, a link to the **Script** is provided. Refer to Plug-in Scripts for more information.

The following zone may appear as part of the portal's **Options** tab page

- **Options.** This zone is used to maintain various configuration options associated with the current batch control.

> **ⓘ Note**
>
> **You can add new option types.** Your implementation may want to add additional batch control option types. To do that, add your new values to the customizable lookup field `BATCH_CTRL_OPT_FLG`.

The following zone may appear as part of the portal's **References** tab page

- **Batch Control References.** This zone list various configuration entities referencing the current batch control.

Actions

The page supports the following special actions:

- **Level of Service.** Use this action to display the output of the level of service algorithms for the batch control.
- **View Source.** If the batch program is shipped with the base package, you can use the adjacent icon to display the source code of this program in the Javadocs viewer.
- Batch Control Algorithms

Batch Control Algorithms

The following table describes all the system events supported for maintenance objects.

The **Algorithms** grid contains algorithms that control important functions for instances of this batch control. You must define the following for each algorithm:

The following table describes all the system events supported by batch controls. Note that some system events are batch program specific and as such are not available to all batch controls.

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System Event	Optional / Required	Description
Error Post-Processing	Optional	Algorithms of this type are called if the batch process fails to complete due to an error. Multiple algorithms are allowed and are executed in sequence order. Refer to Error Post-Processing Logic for more information.
File Upload	Optional	Algorithms of this type are only applicable to plug-in driven background processes and are used to upload all records for a file. This is a single algorithm plug-in spot. If multiple algorithms are plugged into the batch control, the one with the highest sequence is used.
Level of Service	Optional	Algorithms of this type are called to determine the Level of Service provided by a batch control. Multiple algorithms are allowed. Refer to Assessing Level of Service for more information.
Parameter Validation	Optional	Algorithms of this type are only applicable to plug-in driven background processes and are used to validate batch specific parameters. The algorithm is invoked prior to the select and process records plug-ins. This is a single algorithm plug-in spot. If multiple algorithms are plugged into the batch control, the one with the highest sequence is used.
`Post-Processing`	Optional	Algorithms of this type are called after all threads are complete. Multiple algorithms are allowed and are executed in sequence order. Refer to Post-Processing Logic for more information.
Process Record	Optional	Algorithms of this type are only applicable to plug-in driven background processes and are used to process a specific record. This is a single algorithm plug-in spot. If multiple algorithms are plugged into the batch control, the one with the highest sequence is used.

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System Event	Optional / Required	Description
Select Records	Optional	Algorithms of this type are only applicable to plug-in driven background processes and are used to define the SQL to use to select the records to process. This is a single algorithm plug-in spot. If multiple algorithms are plugged into the batch control, the one with the highest sequence is used.

> **Note**
>
> **You can add new system events**. Your implementation may want to add additional batch control oriented system events. To do that, add your new values to the customizable lookup field `F1_BATCH_CTRL_SEVT_FLG`.

Defining File Integration Types

This section describes the functionality supported for viewing and maintaining file integration types.

Refer to Extract Record Processing for an overview of the file integration type functionality provided with plug-in driven background processes.

To view or add a file integration type, open **Admin**, and then **Integration**, and then **File Integration Type.**

Once a file integration type record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The **File Integration Records** zone lists the record definitions for this integration, in hierarchical order. Use the zone actions to add, maintain or view a file integration record. Press the **Record Layout** icon to view a pop-up display of the record's schema.

Defining File Integration Records

This section describes the functionality supported for viewing and maintaining file integration record definitions.

Refer to Extract Record Processing for an overview of the file integration type functionality provided with plug-in driven background processes.

To view or add a file integration record, open **Admin**, and then **Integration**, and then **File Integration Type** and navigate to it from the **File Integration Records** zone.

The **File Integration Record** zone displays details about the selected record. Use the **View Record Types** zone action to review the complete list of record types included in the file integration type configuration.

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On-Line Batch Submission

The on-line batch submission portal enables you to request a specific background process to be run. When submitting a background process on-line, you may override standard system parameters and you may be required to supply additional parameters for your specific background process. After submitting your background process, you may use this portal to review the status of the submission.

The following topics further describe logic available for on-line submission of background processes.

- Batch Submission Creates a Batch Run
- Jobs Submitted in the Background
- Email Notification
- Running Multi-Threaded Processes
- Submitting Jobs in the Future
- Lifecycle of a Batch Job Submission
- Granting Access To Batch Submission
- Submission User and Method
- Batch Job Submission Portal

Batch Submission Creates a Batch Run

When you request a batch job to be submitted from on-line, the execution of the desired background process will result in the creation of a batch run. Just as with background processes executed through your scheduler, you may use the Batch Run portal to view the status of the run, the status of each thread, the run-instances of each thread, and any messages that might have occurred during the run.

> **Note**
>
> Your on-line submission record is assigned a status value so that you may know whether your job has been submitted and whether or not it has ended, however, it will not contain any information about the results of the background process itself. You must navigate to the Batch Run portal to view this detail.

Jobs Submitted in the Background

When you save a record on the batch job submission page, the batch job does not get submitted automatically. Rather, it saves a record in the batch job table. A special background process will periodically check this table for pending records and will execute the batch job. This background process will update the status of the batch job submission record so that a user can determine when their job is complete.

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> **Note**
>
> At installation time, your system administrator will set up this special background process to periodically check for pending records in the batch job submission table. Your administrator will define how often the system will look for pending records in this table.

It should be noted that this special background process only submits one pending batch job submission record at a time. It submits a job and waits for it to end before submitting the next pending job.

> **Note**
>
> If you request a batch job to be run multi-threaded, the special background process will submit the job as requested. It will wait for all threads to complete before marking the batch job submission record as **ended**. Refer to Running Multi-threaded Processes for more information.

Email Notification

If you wish the system to inform you when the background process completes, you may supply your email address. The email you receive will contain details related to the batch job's output; similar to the job results you would see from your batch scheduler.

The email includes information from the product installation to help users that may be working in and submitting background processes in more than one environment.

- It includes the product name and product version for the product in the installed products list that is marked as the one to display.
- If a domain name message is configured in the installation messages, this information is also included.

> **Note**
>
> This assumes that during the installation process, your system administrator configured the system to enable email notification. Your administrator may also override the amount of detail included in the email notification.

> **Note**
>
> A batch control parameter may be used to indicate if the email should only be sent in the case of an error or success or both. Refer to Parameters Supplied to Background Processes for more information.

Running Multi-Threaded Processes

Many of the system background processes may be run multi-threaded. When submitting a background process on-line, you may also run a multi-threaded process. The fields Thread

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Count and Thread Number on the batch submission portal control the multi-threaded process requests:

- To run a multi-threaded process, indicate the number of threads in **Thread Count** and enter `0` in the **Thread Number**. If a previous run ended with one or more threads in error, a new submission may be created to restart all the threads that were in error. This submission would result in new Batch Thread Instance records added for each thread that previously ended in error. Note that if the previous run was marked to "Do Not Restart", then a new submission will result in a new Batch Run.
- In the situation where a previous run resulted in one or more threads in error, you may use the Thread Number to indicate a specific thread to restart. This is only valid if there is a previous run found that is not marked "Do Not Restart". This will result in a new Batch Thread Instance created for the specific thread in the previous run.
- To run a process as a single thread, enter Thread Count = `1` and Thread Number = `1` (or `0`). This will execute the background process single-threaded.

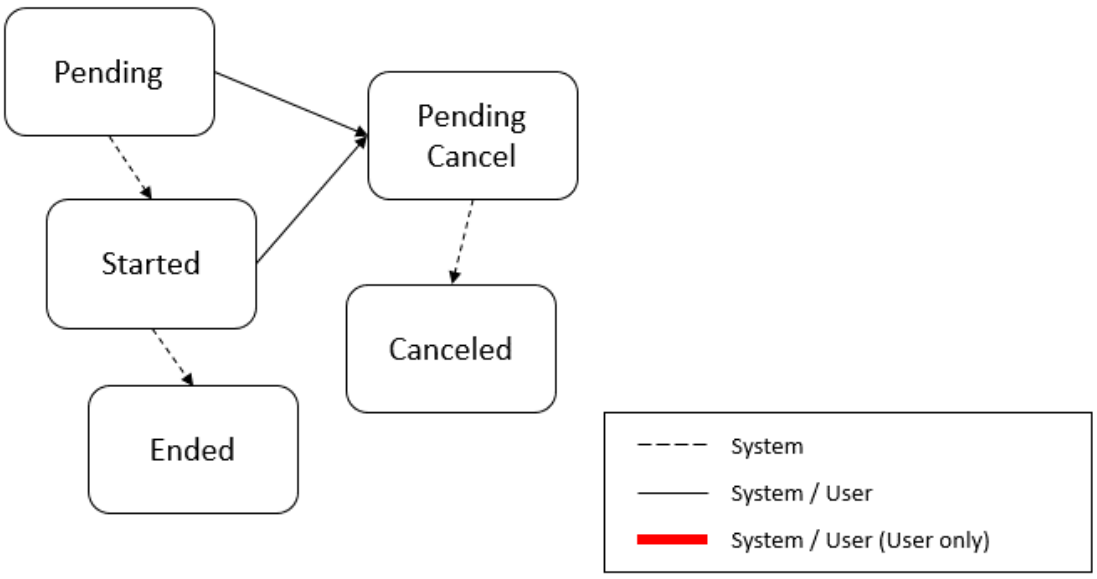
> **Note**
>
> When running a multi-threaded process, the special background process will wait until all threads are complete before marking the batch job submission record as **Ended**.

Submitting Jobs in the Future

If you wish to request a batch job to be submitted in the future, you may do so when creating your batch job submission record by entering a future submission date. The special background process, which looks for pending records in the batch job submission table, will only submit batch jobs that do not have a future submission date.

Lifecycle of a Batch Job Submission

The following diagram illustrates the lifecycle of a batch job submission record.



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Pending – Records are created in **Pending** status. Records in this state are put in a queue to be submitted.

Started – Once a pending record has been submitted for processing, its status will be changed to **Started**.

Pending Cancel – Users may request the cancellation of a pending record to prevent the batch job from being submitted. In addition, users may request to cancel a started batch job. The system will look for records in this status and look for batch runs that may need to be canceled for this batch job. Once it is confirmed that any batch runs are stopped, the status changes to **Canceled**.

Ended – When the batch job has finished processing, its status will be changed to **Ended**. Note that batch jobs in **Ended** status may have ended in error. You will need to navigate to the Batch Run portal to determine the status of the batch run.

Granting Access To Batch Submission

Every batch control must reference an application service. When you link a batch control to an application service, you are granting all users in the group the ability to submit the associated batch job for execution.

> **NOT_SUPPORTED**
>
> Refer to The Big Picture Of Application Security for information about granting users access rights to an application service.

When the batch control is added to the batch job table, the system checks if both the user submitting the job and the user ID recorded on the batch submission record have access rights. Application security does not apply when viewing a batch control or an associated batch run.

> **Note**
>
> Base batch controls will be associated with base owned application services by default. Implementations will need to ensure the appropriate user groups are linked to these application services.

Submission User and Method

Batch jobs track submisssion details using the following attributes.

The **Submission User** indicates who initiated the batch job and may differ from the batch user who controls permissions and auditing during the actual execution of the job. This value is not populated for timed batch jobs or batch jobs submitted via a scheduler.

The **Submission Method** indicates how the batch job was initiated. Valid methods include:

- **Online** - populated when a user manually creates or manually duplicates a batch job submission.
- **Generated** - populated by algorithms that submit a batch job and by 'initiator' batch jobs that submit other batch jobs.

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- **Scheduled** - populated by the DBMS scheduler. Note that for other schedulers, it is not advised to use this value as there may be logic and validation related to records created with this value that may not apply to other schedulers.
- **Timed** - populated by the batch daemon that submits timed batch jobs.
- **Other** - populated when no other value is provided.

Additional values may be added by your implementation. Refer to the lookup `SUBMIT_METH_FLG` for a list of the submission methods supported by your system.

Batch Job Submission Portal

To view a submitted batch job, use **Menu**, and then **Tools**, and then **Batch Job Submission**. You are brought to a query portal with options for searching for a Batch Job Submisssion entry.

Once a batch job submission entry has been selected, you are brought to the maintenance portal to view the selected record.

The inline help provides information about several fields. Refer to Parameters Supplied to Background Processes for more information about the fields on this page.

Refer to On-Line Batch Submission for detailed explanations about many feaures of online submisssion.

Actions

This page has three special actions.

- Using the **Duplicate** button opens a window with the selected batch job submisssion details displayed. These fields, including the batch parameter values, may be overidden. Pressing **Save** will create a new Batch Job Submission entry.
- Use the **Rerun** button to rerun the selected batch job. A window opens displaying the details of the batch job submisssion to be rerun. These fields, including the batch parameter values, may be overidden. Pressing **Save** will create a rerun Batch Job Submission entry.

> **Note**
>
> Rerun is only intended to be used for background processes that download information that belongs to given run number. It is typically only required if you need to download an historical run (rather than the latest run).

- **Cancel** is only applicable for batch job submisssions that are in **Pending** or **Started** status and do not have a submission method of **Scheduled** . The action is not visible for other statuses. Refer to Lifecycle of a Batch Job Submission for more information.

Tracking Batch Processes

The topics in this section cover the tools provided for reviewing the status and performance of batch processes. Refer to Defining Batch Controls for more information on how batch control codes are defined.

- Batch Run
- Batch Day Dashboard

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Batch Run

The batch run portal shows the execution status of a selected batch process. The information includes thread status summary, details about each thread, its instances, and any error To Do Entries and messages (informational, warnings, and errors) that might have occurred during the run. It also includes information about files that may have been created by the process along with various types of analytical reports.

You can access the portal from the **Main Menu**, and then **Tools**, and then **Batch Run**. You are brought to a query portal with options for searching for a specific batch run. Once a batch run has been selected you are brought to this portal to view the selected record.

The following points should help understand the concept of threads:

- Many batch jobs cannot take advantage of your hardware's processing power when they are run singularly. Rather, you'll find that a large percentage of the CPU and/or disk drives are idle.
- In order to minimize the amount of idle time (and increase the throughput of your batch processes), we allow you to set up your batch processes so that multiple instances of a given batch job are executed at the same time. For example, in Oracle Utilities Customer Care and Billing when you schedule the **billing** process, you can indicate that multiple parallel instances should be executed (rather than just one instance). You'd do this so that the processing burden of creating bills for your customers can be spread over multiple processes.
- We refer to each parallel execution of a batch process as a "thread".
- Statistics and information messages are displayed in respect of each thread. Why? Because each thread is a separate execution and therefore can start and end at different times.

Refer to Understanding Background Processes for more information.

The following zones may appear as part of the portal's **Main** tab page.

- **Batch Run.** This zone provides information about the selected batch process, including a high level summary of key details such as threads status, processing record counts and more.
- **Batch Jobs.** This zone lists one or more batch job submission records that were used to execute the batch run. Typically a batch run is associated with a single job submission record but multiple may exist when some of the threads needed to be restarted. When a single job record exists the batch parameters specified at submission time are listed on the Batch Parameters zone. When multiple jobs exist, select a job to view its parameters.
- **Batch Parameters.** This zone lists the parameters specified as part of a selected batch job submission. This zone is hidden by default when more than one job exists for the batch run.

The following zones may appear as part of the portal's **Threads** tab page.

- **Batch Run Threads.** This zone allows you to filter and review thread instances information. When an instance is associated with messages, you may click on the message count to review the message in the Batch Instance Message zone. You may click on the Thread Summary action link to review a summary by thread.
  About Log files:
  - **Availability**. The ability to download batch log files depends on whether the application properties file has been configured with the location of the log files and the log files associated with the batch run are still available.

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  - **Security Access.** Only users that have security access to the **Download** access mode for the batch run application service can download log files.
  - **Compression.** The log files are compressed and include a *.gz extension. Different browsers treat this type of file differently. Some browsers may automatically decompress the file as part of the download and they are viewable in any text viewer by changing the extension to one the text viewer recognizes. However, some browsers download the compressed file and a user will need to unzip the file prior to viewing.
  - **Batch Run Logs.** The **Download stdout** and **Download stderr** zone action links may be used to download log files at the batch run level. These files may exist for processing that occurs before the thread execution. The links are visible when the corresponding file is available and the user has security rights to download files.
  - **Batch Thread Logs.** If the log files associated with a batch thread are still available and the user has security rights to download files, the **Download stdout** and **Download stderr** icons are visible for instances of that thread.

- **Batch Instance Messages.** This zone lists any messages reported by a selected thread instance. The zone is hidden by default. Refer to Processing Errors for information about these types of errors.
- **Batch Run Thread Summary.** This zone summarizes thread information across instances based on the "Accumulate All Instances" indication on the batch control record. The zone is visible upon request by using the Thread Summary link on the Threads zone.

The following zones may appear as part of the portal's **Errors** tab page.

- **Batch Instance Messages.** This zone allows you to filter and review messages across all thread instances. Refer to Processing Errors for information about these types of errors.
- **Batch Run To Do Entries.** If the background process has been enabled to create To Do entries for object specific errors, information about the To Do entries are displayed in this tab. This zone displays a summary of all To Do entries created by this batch process, grouped by status and error message. The zone is only visible when such entries exist.
- **Sample To Do Entries.** This zone displays a sample of To Do Entries for a specific status and application message selected in the Batch Run To Do Entries zone. The zone is hidden by default.

The following zones may appear as part of the portal's **Files** tab page.

- **Batch Run Files.** This zone lists file names created by the batch process.

The following zones may appear as part of the portal's **Threads Analysis** tab page.

- **Threads Analysis.** This zone includes several analytical reports around thread performance.

The following zones may appear as part of the portal's **History** tab page. This tab is only available when the maintenance object supports lifecycle definition.

- **Previous 20 Runs - Records Per Seconds.** This zone compares the throughput of the previous 20 runs.
- **Previous 20 Runs - Processed Records.** This zone compares the number of records processed by the previous 20 runs.
- **Previous 20 Runs.** This zone lists the previous 20 runs along with key details about each run.
- **Concurrent Batch Runs.** This zone lists other batch processes that ran at the same time as the current batch run. This information is sourced from the batch snapshot tables and is therefore only available when snapshot data is kept up to date.

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Actions

The page supports the following special actions:

- **Do Not Attempt Restart.** If the **Run Status** is **Error**, the system will attempt to restart this run when you attempt to execute the Batch Control. In most situations, this is exactly what you want to happen. However, there are rare situations where you do not want the system to execute a given batch run (e.g., if this run is somehow corrupt and you cannot correct the data for whatever reasons). If you want the system to skip the execution of a batch run (and proceed to the next run), click on the **Do Not Attempt Restart** action.
- **Attempt Restart.** Use this action to revert back to the standard restart functionality.

Batch Day Dashboard

This portal provides a high level summary of the status, duration and other details of the batch jobs that ran on a given business date. An implementation may introduce additional zones to this portal as needed.

Use **Menu**, and then **Dashboards**, and then **Batch Day Dashboard** to navigate to the portal.

Batch Runs By Business Day

This zone provides a summary by business date of the number of batch runs completed, in error, and in progress, together with the earliest start time and latest end time of the jobs on that day. sThe zone is sorted in descending order by business date.

> **Note**
>
> For performance reasons, the zone is configured to restrict the number of rows retrieved by the query. The 'Results' number will indicate how many rows have been retrieved. Use the Next and Previous buttons to retrieve additional dates or return to a prior set of dates.

The following filters are provided:

- **Batch Business Date** allows you to select a particular business date.
- **Process Date** allows you to restrict the batch runs included in the summary to those where the processing date is within the start and end dates for the run.
- **Exclude Reruns** allows you to exclude batch reruns from the summary.

> **Note**
>
> The values selected in these filters will be applied as hidden filters to the other zones in the portal.

When a specific business date is broadcast from the summary, the following zones will appear as part of the portal's **Main** tab page.

Batch Day By Status

This zone summarizes the batch runs for the business date by their status, displayed in the form of a pie chart. Selecting a specific slice of data on the chart broadcasts its value to the

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other zones on the portal allowing them to filter their data accordingly. Use the **Reset** action to reset the filter set by this zone.

Batch Day By Category

This zone summarizes the batch runs for the business date by their batch category, displayed in the form of a pie chart. Selecting a specific slice of data on the chart broadcasts its value to the other zones on the portal allowing them to filter their data accordingly. Use the **Reset** action to reset the filter set by this zone.

Batch Jobs Summary

This zone displays details of the individual batch runs for the broadcast business date. The zone is sorted in ascending order by start date/time and batch control.

> **Note**
>
> For performance reasons, the zone is configured to restrict the number of rows retrieved by the query. The 'Results' number will indicate how many rows have been retrieved. Use the Next and Previous buttons to retrieve additional rows or return to a prior set of rows.

The following filters are provided:

- **Batch Control** allows you to select a particular batch control to review. This filter supports wildcard searching.
- **From Start Date/Time** restricts the batch runs displayed to those where the start date time is on or after this date and time.
- **To Start Date/Time** restricts the batch runs displayed to those where the start date time is on or before this date and time.
- **From End Date/Time** restricts the batch runs displayed to those where the end date time is on or after this date and time.
- **To End Date/Time** restricts the batch runs displayed to those where the end date time is on or before this date and time.
- **Batch Control Type** restricts the batch runs displayed to the selected type.

The following columns are displayed initially:

- **Start Date/Time** is the start time of the run.
- **Batch Control** is the batch control ID of the batch run.
- **Description** is the description of the batch control. Click the hyperlink to navigate to the Batch Control portal.
- **Batch Run** is the run number of the batch job. Click the hyperlink to navigate to the Batch Run portal.
- **Status** is the status of the batch run.
- **End Date/Time** is the end time of the run. The current date and time may be displayed if the batch job is still in progress.
- **Duration** is the time taken for the run, formatted as Days:Hours:Minutes:Seconds.
- **Threads** is the total threads for the batch run.

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Click the **Column Configuration** icon in the zone header to show the Column Configuration Area in which additional columns can be added to the results. The additional columns include the following:

- **Batch Category** is the category of the batch run.
- **Batch Control Type** is the type of the batch run.
- **Do Not Attempt Restart** indicates whether the run has been marked not to be restarted.
- **Rerun Nbr** is the rerun number of this batch job.

Requests

Requests enable an implementer to design a process using the configuration tools and standard business object monitoring techniques. They are intended to support use cases where processing should be carried out in background, but is not performed often enough that a dedicated batch process is needed.

An example of such a process might be to send an email to a group of users that summarizes the To Do entries that are assigned to them.

The following topics provide more details of requests and their uses.

- Understanding Requests
- Setting Up Request Types
- Maintaining Requests

Understanding Requests

There are two objects that work together to define a request process:

- The request type which defines configuration related to the request.
- The request record which manages the request process and captures information required to perform the request.

Request Type

The request type business object defines the transactional business object for requests of that type. It may also define parameters to be used by the request, such as to do types for user notification at different points in the request process. In addition, the request type lifecycle may be used to automatically create requests of this type, using a monitor algorithm and the standard monitoring batch control.

Requests

The request object is the object that is responsible for managing a request. A separate request business object must be defined for each use case that follows a unique lifecycle. The business object schema defines the details that are captured during the process. In addition, the business object lifecycle must include at least one algorithm that is responsible for performing the request processing, as an enter plug-in on the appropriate state.

Managing Requests

The product provides a portal for searching and maintaining request objects.

Refer to Maintaining Requests for more information.

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- Designing a New Request
- Configuring Requests

Designing a New Request

The following sections highlight important considerations in setting up a new Request.

Defining the Request Process Details

When defining a new request object, you must first determine what information needs to be captured to perform the request. Some static details, such as to do types to be used for notifications may be configured on the request type BO. Others, such as the details of the records affected may need to be recorded in the request record. These elements are defined in the BO data area of the request using standard UI hint syntax.

In addition, there may be several steps in processing a request, depending on the complexity of the use case. A request may require approval or review before being processed. These steps are modeled using the request business object lifecycle.

The system provides a 'root' business object for data correction requests (`F1-DataCorrectionRoot`) that may be used as an example of a multi-step process. Your specific product may supply additional request business objects.

Previewing a Request

Users often want to preview a sample of the results of the request before submitting for processing. The system provides the following to support preview functionality.

- A special BO option of **Request Preview Service Script**. This script retrieves the information that is displayed when a user asks for a preview of a request.
- The `F1-DataCorrectionReqActions` map fragment. This map fragment includes support for a preview action using script `F1ReqPrvwAct`. This script invokes the request preview script configured on the request BO, using the preview script schema to generate the UI and display the results. The map also supports hiding the edit and preview actions based on flags set in the request BO.

Performing Request Processing

The assumption is that an enter algorithm is responsible for request processing. It is common for requests to be processed in background rather than real-time. The standard technique is to use a deferred monitor to transition the request to the status that has the algorithm plugged in. The `F1-OrphanRecordDeletion` BO uses this technique.

Request Security

Some users may not be authorized to submit certain requests. When adding a new request, the list of available request types is restricted to types where the user has security access to the related request business object's application service. This may affect the choice of application service and the additional configuration required for a new request business object.

Configuring Requests

If your product supports request use cases that you are planning to implement, all you need to do is add a request type record using the business object for that type and define the appropriate configuration for your business requirements.

The following topics provide information about the request types supplied in the framework.

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- Orphan Record Deletion
- Configurable Data Correction
- To Do Summary Email

Orphan Record Deletion

The product supports a data correction method to delete orphan records from a given table. Orphan records are child table records where the parent record no longer exists.

The following points describe the functionality at a high level:

- A request is created to capture the table from which the orphan records are to be deleted. The assumption is that prior investigation has identified the target table.
- Back end logic generates the SQL to delete the orphan records and provides counts of the rows to be deleted.
- When the request is submitted, a batch process is started that will run the SQL in background. Backups are taken prior to performing the deletion.
- When the request is completed, a separate request may be created that cleans up the backup tables from the database.

This functionality is supported by configuration and logic supplied in the base business objects Orphan Record Deletion (**F1-OrphanRecordDeletion**) and Orphan Record Deletion Type (**F1-OrphanRecDelType**). The following sections describe key steps in the request lifecycle.

Capturing the Deletion Details

The base product provides a business service **F1-SelectOrphanRecordsSQL** that constructs the SQL to select orphan records from a target table. The business service returns additional SQL statements for the target's child and grandchild tables, if applicable. The product also provides the business service **F1-CountRecords** which counts the orphan records based on the SQL generated by **F1-SelectOrphanRecordsSQL**.

The Orphan Record Deletion BO invokes these business services in a post-processing algorithm and records the details on the request record.

Approving and Submitting the Request

Once a deletion request is captured, there are several key steps to perform.

- Deletion request records are created in **Pending** state so that the SQL statements and record counts can be reviewed before proceeding.
- If the deletion details are correct, the request can be transitioned to **Ready for Approval**. A to do entry is created to notify potential approvers. The request must be approved by someone other than the user who created the record. The notification to do entry type and role are configured on the Orphan Record Deletion Type.
- The request must be approved before it can be submitted for processing. If the Orphan Record Deletion Type indicates that record counts must be verified before deletion, a warning will be issued at approval time if there is a record mismatch.
- Once the request is in the **Approved** state, it can be submitted. The **Submitted** state is configured to be processed by a batch monitor so that record deletion is carried out in background. The monitor batch job is submitted automatically. When record deletion is complete, the request transitions to the **Processed** state so that the results can be reviewed.

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- If the deletion could not be completed successfully, the request will enter the **Error** state and a to do entry is created. The error to do entry type and role are configured on the Orphan Record Deletion Type.

Completion and Clean Up

The record deletion process includes steps to take backups of the target tables in case the results are not as expected. A separate request may be created to handle deletion of unwanted backup tables at an appropriate time. If the Orphan Record Deletion Type specifies a clean up request type, a request record of that type is created when the deletion request enters the **Complete** state. The clean up functionality is supported by configuration and logic supplied in the base business objects Backup Table Cleanup (**F1-BackupTableCleanup**) and Backup Table Cleanup Type (**F1-BackupTableCleanupType**).

Configurable Data Correction

Implementers can use plug-in driven batches to perform some types of one-off data corrections but the process lacks the built in approval step supported by the request based data correction flows. Moreover, each custom plug-in driven batch involves creating a few custom algorithms, scripts and a batch control, all generated for a one-off update.

The product supports a simplified way to request, approve and perform plug-in driven based data corrections.

The following points describe the functionality at a high level:

- A data correction request is created to capture the following details:
  - An **SQL** query that selects the records to correct.
  - Either a **business object** or a **service script** to perform the data correction for each selected record.
  - The number of threads to submit the data correction batch process with.
- When the request is approved and a user submits it for processing, a batch job is created for the specific request. The batch job uses the query on the request to select the records to correct and calls the corresponding business object or script to perform the update for each record. The request remains in the 'Submitted' status while the batch process runs.
- When the batch completes, it updates the corresponding request to the 'Processed' status, which then creates a monitoring To Do Entry for a user to review the results of the batch. The user marks the request as complete and if further corrections are needed the user can create another request with different correction details as needed.

The following sections provide more information about this tool.

Request Type Setup

A "Data Correction via Batch" (**F1-DataCorrectTypeByBatch**) Request Type business object is provided to define a request type record for creating such requests. To enable this functionality, a request type should be created using this business object.

The request type should reference the "Configurable Data Correction" (**F1-DataCorrectPlugIn**) as the request business object. This business object is a subclass of the data correction root business object and as such leverages the same approval based lifecycle support.

Data Correction Implementation

The following is a suggested description for a one-off data correction procedure:

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- If the change is not a simple update of fields using a business object, implement a service script that gets the prime key of a selected record and uses standard scripting logic to perform the update. The script can be tested using the Test action on the Script page.
- Use any tool to compose and test an SQL that selects the records from a primary table of a maintenance object to correct.
- If the change is a simple update of non-list fields on a business object, note the xpath of the primary key fields and the xpath of each element that needs to be updated on that business object. Adjust the SQL to set the xpath element name as the alias of each field.

  This is an example of a data correction SQL that selects some batch control records and assigns each with a new "next batch run number". The "batchControl" and "nextBatchNumber" aliases are xpath references to the corresponding fields in the F1-BatchControlPhysicalBO business object.

  ```
  select batch_cd "batchControl",
  case
  when batch_cd = '...' then <new next batch run number>
  ...
  else ...
  end "nextBatchNumber"
  from ci_batch_ctrl
  where batch_cd in ('.... list of batch control records to update ... ')
  ```

  > **Note**
  >
  > The SQL is provided for illustration purposes only.

- If the change is not as simple, implement a service script that gets the fields from a selected record and uses standard scripting logic to perform the update.
  - The script's schema must include the **F1-DataCorrectionProcessRecord** data area. It is via this data area that your script gets the selected field from each row to update. The structure of this data area is similar to the plug-in driven **Process Record** plug-in spot.

    All selected fields are provided to your script in the 'selectFields' list of the data area. In addition, the primary key of the selected record may also be provided via the 'mo', and 'pk1-5' elements, if the 'MAINT_OBJ_CD', and 'PK_VALUE1-5' designated aliases are used in your query.

    For example:

    ```
    select 'F1-FACT' MAINT_OBJ_CD, fact_id PK_VALUE1, ...
    from f1_fact ...
    ```

  - The script can be tested using the 'Test' action on the Script page.
- Create a 'Configurable Data Correction' Request using the corresponding Request Type. Specify on the request the SQL and the business object or script to use for data correction.
- Progress the request through approval and submit for processing when ready.
- Review the data once the submitted batch is complete.

Approving and Submitting the Request

Once a data correction request is captured, there are several key steps to perform.

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- If the deletion details are correct, the request can be transitioned to **Ready for Approval**. A to do entry is created to notify potential approvers. The request must be approved by someone other than the user who created the record. The notification to do entry type and role are configured on the Request Type.
- The request must be approved before it can be submitted for processing.
- Once the request is in the **Approved** state, it can be submitted. The **Submitted** state is configured to be processed by a plug-in driven batch process that uses details from the request to perform the deletion in background. The batch job is submitted automatically. When batch job completes, the request transitions to the **Processed** state so that the results can be reviewed.
- A user marks the request as complete and if further corrections are needed the user can create another request with different correction details as needed.

To Do Summary Email

The base product includes a sample request process that sends an email to users that have incomplete To Dos older than a specified number of days.

Configuring the Email Request Type

The following configuration tasks are required to use this process:

- Define an Outbound Message Type. The business object usually defined for the Outbound Message Type is **F1-EmailMessage.**
- Define an External System that contains the Outbound Message Type in one of its steps. In the configuration determine if the communication is through SOA, batch, or real-time processing method when sending the email notification. Refer to Outbound Messages for more information about configuration needed for the different processing methods.
- Create a Request Type using the `F1-TodoSumEmailTyp` business object.
- Configure the Request Type with the outbound message type and external system.
- Provide values for the threshold, email subject and email address.
- If you want emails of this type to be sent periodically, enter a value for the frequency parameter.

Previewing the Email Request

When adding or editing a To Do email request, the following actions are possible:

- Click **Save** to submit the request.
- Click **Cancel** to cancel the request.
- Click **Preview** to see a sample of records that satisfy the selection criteria for this request. This information is displayed in a separate map. In addition, the map displays the total number of records that will be processed when the request is submitted. From this map you can click **Save** to submit the request, **Back** to adjust the parameters, or **Cancel** to cancel the request.

Submitting the Email Request

When an email request is saved, the job is not immediately submitted for real time processing. The record is saved with the status **Pending** and a monitor process for this record's business object is responsible for transitioning the record to **Complete**.

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As long as the record is still **Pending**, it may be edited to adjust the parameters. The preview logic described above may be repeated when editing a record.

The actual work of the request, such as generating an email, is performed when transitioning to **Complete** (using an enter processing algorithm for the business object).

Setting Up Request Types

This portal is used to view and maintain request types.

You can access this portal from **Admin**, and then **General**, and then **Request Type**. You are brought to a query portal with options for searching for a specific request type. Once a request type has been selected, you are brought to the maintenance portal to view and maintain the selected record.

Refer to the embedded help text for more information on the Request Type attributes.

Refer to Understanding Requests for background information about defining request types.

Maintaining Requests

This portal is used to view and maintain requests.

You can access this portal from **Main Menu**, and then **Tools**, and then **Request**. You are brought to a query portal with options for searching for a specific request. Once a request has been selected, you are brought to the maintenance portal to view and maintain the selected record.

Refer to Understanding Requests for more information.

Attachments

Some implementations may require that attachments be available from the application. These attachments can be stored in the Attachment table and then linked to other objects if applicable.

- Attachment Overview
- Configuring Your System for Attachments
- Maintaining Attachments

Attachment Overview

The following topics provide additional information regarding attachment functionality.

Attachment Types

The system supports several different attachment content types, for example:

- PDF Document
- Excel Spreadsheet
- Jpeg Image
- Text Document

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The attachment data itself may be text or binary. When storing the data in the application however, it is stored as text information only. As a result, the upload of an attachment that is a binary type requires a conversion prior to storing the data. When viewing the attachment, the data is converted again for display.

The system also supports attachments that reference a URL to a document hosted in an external system. When viewing the attachment, the URL is launched to access the related document in the external system.

Each type of attachment is defined using an attachment business object. The business object includes configuration defining the supported file extensions, whether the data is binary or not and the content type that represents the type of data for the attachment.

> **Note**
>
> To view the attachment business objects provided with the base product, navigate using **Admin**, and then **System**, and then **Business Object**, and then **Search** and search for business objects related to the Maintenance Object for Attachments (`F1-ATCHMT`). You may set any of these business objects as not allowing new instances to prevent their use for creating attachments.

Owned Attachments

Attachments can be either ‘owned’ or ‘common’. An owned attachment is one that is related to a specific record. For example, the specific test results for a given device can be uploaded and linked to that device or to its test records. These types of attachments are typically uploaded and maintained via the object that owns it.

Common Attachments

Common attachments are ones that are uploaded independent of any transaction in the system. They can be used for general system or company information. Or they can be linked to more than one transaction. For example, instructions for performing a certain type of task can be uploaded as an attachment and linked to a task type where those instructions are relevant. These types of attachments are uploaded and maintained in the central Attachment portal. Objects that may refer to the attachments may link the attachments via characteristics or some other appropriate mechanism.

Content Location

An attachment's content may reside in either of the following locations:

- **Database.** The content is stored in the database as part of the attachment record. This is also the default location when uploading a file that is not too large.
- **Object Storage.** When an uploaded file is too large to be stored in the database its content is stored in Object Storage. Refer to the "Uploading a Large Attachment File" section for more information.
- **External URL.** An attachment may reference a URL to a document hosted by an external system.

> **Note**
>
> To reference an existing Object Storae file use the file storage syntax.

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When sending an attachment to an external system via an outbound message or including it in an email, the attachment's content can only be embedded in the message when the content resides in the database. For all other content locations, an external facing URL to view the attachment is provided instead.

Uploading a Large Attachment File

By default, an attachment is uploaded and stored in the database along with its entire content. The process of uploading very large content like videos etc. is often limited by memory and other resource constraints. You may configure a threshold above which content is stored in object storage and a link to the file is kept on the attachment record.

To enable this feature refer to the **attachment location** and related options in the **General System Configuration** feature configuration for more information. In a cloud installation, this configuration is required to upload large attachments due to stricter resource limits.

The following are known limitations with storing content in object storage:

- The responsibility for data recovery of attachment content shifts to the customer as part of their object storage files management.
- Custom logic if any that relies on attachment content to exist in the database will not work for attachments stored in object storage.

Emailing Attachments

The system supports a business service that may be used by system processing to send an email. The business service `F1-EmailService` supports receiving the IDs of one or more attachments as input parameters. Refer to Sending Email for more information.

By default, an attachment's content is embedded in the email message when the content resides in the database. For all other content locations, an external facing URL to view the attachment is provided instead. When the content of the attachment is too large to be embedded in the email, a link is provided instead. Refer to the **Maximum Email Attachment Size** in the **General System Configuration** feature configuration for more information.

External Reference

Attachment records may be added from an external system in which case, the external system could have a reference ID to capture. The attachment allows for including an external reference ID when adding an attachment internally.

Malware Scan

The system provides a plug-in spot where on premises implementations can configure a step to scan attachment for malware. If an algorithm is provided, it is called every time attachment content is added. This is not supported in cloud implementations.

Configuring Your System for Attachments

In order to link attachments to objects in the system, there may be some configuration or implementation required to support the link. It is possible that one or more objects in your product already support attachments out of the box. Consult the product documentation for the specific object for confirmation. For objects in the system that do not support attachments out of the box, the following sections provide some guidelines for enabling support for attachments. Contact product support for more information.

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Supporting Common Attachments

The attachments themselves are created / uploaded using the attachment portal. Refer to Maintaining Attachments for more information.

If your implementation has a use case where one or more common attachments may be linked to an object (and the object does not already support this functionality), the object may need to be extended to capture the attachments.

- If the object includes a characteristic collection, this is a recommended way to capture attachments. A characteristic type should be defined for each type of attachment. The characteristic type should be a foreign key type and should reference the Attachment FK reference. The characteristic entity collection should include the object that the common attachment will be linked to.
- Most characteristic collections are sequence based characteristics and would support multiple entries for the same characteristic types, if multiple attachments are applicable.
- If the object to support the attachments is governed by a business object, the implementation must extend the business object to define one or more appropriate elements used to capture the attachments. If only one attachment of a certain type is allowed, a single flattened characteristic may be used. If multiple attachments of a certain type are allowed, the BO schema may define a “flattened list” exposing the sequence and the characteristic type.
- If the object is maintained on a “fixed page” with a generic characteristic collection, no additional configuration is needed to allow users to link attachments to that object.

Supporting Owned Attachments

When creating an attachment for a specific record, the attachment itself captures the information about the related record, namely its maintenance object code and its primary key. For these types of attachments, no configuration is needed on the related business object to capture the attachments, as was the case with common attachments.

However, it is recommended to configure the user interface of the related object so that the owned attachments can be viewed and maintained from that page. To do this, you may use the generic attachment zone provided by the product: `F1-ATTCHOWN`.

Note that your product may already have support for viewing and maintaining owned attachments on one or more if its base delivered portals.

Configuring Size Limit

The system allows for configuration of a size limit for uploading attachments. This is optional but the recommendation is to set this to a reasonable value so as to limit the ability to upload unreasonably big files. To configure this, navigate to Feature Configuration. Search for an existing feature configuration with the Feature Type **General System Configuration**. If one does not exist, create a feature configuration of this type. Select the **Maximum Attachment Size** option and define an appropriate value.

You may also configure the system to upload very large attachments to Object Storage. To enable this functionality, set the **Attachment Location** option in the same feature configuration to define the file location in object storage. Configure the **Attachment Threshold Size** option to set the size limit above which attachment data is stored in object storage as files and not in the database.

If your organization performs many concurrent attachment uploads, you may optionally set the **Maximum Attachment Aggregate Size** option to override the system limit as needed.

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When the content of the attachment is too large to be embedded in an email, an external facing URL to view the attachment is provided instead. Refer to the **Maximum Email Attachment Size** in the **General System Configuration** feature configuration for more information.

Defining a New Attachment Type

As mentioned, the product provides support for several content types. If your implementation needs to support attachments for a content type not currently supported, create a new business object copying the configuration of an existing attachment business object.

Configure the following option types for the BO:

- **Binary** indicates whether the attachment data must be converted from binary format. Binary attachments are stored in the database as text, and are then converted back to the original format when retrieved.
- **Content Type** represents the browser's mime type of the attachment.
- **Supported File Extension** specifies the valid file extensions for the content type.

Once the business object is defined, it is ready for use.

Supporting File Name Exceptions

By default, the system prevents attachment file names from having special characters. If there is some reason that an implementation needs to define an attachment with special characters, there is a system property setting that may be configured to relax this validation. Contact your system administrator for support.

Enabling Malware Scan

> **Note**
>
> This functionality is only available for on premises implementations. It is not supported for cloud implementations.

The product provides a malware scan algorithm in the base product that uses ClamAV. ClamAV itself is not provided as part of the product. To use the base algorithm, your implementation needs to get ClamAV and define system properties for the host and port where ClamAV may be called. The algorithm, called `F1-ATCHM-WS` should be plugged into the installation options - algorithms collection using the system event **Attachment Malware Scan**

If your implementation wants to use a different algorithm for malware scanning, you may deliver your own algorithm and plugit into the installation algorithm collection.

Maintaining Attachments

This section describes the functionality supported for viewing and maintaining attachments.

Navigate using **Admin**, then **General**, the **Attachment**. You are brought to a query portal with options for searching for common attachments.

Once an attachment has been selected, you are brought to the maintenance portal to view and maintain the selected record.

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> **Note**
>
> The base search options for the attachments query only support searching for common attachments. Owned attachments may also be viewed on the attachment maintenance portal, but a user may only drill into the attachment maintenance from the maintenance portal of the "owning" entity.

The Attachment zone provides basic information about an attachment, including the ability to upload the file and to view an uploaded file. Viewing an attachment will typically launch a download of the attachment file, following standard browser behavior.

- Adding Attachments

Adding Attachments

Common attachments may be added from the attachments portal (or via the standard menu path). In addition, your product may support attachments associated with specific records ("entity owned attachments") which may also provide the capability to add attachments.

In both cases, when adding an attachment, you are prompted for either a file to upload or an external URL to a document that resides in another system. When uploading a file then once a file is chose, the system determines the appropriate business object to associate with the attachment based on the file extension. Typically one and only one business object is found at which point you are prompted to provide the Attachment Name. (Your specific product may also require additional information at this time). Fill in the details and save.

Please note the following:

- If no business object is found for the uploaded file's file type, an error is issued. This type of file is not currently supported as an attachment.
- If multiple business objects are found, the user must choose the appropriate one. This should be rare.
- The ability to add URL based attachments is enabled by default but may have been disabled by your organization.
- The attachment's file extension is validated against the base delivered allow list F1-FileExtensionAllowList, defined as a managed content record.
- The system ensures that the attachment's file name does not contain special characters and uses only standard UTF-8 supported characters.

Monitoring and Analytics

This chapter describes various tools provided in the product to support system monitoring including tools related to reporting, monitoring and analytics.

- Understanding Batch Analytics
- Reporting Tool Integration
- Health Assessment Options
- Service Health Check
- Measuring Performance
- Capturing Statistics

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- Capturing Product Use Metrics

Understanding Batch Analytics

This section explains how to use batch analytics for strategic analysis of jobs, threads, and workload performance.

- Batch Job Analytics
- Batch Thread Analytics
- Batch Workflow Analytics

Batch Job Analytics

The Batch Job Analytics portal illustrates a set of metrics aligned with execution of batch processes at the job level. This portal is useful for summarization of the state and work performed by a batch control over a selected date range.

> **Note**
>
> To use these analytics, you must populate the batch snapshot must be populated, on a regular basis, using the batch job **F1BRANSN - Batch Run Analytics Snapshot Update.**.

> **Note**
>
> Not all zones in this portal support broadcast as it is not appropriate in all situations. Unless indicated assume broadcast is not available from the zone.

> **Note**
>
> At the top of each tab in this portal, the selected batch control and date range is shown.

Batch Job Analytics Search

To use this portal you must first select the batch control and the period you want to analyze using the Batch Job Analytics search from the search dropdown. To help find the necessary batch control, you can use a variety of filters to refine your search.

> **Note**
>
> **Date Range is required** At a minimum a date range must be specified. This must be either the predefined period or a custom date range. For custom date ranges, it is recommended to limit the range to analyze less than a thousand (1000) values for performance and readability reasons.

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Once the appropriate filters are populated a list of batch controls is returned with the number of executions in the snapshot for the specified date range and other filters specified. To start the analysis, select the desired batch control from the list.

Batch Job Analytics - Main

The Main section of the analytics summarizes the state, submission source, performance, and volumes processed by the desired batch control over a date range. This includes analysis in the following areas:

- The Batch Job Status Summary zone summarizes the state of all executions of the desired batch control over the desired date range within the snapshot. In an ideal situation this graph should show a high percentage of complete (successful) executions.
- The Batch Job Submission Summary zone summarizes the method used to submit the desired batch control over the desired date range within the snapshot. In an ideal situation, batch jobs are submitted the using a small amount of methods to maximize efficiency.
- The Batch Job Elapsed Time Summary zone shows the minimum (best) elapsed time, average elapsed time and maximum (worst) elapsed time for the desired batch control over the desired date range within the snapshot. All elapsed times are shown in seconds, with the hover text translates the time into DD:HHMI:SS format. In an ideal situation, all the values should be relatively the same. Large deviations in values may be due to volume or inefficiencies.
- The Batch Job Volume Summary zone shows the minimum (lowest) volume, average volume and maximum (highest) volume for the desired batch control over the desired date range within the snapshot. Volume is expressed as the total number of objects processed by the job. In an ideal situation, all the values should be relatively the same. Large deviations in values may be due to business fluctuations or inefficiencies.

Batch Job Analytics - History

The History section of the analytics shows detail information for job level elapsed time and volumes for the desired batch control over the desired date range within the snapshot.

Each analysis includes additional reference information such as the average value and the confidence interval to use. Values above the confidence interval should be considered as outliers and require further analysis.

This includes analysis in the following areas:

- The Batch Job Elapsed Time History zone shows the job level elapsed time, in seconds (the hover text translates the time into DD:HHMI:SS format) for each batch run for the desired batch control over the desired date range within the snapshot. This can highlight fluctuations in elapsed time of data processed by the batch job over time.
- The Batch Job Volume History zone shows the total number of objects processed by each batch run for the desired batch control over the desired date range within the snapshot. This can highlight fluctuations in volumes of data processed by the batch job over time.

Batch Job Analytics - Submission

The Submission section of the analytics shows analysis of submission information periods applicable to the desired batch control over the desired date range within the snapshot.

This includes analysis in the following areas:

- The Batch Job Submission History zone shows the number of submissions per day over the for the desired batch control over the desired date range within the snapshot. This can

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highlight fluctuations in how often the desired batch control is submitted. Ideally the number of submissions should be consistent.

- The Batch Job Submission By Day Of Week zone is an analysis of the total submissions by each day of the week to help detect any fluctuations in submission patterns for the desired batch control over the desired date range within the snapshot. Ideally the number of submissions should be consistent.
- The Batch Job Submission By Hour Of Day zone is an analysis of the total submissions by each hour for the desired batch control over the desired date range within the snapshot. This zone is provided to help detect any fluctuations in submission patterns. Ideally the number of submissions should be consistent.
- The Top Users Submitted Job zone summarizes the top 20 users that have submitted the desired batch control over the desired date range as expressed in the snapshot. The total number of submissions by those users is shown for the desired batch control over the desired date range within the snapshot. This zone is primarily provided to help detect unusual patterns by individual users as necessary.

Batch Job Analytics - Detail

The Detail section of the analytics lists all batch runs for the desired batch control over the desired date range as expressed in the snapshot. This represents the data that was used as part of the analysis used in the previous sections. It is possible to navigate to the Batch Run Portal for individual runs for further information. This list can be further filtered for status and submission method used.

Batch Thread Analytics

The Batch Thread Analytics portal illustrates a set of metrics aligned with execution of batch processes at the thread. This portal is useful for summarization of the state and work performed by the threads for a batch control over a selected date range. This portal is useful for jobs that are run multi-threaded.

> **Note**
>
> To use these analytics, you must populate the batch snapshot must be populated, on a regular basis, using the batch job **F1BTANSN - Batch Thread Analytics Snapshot Update.**.

> **Note**
>
> Not all zones in this portal support broadcast as it is not appropriate in all situations. Unless indicated assume broadcast is not available from the zone.

> **Note**
>
> At the top of each tab in this portal, the selected batch control and date range is shown.

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Batch Thread Analytics Search

To use this portal you must first select the batch control and the period you want to analyze using the Batch Thread Analytics search from the search dropdown. To help find the necessary batch control, you can use a variety of filters to refine your search.

> **Note**
>
> **Date Range is required** At a minimum a date range must be specified. This must be either the predefined period or a custom date range. For custom date ranges, it is recommended to limit the range to analyze less than a thousand (1000) values for performance and readability reasons.

Once the appropriate filters are populated a list of batch controls is returned with the number of executions and the maximum thread limit used in the snapshot for the specified date range and other filters specified. To start the analysis, select the desired batch control from the list.

Batch Thread Analytics - Main

The Main section of the analytics summarizes the state, submission source, performance, and volumes processed by the desired batch control over a date range. This includes analysis in the following areas:

- The Batch Thread Status zone summarizes the state of all executions of the desired batch control over the desired date range within the snapshot. In an ideal situation this graph should show a high percentage of complete (successful) executions.
- The Batch Thread Reliability Summary zone calculates the total reliability rating for the desired batch control over the desired date range within the snapshot.
- The Batch Thread Limit History zone shows the thread limit specified for each batch run for the desired batch control over the desired date range within the snapshot. Ideally the thread limit used should be consistent. Large deviations in values may be due to volume or inefficiencies.

Batch Thread Analytics - Reliability

The Reliability section of the analytics focuses on the reliability of individual job runs for the desired batch control over the desired date range within the snapshot.

The analysis of threads introduces a reliability rating related to the success rate of threads for an execution. The percentage of successful threads over total thread count for each execution is used for the rating using the following criteria:

- If all threads (100%) are successful for a batch run then the rating is **High**.
- If the thread failure rate is less or equal to 1% of the total number of threads then the rating is **Good**.
- If the thread failure rate is less or equal to 5% of the total number of threads then the rating is **Fair**.
- If the thread failure rate is above 5% of the total number of threads then the rating is **Poor**.

The reliability analysis includes analysis in the following areas:

- The Batch Thread Reliability History zone shows the reliability rating for each run for the desired batch control over the desired date range within the snapshot. The color and size of the entries in the graph illustrate the reliability and percentage of successful threads.

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- The Batch Thread Reliability Details zone lists the individual batch runs with their associated reliability rating for the desired batch control over the desired date range within the snapshot. You can navigate to the Batch Run Portal for additional information.

Batch Thread Analytics - Differential

The Differential section of the analytics shows analysis of submission information periods applicable to the desired batch control over the desired date range within the snapshot.

This includes analysis in the following areas:

- The Batch Thread Time Differentials zone shows the difference between start and end time for the desired batch control over the desired date range within the snapshot as expressed as a wost case differential. Each differential is shown in seconds. If threads start at the same time and end at the same time then the differential is zero (0). Positive differentials mean differences in start and end times of threads.
- The Batch Thread Volume Differentials zone shows the difference between the smallest volume and largest volume for the threads within each run against the average volume. Each differential is shown as number of records that are different compared to the average volume. A reference line is shown to show the relative difference in low and end volumes. In an ideal situation each thread should work on the same amount of records. Variations means variance in processing volume and may result in different thread elapsed times.

Batch Thread Analytics - Retries

> **Note**
>
> If this zone is blank, then there were no automatic retries for the desired batch control over the desired date range within the snapshot.

The Retries section of the analytics lists the total retries per batch run. If the number of retries is above zero, in a consistent way, then there may be some underlying issues that need investigation.

> **Note**
>
> Retries are only performed for specific conditions. Refer to the cloud service documentation for additional information.

Batch Thread Analytics - Zero Processing

> **Note**
>
> If this zone is blank, then there were no zero processing threads found for the desired batch control over the desired date range within the snapshot.

While most threads have records to process, it is possible that a thread is allocated no work to do. This is inefficiency as resources are allocated to start an end the thread at a minimum. This zone highlights the number of threads per batch run with zero processing for the desired batch control over the desired date range within the snapshot. If the number is consistently high then consider altering the thread limits or thread numbers to re-balance the workload.

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Batch Thread Analytics - Interquartile Range Analysis

Interquartile analysis is a statistical method used to understand the spread and distribution of a set of data by focusing on the middle 50% of values. By dividing the data into four equal parts, it helps identify the range where most data points fall, making it easier to spot any unusual or extreme values (outliers). This approach is helpful for quickly assessing data consistency and detecting trends, enabling you to make more informed decisions based on typical, rather than exceptional, results.

The Batch Thread Inter Quartile Analysis zone shows the inter-quartile analysis for threads across batch runs for the desired batch control over the desired date range within the snapshot.

To understand the analysis there are different metrics calculated to provide reference:

- The **median quartile** represents the median between the worst and best thread elapsed time. This metric is calculated to provide a reference to assess other metrics against. In an ideal situation all the threads would have this elapsed time.
- The **upper quartile whisker** and **lower upper quartile whisker** are calculated at the 75% and 25% confidence interval, respectively, from the median. These whiskers represent the acceptable extremes for elapsed times of threads. There proximity to the median illustrates whether the threads are finishing
- The **high within quartile** and **low within quartile** calculates the thread elapsed time within the whiskers. The proximity of these metrics to the whiskers indicates if threads are ending early and/or late consistently.
- The **worst thread elapsed time** and **best thread elapsed time** are used as reference for all the above metrics. If these values are above their respective whiskers then they are consider outliers
- The difference between the whispers is known as the **Inter Quartile Range (IQR)**. The higher the IQR value the more the variation in the thread elapsed times. If these is little variation, then these values are close to the median.

It is divided into three types of analysis, as different graphs on the zone:

- The first analysis is focusing on the upper quartile against the worst performing threads. The relationships between these metrics will illustrate the extent of any variation in the threading and the potential presence of threads that overrun.
- The second analysis is focusing on the lower quartile against the best performing threads. The relationships between these metrics will illustrate the extent of any variation in the threading and the potential presence of threads that finish too early.
- The last analysis is focusing on the IQR value. If you see a small IQR, it means thread execution times are consistent. A large IQR suggests there is significant variation.

Batch Workflow Analytics

The Batch Workflow Analytics portal illustrates a set of metrics aligned with execution of batch processes at the workload level. This portal is useful for ;looking at workload at the threadpool level to determine load profiles over a particular day for a particular threadpool.

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> **Note**
>
> To use these analytics, you must populate the batch snapshot must be populated, on a regular basis, using the batch job **F1BTANSN - Batch Thread Analytics Snapshot Update.**.

> **Note**
>
> Workload Analytics use a "workload minute" to measure capacity. Each thread running in any minute uses one workload minute. If multiple threads run in the same minute, each one adds to the total. This makes it easy to see how much capacity is used during a day, since the maximum available is the number of allowed threads multiplied by 1,440 minutes (the total minutes in a day) for each thread pool.

Batch Workload Analytics Search

To use this portal you must first select the batch control and the period you want to analyze using the Batch Workload Analytics search from the search dropdown. To help find the necessary threadpool and date, you can use a variety of filters to refine your search.

> **Note**
>
> **Date Range is required** At a minimum a date range must be specified. This must be either the predefined period or a custom date range. For custom date ranges, it is recommended to limit the range to analyze less than a thousand (1000) values for performance and readability reasons.

Once the appropriate filters are populated a list of threadpools and dates is returned with the total workload minutes for the combination of threadpool and date in the snapshot for the specified date range and other filters specified. To start the analysis, select the desired threadpool and date combination from the list.

Batch Workload Analytics - Main

The Main section of the analytics summarizes workload minutes for the desired threadpool and desired date for every two minute interval. This zone shows how busy the desired threadpool was at any point in the desire date. You filter the information with additional filters as necessary.

Clicking on any point in time will broadcast the time interval and the Batch Workload Detail will show the batch jobs and threads that were started, running and/or complete in that interval. You can navigate to the Batch Run Portal for additional information.

Batch Workload Analytics - Summary

The Summary section of the workflow analytics provides summary level analytics related to the total workload minutes in the desired threadpool and desired date. This includes analysis in the following areas:

- The Batch Workload Summary by Category zone summarizes total workload minutes by batch category. This can be used to appreciate the distribution of workload for the desired threadpool and desired date.

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- The Batch Workload Summary by Submission zone summarizes total workload minutes by submission type. This can be used to appreciate the distribution of how the workload is submitted for the desired threadpool and desired date.

Batch Workload Analytics - Hour Analysis

If the minute by minute analysis is too detailed, the Batch Workload Hour Analysis zone shows workload by hour of the day for the desired threadpool and desired date.

Reporting Tool Integration

This section describes how to configure your third party reporting tool and how to define your reports in the system to enable users to submit reports online.

- The Big Picture Of Reports
- Configuring The System To Enable Reports
- Sample Reports Supplied with the Product
- How To Define A New Report

The Big Picture Of Reports

The topics in this section describe the approach for designing and defining your system reports. Note that the product includes an out-of-the-box integration with BI Publisher. However it is possible to use the reporting objects to integrate with a different third party tool.

- Integration with BI Publisher
- How To Request Reports
- Viewing Reports

Integration with BI Publisher

Your DBMS, your product, and BI Publisher can work together to produce reports. You may choose to use a different reporting tool, but this may not be a trivial effort. This section provides high-level information about some of the business requirements that are being solved with the reporting solution.

Multi-Language and Localization Support

The integration supports a multi-language implementation and supports different localization settings.:

- All labels, headings and messages are defined using field and message meta-data in the application, which support multiple languages.
- The appropriate font, size, and layout are based on the requested report and the user's language.
- Dates and numbers are formatted as per the user's display profile.
- Currency based numbers are formatted as per the currency definition from the product
- Requesting Reports from The System
- Overview of the Data - BI Publisher

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Requesting Reports from The System

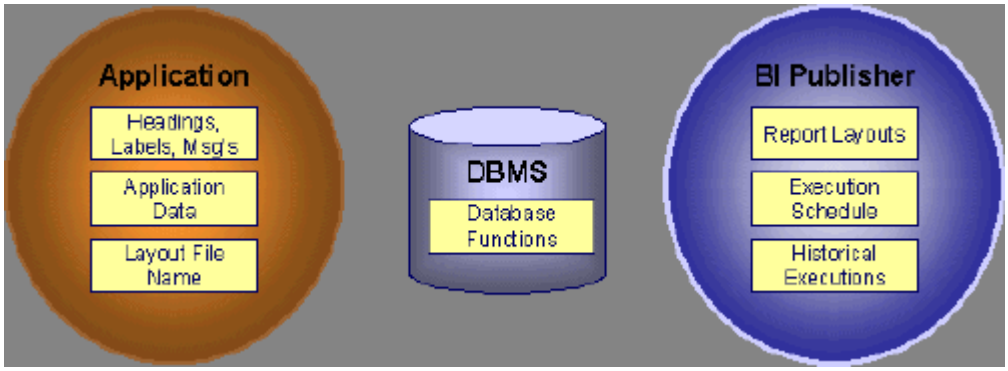
Although reports are rendered in your reporting tool, users must be able to request ad-hoc reports from within the system (assuming users have the appropriate security access).

- The prompts for the input parameters must be shown in the user's language
- Users should be able to use the standard search facilities to find parameter values
- Plug-ins can be optionally used to cross-validate input parameters
- Application security must authorize ad-hoc report requests

Overview of the Data - BI Publisher

The following diagram provides an overview of where data is stored for your reports for integration with BI Publisher.

Figure Application and BI Publisher



The application contains:

- The application data that appears on your reports.
- The language-specific headings, labels and messages on your reports.
- The layout file name to be used for the report.

BI Publisher contains:

- How your reports look.
- Information about scheduled reports and reports that have already run.

The DBMS contains the SQL used to retrieve the data on your reports (residing in database functions).

> **Note**
>
> BI Publisher can be configured to retrieve data via a service call. Because every business object can be read via a service call, elements that reside in an XML based column can be displayed on reports produced using BI Publisher. See your product's *Installation Guide* or *Optional Products Installation Guide* for information on this configuration.

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How To Request Reports

A user may request an ad hoc report from within your product:

- A report submission page enables a user to choose the desired report and enter the parameter values for the report
- The user must be granted security access to the report
- The request is passed to the reporting tool real time. Refer to Configure The System to Invoke BI Publisher for more information.
- The reporting tool generates the report and displays it in a new browser window

The reporting tools' scheduler creates reports (as per your schedule). This function is entirely within the reporting tool. No scheduling functions reside within your product.

A user can request an ad-hoc report from within the reporting tool. Note, the user's ID must be supplied as a parameter to the report in order for the user's profile to be used to format dates and numbers

Viewing Reports

As described above, ad-hoc reports requested from within your product are displayed immediately after they are generated in a new browser window

If your reporting tools supports it, the Report History page may be configured to open your tool's report execution history page and request a view of this report.

> **Note**
>
> The Report History page currently does not display historical reports for BI Publisher.

Configuring The System To Enable Reports

- Configuring BI Publisher Reports
- Defining Reporting Options
- Defining Report Definitions

Configuring BI Publisher Reports

This section contains topics specific about configuring the product to interoperate with BI Publisher.

- Configure the System to Invoke BI Publisher Real-time
- Batch Scheduling in BI Publisher

Configure the System to Invoke BI Publisher Real-time

The base product provides an installation algorithm plug-in spot called Reporting Tool. This plug-in spot should contain an algorithm that invokes the third party reporting tool real-time.

For BI Publisher, the system provides an algorithm type called `F1-BIPR-INV`, which invokes BI Publisher.

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These algorithms rely on information defined in the Reporting Options table: the reporting server, reporting folder and the user name and password for accessing the reporting tool. The values in the reporting options should have been set up when the system was installed. Contact your system administrator if there are any problems with the values defined on the reporting options.

To use the algorithm types to invoke BI Publisher, perform the following steps:

- Create an algorithm for the appropriate algorithm type.
- On the installation options, add an entry to the algorithm collection with an algorithm entity of **Reporting Tool** and indicate the algorithm created in the previous step.

Batch Scheduling in BI Publisher

For many of your reports, you probably want the report to be produced on a regular basis according to a scheduler. The reporting solution relies on the BI Publisher software to provide the batch scheduler functionality. Refer to BI Publisher documentation for details about configuring the batch scheduler.

Defining Reporting Options

The reporting options are provided as a mechanism for defining information needed by your reporting solution. The base product uses the reporting options to define information needed to access the reporting tool from within the system using the algorithm defined on the installation option.

Navigate to this page using **Admin**, and then **Reporting**, and then **Reporting Options**.

Description of page

Reporting Folder defines the shared folder where reports are stored.

Reporting Server From Browser defines the URL of the web application where the reporting tool is installed. For example, using BI Publisher, the format is: `http://<BI Publisher Server>:<port>`.

> **Note**
>
> **Customize Options**. The reporting options are customizable using the Lookup table. This field name is `RPT_OPT_FLG`. The reporting options provided with the system are needed to invoke the reporting tool. If your implementation requires other information to be defined as reporting options, use the lookup table to define additional values for the reporting option flag.

Where Used

This information is used by the reporting tool algorithm on the installation option to invoke the reporting tool software.

Implementations may use reporting options to record other information needed for their reporting tool.

Defining Report Definitions

For each report supplied by your installation, use the report definition page to define various attributes of the report.

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- Report Definition - Main
- Report Definition - Labels
- Report Definition - Parameters

Report Definition - Main

Navigate to this page using **Admin**, and then **Reporting**, and then **Report Definition**.

> ⚠ **Caution**
>
> Important! If you introduce new report definitions, you must prefix the report code with **CM**. If you do not do this, there is a slight possibility that a future release of the application could introduce a new system report with the name you allocated.

Description of page

Enter an easily recognizable **Report Code** and **Description** for each report. Use the **External Reference ID** to define the identifier for this report in your external reporting tool.

Define an application service to enable users to request submission of this report online or to view report history for this report. Once you define an application service for each report, use Secured Objects and Application Services to define which users may access this report.

> ⓘ **Note**
>
> **Access Mode**. The access mode for application services related to reports must be set to **Submit/View Report**.

If you have more than one parameter defined for your report and you wish to perform cross-validation for more than one parameter, provide an appropriate **Validation Algorithm**.

Enter a **Long Description** to more fully describe the functionality of this report. This information is displayed to the user when attempting to submit the report online or when viewing history for this report.

For BI Publisher, if you want to use one of the sample reports provided by the system, but with a different layout, indicate the layout to use for the report in the **Customer Specific Font/ Layout** field and BI Publisher uses this information instead. The name for base report layout is <report code>_Base. For example, a base layout for CM_TODO is named CM_TODO_Base.

Report Definition - Labels

Navigate to this page using **Admin**, and then **Reporting**, and then **Report Definition** and go to the **Labels** tab.

> ⓘ **Note**
>
> **Company name and logo.** Note the company name used as a title in the sample reports is defined as a message on the installation options. For information about installing the company logo, refer to your product's *Installation Guide* or the *Optional Products Installation Guide*.

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Description of Page

In order to provide multi-language capability for each report, the labels used for the report must support multiple language definitions. For each label used by your report, indicate a unique **Sequence** and the Field used to define the **Label**. The label defined here should be the same label that is defined in your report layout defined in the external reporting tool.

When rendering an image of the report, the external reporting tool retrieves the appropriate label based on the language used for the report.

Report Definition - Parameters

Navigate to this page using **Admin**, and then **Reporting**, and then **Report Definition** and go to the **Parameters** tab **.**

Description of Page

The **Parameters** scroll contains one entry for every parameter defined for the report. The following fields display:

Parameter Code is the identifier of the parameter. This must correspond to the parameter definition in the reporting tool.

Required indicates that a value for the parameter must be defined when submitting the report.

Sort Sequence must match the parameter order defined in the reporting tool's report. It is also used when displaying the list of parameters on the report submission page.

Characteristic Type indicates the characteristic type used to define this parameter.

Default Value is option and if populated is displayed to the user when the report is chosen on the report submission page.

Description is a brief description of the parameter. This description is used when displaying the parameter on the report submission page.

Long Description is a detailed description of the parameter. This description is used on the report submission page when the user requests more information for a given parameter.

Sample Reports Supplied with the Product

Depending on your specific product, there may be sample reports provided that your organization may use as they are or as a starting point for creating a new report. The following sections provide an overview of the sample reports along with instructions on how to use one of the sample reports in your implementation environment.

- How to Use a Sample Report Provided with the System

How to Use a Sample Report Provided with the System

If you would like to use any of the sample reports, you need to perform some steps to be able to execute them in an implementation environment. This section walks you through the steps needed.

- Steps Performed at Installation Time

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Steps Performed at Installation Time

Refer to the *Installation Guide* or *Optional Products Installation Guide* for instructions for setting up and configuring your product and reporting tool to use the sample reports provided with the system. The following steps are described there.

- Setting up the stored procedures used by the sample reports.
- Defining the company title and logo used by the sample reports. Note the company name used as a title in the sample reports is defined as a message on the installation options.
- Defining a user for integration with your product.
- Publishing the sample reports in BI Publisher.

Contact your system administrator to verify that the above steps have occurred.

How To Define A New Report

- Use a Sample Report as a Starting Point
- Publishing Reports in BI Publisher
- Designing Your Report Definition

Use a Sample Report as a Starting Point

- Make a copy of the report and save it in an appropriate directory. Prefix the new report name with **CM**.
- Review the stored procedure(s) used for this report. Refer to the installation guide for information about where the stored procedures should be defined. If you want to change the data that is being accessed, copy the stored procedure, prefixing the new stored procedure with **CM**. Make the appropriate changes in the new version of the stored procedure. Contact your database administrator to find out the procedure for creating a new stored procedure.

> **Note**
>
> **Performance considerations**. When designing a stored procedure, you must consider the performance of the report when executed. Consult your database administrator when designing your database access to ensure that all issues are considered.

> **Note**
>
> **Defining Messages**. The stored procedures provided with the system use messages defined in message category 30. If your new stored procedures require new messages, use message category 90000 or greater, which are reserved for implementations.

- Review the parameters used by the report. Make appropriate changes to the parameters required by the report. This affects how you define your report. Refer to Designing Parameters for more information.

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- Determine whether or not you require cross validation for your report parameters. If any cross validation is necessary, you should design an appropriate validation algorithm to be executed when requesting a report in your product. Refer to Designing Validation Algorithms for more information.

> **Note**
>
> **Cross Validation for On-line Submission Only**. The cross validation algorithm is only executed for ad-hoc report submissions via your product. If you submit this report through your reporting tool, this algorithm is not executed.

- Review the labels used by the report. Labels and other verbiage are implemented in the sample reports using a reference to the field table in the system. This enables the report to be rendered in the appropriate language for the user. For any new report label you require, you must define a new field entry. Refer to Designing Labels for more information.
- Review the layout of the report and make any desired changes based on your business needs.

When you have finished designing and coding your new report in your reporting tool, you must do the following in order for it to be usable:

- Publish the report in BI Publisher. Refer to the documentation for this products for details about publishing a report. Refer to Publishing Reports in BI Publisher for configuration information specific to publishing a report for integration with your product.
- Define the report. Refer to Designing Your Report Definition for more information.

Publishing Reports in BI Publisher

Please refer to the documentation for BI Publisher for more information about publishing a report in this system. The remaining topics in this section provide information about settings needed to ensure that the report is accessible using BI Publisher.

- BI Publisher Database Access
- Verify BI Publisher User Access Rights

BI Publisher Database Access

When publishing a report in BI Publisher, you are asked for database logon information. The logon user name and password must be the user name and password that has access to the database functions related to this report in your database.

Verify BI Publisher User Access Rights

To verify the user's access rights to folders in BI Publisher:

- Open the BI Publisher Enterprise Security Center.
- Check that the role for the user has access to the appropriate report folders.

For more information, refer to the "Understanding Users and Roles" section in the Oracle Business Intelligence Publisher User's Guide.

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Designing Your Report Definition

When adding a new report, you must define it in the system to allow users to request ad-hoc reports from on-line and to take advantage of the multi-language provisions in the system. The following topics illustrate the steps to take to correctly configure your report definition.

- Designing Main Report Definition Values
- Designing Characteristic Types
- Designing Parameters
- Designing Validation Algorithms
- Designing Application Services
- Designing Labels

Designing Main Report Definition Values

Refer to field description section of the report definition main page for information about defining general information about the report.

For the validation algorithm, preliminary steps are required. Refer to Designing Validation Algorithms for more information.

For the application service, preliminary steps are required. Refer to Designing Application Services for more information.

Designing Characteristic Types

The parameter tab on the report definition page uses Characteristic Type to define the report parameters. For each report parameter that you plan to use, you must define a characteristic type.

You do not need a unique characteristic type for each report parameter. For example, if Start Date and End Date are parameters your report, only one **Report Date** characteristic type needs to be defined. This characteristic type would be used on both date parameters.

Each characteristic type to be used as a report parameter must indicate a characteristic entity of **Report**.

To illustrate the characteristic type definitions, let's look at the sample report Tax Payables Analysis. It needs the following parameters: From Date, To Date, GL Account Type Characteristic Type and Account Type value.

> **Note**
>
> **Account Type Parameters**. The tax payables report must find general ledger entries that have posted to a certain distribution code. In order to find the appropriate distribution code, the report expects each distribution code to be defined with a characteristic indicating its GL account type (for example, **Revenue**, **Asset**, etc.) The report needs to know the characteristic type used to define this entry.

To support the required parameters, the following characteristic types are needed.

Char Type	Description	Type	Valid Values	Char Entities

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CI_DATE	Date Parameter	Ad-hoc	(Uses validation algorithm to validate proper date entry)	Report
CI_CHTYP	Characteristic Type	FK Reference	CHAR_TYP	Report
CI_GLTY	GL Account Type	Pre-defined	A- Asset, E-Expense, LM-Liability/ miscellaneous, LT-Liability/taxes, R-Revenue	Distribution Code, Report

Highlights for some of the above settings:

- We have defined a characteristic type for defining a characteristic type. This is to allow the user to indicate which Char Type on the Distribution Code is used for the GL account type. This is an FK reference type of characteristic.
- The GL account type characteristic type is referenced on both the Distribution Code entity and the report entity.

Designing Parameters

Your report definition parameters collection must define a unique parameter entry for each parameter sent to the reporting tool. The sequence of your parameters must match the sequence defined in your reporting tool.

Continuing with the Tax Payables Analysis report as an example, let's look at the parameter definitions.

Parameter Code	Description	Char Type	Default Value
P_FROM_DT	From Date	CI_DATE	N/A
P_TO_DT	To Date	CI_DATE	N/A
P_CHAR_TYPE	Account Type Characteristic	CI_CHTYP	CI_GLTY
P_TAX_ACCTY_CHAR	Account Type Char Value for Tax Related GL Account	CI_GLTY	LT-Liability/taxes

Highlights for some of the above settings:

- The from date and to date parameters use the same characteristic type.
- The characteristic type parameter is defined with a default value pointing to the GL account type characteristic type.
- The GL account type parameter defines the liability/taxes account type as its default value.

> **Note**
>
> **User Id**. The sample reports provided by the system pass the user id as the first parameter passed to the reporting tool. It does not need to be defined in the parameter collection for the report.

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Designing Validation Algorithms

When designing your report definition, determine if cross validation should occur for your collection of parameters. In the Tax Payables Analysis report, there are two date parameters. Each date parameter uses the characteristic type validation algorithm to ensure that a valid date is entered. However, perhaps additional validation is needed to ensure that the start date is prior to the end date. To do this, a validation algorithm must be designed and defined on the report definition.

The system provides a sample algorithm `RPTV-DT` that validates that two separate date parameters do not overlap. This algorithm should be used by the Tax Payables Analysis report.

If you identify additional validation algorithm, create a new algorithm type. Create an algorithm for that algorithm type with the appropriate parameter values. Plug in the new validation algorithm to the appropriate report definition.

Designing Application Services

Application services are required in order to allow a user to submit a report on-line or to view history for a report. Define an application service for each report and define the user groups that should have submit/view access to this report.

Update report definition to reference this application service.

Designing Labels

The system supports the rendering of a report in the language of the user. In order to support a report in multiple languages, the verbiage used in the report must be defined in a table that supports multiple languages. Some examples of verbiage in a report include the title, the labels and column headings and text such as "End of Report".

The system uses the field table to define its labels.

> **Note**
>
> **Report Definition.** This section assumes that your new report in the reporting tool has followed the standard followed in the sample reports and uses references to field names for all verbiage rather than hard-coding text in a single language.

For each label or other type of verbiage used by your report, define a field to store the text used for the verbiage.

- Navigate to the field page using **Admin**, and then **System**, and then **Field**.
- Enter a unique **Field Name**. This must correspond to the field name used in your report definition in the reporting tool and it must be prefixed with **CM**.
- Define the **Owner** as **Customer Modification**.
- Define the **Data Type** as **Character**.
- **Precision** is a required field, but is not applicable for your report fields. Enter any value here.
- Use the **Description** to define the text that should appear on the report.
- Check the **Work Field** switch. This indicates to the system that the field does not represent a field in the database.

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Update the report definition to define the fields applicable for this report in the **Labels** tab.

If your installation supports multiple languages, you must define the description applicable for each supported language.

Health Assessment Options

The product provides functionality to periodically collect health assessment scores of various aspects of the application. Such mechanism has the following benefits:â€‹

- Minimize risks and costs by reporting and addressing issues promptly.
- Proactively identify common implementation issues in customer environments to address potential problems early.â€‹
- Leverage best practices that are based on proven strategies from other Oracle products to ensure consistency and efficiency.â€‹

Following points highlight some of the features of this functionality:

- The health assessment type object defines configuration related to a given assessment rule, including various criteria that determine whether it is applicable to the current environment or not.
- The health assessment object is used to capture a calculated assessment value at a given point in time along with a corresponding pass, fail or warning score.
- The Health Assessment Dashboard portal provides a high level compliance summary.
- The Health Assessment portal is provided to display information about a calculated assessment.
- A monitor batch control is used to create the health assessment records. Every time it's run, it calculates and captures another measurement for each health assessment type that is eligible for the current environment.
- In a cloud environment, the monitor batch control used to create the health assessment records is considered an internal batch job and will be run by the Oracle Utilities Cloud Service.

> **Note**
>
> Although the health assessment functionality is required for cloud implementations, implementations that are on premises may also choose to run the health assessment type's monitor batch control to capture information for viewing in the Health Assessment Dashboard portal if desired.

- Understanding Health Assessments
- Defining Health Assessment Types
- Health Assessment
- Health Assessment Dashboard

Understanding Health Assessments

A health assessment record captures the environment's score for a given condition at a given point in time. Health assessment records are calculated and captured periodically to assess an environment health over time.

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Health assessment type describes a health condition that should be measured and evaluated over time along with remediation instructions for completeness. The condition may be classified as being critical or not and it is assigned a category for reporting purposes.

The definition specifies the calculation rule for measuring the condition along with settings that determine whether it is eligible for the current environment or not.

> **Note**
>
> Base delivered assessment types cannot be inactivated. They represent conditions that should be checked for product health. Your organization can mark an assessment type as hidden from report for it not to appear on the Health Assessment Dashboard portal by default. The portal allows you to toggle your view to include or exclude those as needed.

This section describes topics related to designing and reviewing health assessments.

Eligibility Rules

A health assessment condition may only be applicable in certain environments and not others. For example, a condition that should only be checked in a production environment or is only applicable in a cloud installation, etc. By default, a health assessment type is considered eligible in any environment unless explicitly defined otherwise.

For a cloud implementation, the system looks at the applicable cloud offerings setting on the health assessment type. If that is populated with specific cloud offerings, then the assessment type is only applicable if your product is in the list. (If no applicable cloud offerings are populated, then it's considered applicable for all cloud offerings.)

The health assessment calculation algorithm, referenced on the health assessment type definition, may further determine that the assessment type is not eligible for the current environment.

Capturing Health Assessments

The health assessment type monitor batch process, which is used to calculate and store assessments, is scheduled as an internal batch process in the cloud.

Implementations that are on premises may also choose to run the health assessment type's monitor batch control to capture information for viewing in the Health Assessment Dashboard portal if desired.

The process of calculating a health assessment of a given type is as follows:

- Basic eligibility rules are evaluated, such as whether this is a cloud or production environment, etc. If the assessment type is not eligible it is skipped.
- The calculation algorithm is called. If the algorithm indicates the assessment type is not eligible it is skipped.
- If an exception occurred while calling the algorithm, i.e. a measured value could not be calculated, the assessment score is set to **Exception** and the assessment record records the exception details.
- If the algorithm did not score the measured value, and a scoring range is defined on the assessment type, the value is scored accordingly. Scoring the measured value is required and if it cannot be scored an exception is issued.

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- If the algorithm did not provide the percentage to failure value, it is calculated based on the assessment score and the scoring range defined on the assessment type.
- The assessment record is stored along with any optional characteristics provided by the algorithm.

Health Assessment Score

The measured assessment value is scored as either **Pass**, **Warning** or **Fail** to describe the severity of the condition. In addition, a **Percentage to Failure** value is also provided to indicate how close the measured value is from a failure score as a proactive alert mechanism. A pass score is set to 0% and a failed score to 100%.

The algorithm associated with the assessment type is responsible for computing a measured value. It may also provide a score for the measurement and calculate its percentage to failure value.

If the algorithm did not score the value, the system uses the scoring range defined on the assessment type to score the calculated value. A value less than or equal to the pass limit is set with a 'pass' value and if greater or equal to the 'fail' limit then is set to 'fail'. Any value is between is scored with 'warning' value. If a scoring range is not defined the assessment is scored with a 'warning' value.

For example, if an assessment type is defined with a maximum pass value of 7 and a minimum failure value of 11 then a measured value of 5 would be scored as 'pass', a value of 9 as 'waring' and a value of 11 as 'fail'. In the same way, if a percentage to failure is not set by the algorithm, the system calculates it based on the same range. A value scored as warning is set with a higher percentage to failure the close it is to the fail limit. If a scoring range is not defined the default is 0 as percentage to fail.

Assessment Calculation Algorithm

The health assessment type definition references a processing algorithm for calculating the condition's measurement value and scoring it. If the algorithm does not score the value, settings on the assessment type may be used to do so.

Basic eligibility rules are defined on the assessment type definition. For more specific rules, the algorithm may also determine that the assessment is not eligible for the current environment and therefore should be skipped.

The algorithm may provide basic supporting details as characteristics to display along with the assessment.

The product provides generic assessment algorithms that can be used to simplify the configuration of basic assessment types. For example, an algorithm that gets a measurement value labeled as 'count' from an SQL provided as an parameter. The measured value is scored by comparing it against the scoring range defined on the assessment type. Refer to product health assessment types for examples.

Launching A More Information Portal

An assessment type may be associated with an optional portal for reviewing specific details about an assessment. When specified, the health assessment portal provides navigation to the specific portal along with the health assessment identifier as context. This is an optional configuration and most likely needed to clarify complex assessment conditions.

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Review Assessments

The Health Assessment Dashboard portal provides a high level summary of health assessment conditions. It is recommended to review this portal periodically and address highlighted issues as needed.

Health assessment types provided by the base product cannot be disabled. Customers can mark certain product assessment types to be hidden from this dashboard display. These are still assessed and collected but a user may choose to view them or not on this dashboard. The user may drill into a Health Assessment portal for more information about a given rule over time. â€‹When applicable, the user may also further navigate to the specific portal associated with the rule.

No Custom Business Objects

Health assessment functionality relies on base product business objects for core functionality. There is no support for custom business objects nor customization of the base product's business objects. Customers can add assessment types with custom calculation rules but the assessment type and assessment entities must be based on product business objects.

Defining Health Assessment Types

Health assessment types are mainly defined by the product but allow additional ones to be added by your organization. To view the health assessment types, open **Admin**, and then **System**, and then **Health Assessment Type.**

Use the **Health Assessment Type Query** portal to search for a health assessment type. Once a record is selected, you are brought to the maintenance portal to view and maintain the selected record.

Refer to Understanding Health Assessments for more information.

For information about the data defined on the product metric type, refer to embedded help.

Health Assessment

The Health Assessment portal displays the measurement score and additional information related to a specific health assessment rule.

To view this portal, open **Main**, and then **System**, and then **Health Assessment.**

Refer to Understanding Health Assessments for more information.

The portal includes the following zones:

- **Health Assessment.** This zone displays details about a health assessment record along with guidance on how to address such issue.
- **Assessment History.** This zone lists a history of assessment values prior to the current assessment.

For more information about what each zone on the portal is reporting, refer to the embedded help.

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Health Assessment Dashboard

The Health Assessment Dashboard portal provides a high level summary of health assessment scores for key aspects of your application. The information visible on this portal will depend on the product or products installed by your organization.

To view this portal, open **Main**, and then **Dashboards**, and then **Health Assessment Dashboard.**

Refer to Understanding Health Assessments for more information.

The portal includes the following zones:

- **Critical Assessments.** This zone summarizes the latest assessment for all critical assessment types by assessment score.
- **Overall Assessments.** This zone summarizes the latest assessments of all types by assessment score.
- **Assessments.** This zone lists latest assessments by assessment score.

For more information about what each zone on the portal is reporting, refer to the embedded help.

Service Health Check

The system provides a plug-in spot on Installation, called Health Check. The algorithms plugged in here are used to check various system conditions and return details to help assess the health of the system.

What Information is Checked?

Each algorithm is responsible for checking one type of health check condition. The condition should be defined as a valid health component type (as defined in the `HEALTH_COMP_FLG` lookup). The algorithm may check conditions across many records (referred to as Health Components) and return a status and details for each health component. For example, if the algorithm is checking the level of service for batch programs in the system, the batch control is the health component in this case. The algorithm should gather the level of service results for each batch program and return the collection of information to the calling program.

The algorithms for the plug-in spot should return the following information for each health component.

- The **Health Component Detail** should be populated with information specific to the object that was checked. For example, if the algorithm is checking batch control level of service, this will have the Batch Control code. In addition, for enabling display for details of each health component type, the algorithm should populate the maintenance object code and primary key field and value details along with the navigation option.
- The **Health Component Status Flag** and **Health Component Status Description** should be populated with a valid status code and description appropriate for the condition being checked. This information could differ based on the health component type as each health component type may have its own unique status values.
- The **Health Component Status Reason** is meant to provide supporting information about the health component's status value. For example, if the component provides an error type of status, this could have the status reason.

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- The **Health Component Response** is used to map the status value of the health component to a standard value defined in the lookup `HEALTH_RESPONSE_FLG`. The values are a subset of HTTP response codes. The supported values are **All Checks Successful** (200); **Non-Critical Function Degraded** (203), **No Content** (204) and **One or More Critical Functions Degraded** (500).
- The **Response Details** list is provided for health components that check several conditions as part of the health check. Each condition could return its own status. In this situation, the algorithm should use the response details list to record the individual responses and populate the overall Health Component Status Flag, Description and Reason with summary information. The suggestion is to do the following:
  - Set the status flag and response based on the details of the individual responses. Refer to the batch level of service information below for an example of this logic.
  - When the response list is populated, the health check user interface will show the overall Status Reason text along with an icon to expand the details. The suggestion is to populate this field with text like "See Results for Details".

The system provides an algorithm that checks the **Batch Level of Service** health component type. This health component type finds all the batch controls that are configured with at least one level of service algorithm and invokes the algorithms for each batch control. The business service populates the output for this health service for each batch control as follows:

- The **Health Component Detail** is populated with the Batch Control code and description. In addition, the navigation information for being able to drill into the batch control are provided and used to build the column as hypertext.
- The **Status** is populated based on whether the batch control has one algorithm or multiple. If there is one algorithm, the Level of Service lookup value returned by the algorithm is returned. If there are multiple, the system determines an overall status based on the detailed status values from each algorithm. If any algorithm returns Error, that value is returned. Otherwise, if any return a Warning, that value is returned. Otherwise Normal is returned.
- The **Status Reason** is populated based on whether the batch control has one algorithm or multiple. If there is one algorithm, the expanded text of the status reason returned by the algorithm is returned. If there are multiple, the text from message category / message number 11002 / 22001 is returned (**See Results for Details**)
- The **Response** is populated based on the value of the overall Level of Service status. It is set to **All Checks Successful** (200) when the Level of Service is **Normal** or **Disabled**; **Non-Critical Function Degraded** (203) when the Level of Service is **Warning** and **One or More Critical Functions Degraded** (500) when the Level of Service is **Error**.

How are the Algorithms Called?

These algorithms are called by a business service provided by the product `F1-HealthCheck`.

That service calculates an overall Health Response value based on all the details returned by all the algorithms. The values described above for the `HEALTH_RESPONSE_FLG` are the ones used.

Also note that the system provides Inbound Web Services for this business service for both SOAP and REST service calls allowing external systems to use a web service to retrieve this information.

- Health Check Configuration
- Viewing Health Check Results
- Introducing Health Check Conditions

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Health Check Configuration

To enable your system to display health check information, navigate to the Installation Options - Algorithms collection and add an entry for the **Health Check** system event for each health check algorithm provided by the product that your product would like to include in your system health check assessment.

Viewing Health Check Results

The product provides a portal that allows a user to view the detailed results of the health check business service.

Navigate using **Admin**, and then **System**, and then **Health Check** to view this portal.

The zone on the portal displays the following:

Overall Response is the HTTP response code returned by the business service.

The grid displays the detail of each individual component checked as part of the system health check. Refer to Service Health Check for more information about the details returned.

Introducing Health Check Conditions

If your implementation would like to check a condition for system health that is not already provided by your product, here are the steps required:

- Define a new value in the Health Component Type lookup (`HEALTH_COMP_FLG`).
- Provide a new algorithm type, plug-in script and algorithm for the Health Check system event that checks the condition that you wish to check. Refer to the Service Health Check topic for the information that each algorithm should be supplying for the condition. Note that if you follow the pattern of the system delivered Batch Control - Level of Service algorithm, your algorithm may be designed to check conditions across many records of the same type and gather all the results.
- Plug this new algorithm into the Installation Options - Algorithms collection using the **Health Check** system event.

Measuring Performance

Many implementations need the ability to track and view the performance of key system processes against a defined target level. The framework provides objects to allow an edge product or an implementation to calculate and display performance measures against a desired target for one or more use cases. The topics in this section provide information about what is supplied in the framework and guidelines for implementing a specific use case for batch processes. Your product may supply out of the box support for additional use cases. Refer to your product documentation for more information.

- Understanding Performance Targets
- Setting Up Performance Target Configuration
- Maintaining Performance Targets

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Understanding Performance Targets

The following are examples of use cases that would be well suited for tracking as performance targets:

- Track and view the duration of key batch processes, either individually or as a group, and how they relate to a defined target.
- Monitor used and free space on a database against critical levels.
- Check the performance of individual user interface zones against a defined performance expectation
- Compare the number of web service requests made to an application against a threshold where performance may be of concern.

Framework provides functionality to define and categorize performance targets and link them to objects such as business services, zones and portals. This supports the calculation and display of the metrics against desired results.

In addition, Framework supplies out of the box support for batch process performance targets. Individual edge applications may supply more specific functionality for other use cases, if applicable.

Ideally, users should have the ability to view these performance targets on a dashboard that groups related measures. Framework provides the necessary components to achieve this for batch process performance targets.

The following sections highlight functionality supported for performance targets in the framework. Refer to the edge application product documentation for more details of other supported use cases.

- Performance Target Objects Overview
- Calculating and Displaying Performance Targets
- Performance Target Metrics and Metric Types
- Performance Target Categories and Types
- Performance Targets Define Specific Metrics
- Objects Linked to a Performance Target
- Creating Performance Target Zones

Performance Target Objects Overview

The setup of a performance target involves a unique combination of configuration data and processing logic that calculates and displays a specific measure.

The framework performance target functionality is supported by a combination of inter-related objects, as shown below. Some of these objects will be generic for use in all performance targets while some are specific to a functional area such as batch processes.

- **Maintenance Objects** for capturing performance target types and performance target instances.
- **Extendable Lookups** to define performance target categories and performance target metrics.
- **Business Services** to calculate known metrics for a group of performance targets, such as for batch processes.

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- **UI Maps** to interpret the performance calculation results and display them in charts that show the comparison to the target.
- A **Zone** that serves as a template for system duplication to create specific zones related to each performance target. The zone invokes a business service to perform calculations and display performance measures in the related UI map.
- **Business Objects** to capture configuration data for a specific performance target instance and its related objects.
- Functionality to create **Zone instances** for specific performance targets based on the associated template zone.

Each edge application will deliver the following to compliment the objects delivered by the framework:

- **Portals** to group related performance target zones.
- Specific entries for the performance target category **Extendable Lookup** .

The following sections describe the combined use of these objects for performance targets in more detail.

Calculating and Displaying Performance Targets

Performance targets are intended to be displayed in a portal using an explicit object zone. The zone parameters define both the business service used to calculate the performance metrics and the UI map that displays the results. While an individual performance target needs to reference a zone with a unique configuration that calculates a particular metric, those zones will be based on a template zone which defines the core parameters.

Framework provides a base Batch Performance Target Metric Template zone (`F1-PERFBA`) for batch process performance targets. Refer to this zone and its parameters for more information about the batch performance zone configuration and the related business service and UI map.

Performance Target Metrics and Metric Types

The framework supports two types of metrics for performance monitoring:

- **Value based metrics** are used to record results against a specific numeric target.
- **Time based metrics** are used to track the results against a specific date and time target.

The list of valid metrics for a given performance target category and its associated performance target types is maintained using an extendable lookup. Framework uses the base business object Batch Performance Target Metric (`F1-BatchPerfTargetMetric`) to define batch process metric values. Refer to this lookup for the supported batch process metrics.

> **Note**
>
> While users are not prevented from adding new values to the lookup, the list is not intended to be extendable as new values will not be recognized by the business service that performs the base batch performance calculation logic.

Your edge product or implementation may supply other extendable lookup business objects for additional performance measurement use cases, if applicable.

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Performance Target Categories and Types

There are key configuration details required by all performance targets. These are defined on two related objects.

Performance Target Categories

Target categories define the template zone and security setting for a group of performance measures. The list of valid categories is maintained using an extendable lookup.

The framework product supplies the business object Performance Target Category (`F1-PerformanceTargetCategory`) for this functionality. Refer to the business object description and configuration for more information.

Performance Target Types

Target types define the related performance target business object and the display portal for a group of performance measures. In addition, a target type references a target category which defines the associated zone details.

The framework product supplies the business object Performance Target Type (`F1-PerformanceTargetType`) for this functionality. Refer to the business object description and configuration for more information.

The framework does not deliver any standard type or category values for batch processing performance targets. Refer to your specific edge application products to verify if any standard values are delivered for the batch processes within your applications. Edge applications may also supply standard categories and types for additional performance target use cases.

Performance Targets Define Specific Metrics

Although the types of measures and the business services and UI maps that govern how they are calculated and displayed are defined using separate objects, a **performance target** record defines the additional configuration needed to measure a specific metric and compare the result to a desired value.

There are key configuration details required by all performance target instances. These include a reference to the metric being measured, the desired target value or time, the desired result for the target and the unique zone by which this performance target will be monitored.

> **Note**
>
> The performance target maintenance object has a direct foreign key link to the extendable lookup business object and value that define the performance metric. This is an unusual pattern as extendable lookup values are normally recorded only in an object's schema. The pattern has been adopted to allow the description of the metric to be displayed in the performance target maintenance portal.

A given **performance target type** may require additional details for its calculations. For example, the framework batch process performance target defines additional details to restrict the measurement to specific batch processes that have executed within a given time frame. These details are configured on the performance target business object. Refer to the embedded help text on the business objects supplied by the framework and your edge applications for more information.

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The **performance target type** also defines the business object to use when creating the resulting performance target record.

Objects Linked to a Performance Target

Some performance measures such as batch process metrics, derive the data for the calculation from objects within the system. The performance target can be linked to one or more related objects to define the specific data sources included in that target metric. For example, when creating a batch process performance target, the framework supports linking specific batch codes to the performance target to indicate the group of batch processes that are included in the measure.

The performance target business object may be configured to allow only relevant objects types to be linked to a performance target record. Refer to the base Batch Performance Target business object (`F1-BatchPerformanceTarget`) for an example.

Creating Performance Target Zones

Once a performance target and its objects have been defined, a unique zone needs to be created to display and monitor the specific target.

The framework functionality for batch performance targets implements the zone creation via the related business object lifecycle. When a performance target is added, status enter plug-ins are responsible for generating the new zone using the template zone and prefix configured on the target category (or the override values) and adding the zone to the portal configured on the target type. When a performance target is inactivated, an enter plug in is responsible for removing the zone from the portal.

> **Note**
>
> While the template zone associated with the performance target category may be overridden, the zone generation algorithm makes certain assumptions about the zone type and parameters. In particular, the logic expects to configure a zone parameter that references the performance target code as input to the business service responsible for calculating the metrics.

Refer to the base Batch Performance Target business object (`F1-BatchPerformanceTarget`) for details of the lifecycle and the enter plug-ins responsible for performance target zone creation.

Setting Up Performance Target Configuration

The following topics highlight the general configuration steps required to use performance target functionality. Your particular product or implementation may supply additional functionality to support specific use cases for performance targets. Refer to your product documentation and the library of business objects supplied for performance target in your system for more information.

- Performance Target Category Lookup
- Defining Performance Target Types

Performance Target Category Lookup

Refer to About Performance Targets for an overview of performance target functionality.

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Each Performance Target Type is associated with a unique Performance Target Category. The categories are defined as an extendable lookup.

Navigate to the Extendable Lookup portal. Search for and select the **Performance Target Category** business object. Define values that are appropriate to the categories your implementation is assigning for the performance target types in use. In some cases, an edge application may already have delivered the appropriate performance target category for your use

Refer to the embedded help for more information about configuring this object.

Defining Performance Target Types

Refer to About Performance Targets for an overview of performance target functionality.

To maintain the performance target types applicable to your product or implementation, open **Admin**, and then **Reports**, and then **Performance Target Type.**

This is a standard All-in-One portal.

The information captured on the performance target type depends on the business objects supported by your product or implementation. Refer to the embedded help text for more information.

Maintaining Performance Targets

This section describes the functionality supported for viewing and maintaining performance targets.

Refer to About Performance Targets for an overview of performance target functionality.

Navigate using **Main**, and then **Reporting**, and then **Performance Target**. This is an All-in-One portal and includes the standard List and display zones for a performance target.

For information about the data defined on the performance target, refer to embedded help.

Capturing Statistics

The product provides objects to allow for an edge product or an implementation to periodically calculate and capture statistics for one or more use cases. The topics in this section provide information about what is supplied in the framework and guidelines for implementing specific use cases.

- Understanding Statistics
- Configuring Your System for Statistics

Understanding Statistics

There are two objects that work together to capture the statistics related to a given business use case:

- The statistics control record which defines configuration related to capturing statistics. It also defines a category that is used to group similar types of statistics together.
- The statistics snapshot is the record where the actual calculated statistics are captured.

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Statistics Control

The statistics control record defines whether or not statistics are automatically calculated and how frequently. In addition, you may control the retention policy of snapshot records. You may indicate that only the most recent snapshot is kept or all snapshot records are kept or that they are retained for a defined number of days.

The system provides a business object for statistics control (`F1-Statistics`) that is expected to be used for most use cases. Its lifecycle includes the support for periodic capturing of statistics snapshot records as well as on demand capture.

Statistics Snapshot

The statistics snapshot object is the object that is responsible for calculating and capturing the statistics details. A separate business object must be defined for each use case. The schema of the business object defines the details that are captured. In addition, it must include an algorithm as an enter plug-in on the **Complete** state that is responsible for capturing statistics.

The system provides a 'root' business object for statistics snapshot (`F1-SnapshotRoot`) which includes the lifecycle that statistics snapshot business objects should follow. No explicit statistics snapshot use case is provided by the Framework. Your specific product may supply some out of the box support for certain use cases, in which case specific statistics snapshot business objects are provided. Refer to your product specific documentation for more information.

Viewing / Reporting Statistics

The product provides the mechanism for defining statistics control and statistics snapshot records and viewing the data in basic format. If your product has provided support for specific use cases, there may also be additional portals used to display the statistics in a meaningful format. For example, the statistics snapshot may be capturing data that can be presented in graphical format. Additionally, if multiple historical statistics snapshot records are retained, a zone may be defined to graph changes over time.

Configuring Your System for Statistics

If your product provides statistics use cases that you are planning to implement, all that you need to do is configure the appropriate statistics control record and define the appropriate configuration for your business requirements. Refer to Defining and Monitoring Statistics for more information.

If your implementation has identified an additional use case where you would like to capture statistics, the following points highlight the steps needed to configure the system to support the use case.

- Determine whether an additional Statistics Category value is needed. This is captured on the statistics category record. Navigate to the Lookup page. Search for and select the `STAT_CATEGORY_FLG` field. Review the values and determine if additional values are needed.
- Define a new statistics snapshot BO. This should be a child BO of the base delivered BO (`F1-SnapshotRoot`). Its schema should define elements for the specific information that is captured by the statistics calculations. The schema should be designed in conjunction with an appropriate Enter Status algorithm for the **Complete** that calculates the statistics as appropriate for the business requirement.
- Once the snapshot business object is designed and implemented, configure the appropriate statistics control record.

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- Defining and Monitoring Statistics

Defining and Monitoring Statistics

Refer to Understanding Statistics for an overview of the statistics functionality.

To define and maintain statistics control records and view a list of the current snapshot records, open **Admin**, and then **Reporting**, and then **Statistics Control.**

This is an All-in-One portal and includes the standard List and display zones for a statistics control.

For information about the data defined on the statistics control, refer to embedded help.

Statistics Snapshot

If there are any Statistics Snapshot records for the statistics control, the **Statistics Snapshot List** zone displays a list of the most recent records. A user may drill into any of the records to view more detail. You are brought to a maintenance portal where you may view details about the calculated statistics. The information captured will be unique to the particular use case. Refer to the embedded help for more information.

Capturing Product Use Metrics

The product provides functionality to periodically calculate and capture information used to review and confirm licensing / subscription compliance for cloud implementations.

Following points highlight some of the features of this functionality:

- The product metric type object defines configuration related to a given metric, including which cloud offerings it applies to and the product metric snapshot business object to use when capturing the metric.
- The product metric snapshot object is used to capture the calculated metric.
- The Product Use Metric portal is provided to display information about the calculated metrics.
- A monitor batch control is used to create the product metric snapshots. Every time it's run, it creates a snapshot for each applicable product metric type. For on premises, all product metric types are considered applicable. For a cloud implementation, the system looks at the applicable cloud offerings setting on the product metric type. If that is populated with specific cloud offerings, then the product metric type is only applicable if your product is in the list. (If no applicable cloud offerings are populated, then it's considered applicable for all cloud offerings.)
- In a cloud environment, the monitor batch control used to create the product metric snapshot is considered an internal batch job and will be run by the Oracle Utilities Cloud Service.

> **Note**
>
> Although the product use metrics functionality is required for cloud implementations, implementations that are on premises may also choose to run the product metric type's monitor batch control to capture information for viewing in the Product Use Metric portal if desired.

- Defining Product Metric Type

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- Product Metric Snapshot
- Product Use Metrics

Defining Product Metric Type

Product metric types are defined by the product. To view the product metric types, open **Admin**, and then **System**, and then **Product Metric Type.**

Use the **Product Metric Type Query** portal to search for a product metric type. Once a record is selected, you are brought to the maintenance portal to view and maintain the selected record.

For information about the data defined on the product metric type, refer to embedded help.

Product Metric Snapshot

Product metric snapshots are created whenever the product metric type's monitor batch is run. A snapshot is created for every applicable product metric type. Refer to Capturing Product Use Metrics for more information

To view the product metric snapshots, open **Admin**, and then **System**, and then **Product Metric Snapshot.**

Use the **Product Metric Snapshot Query** portal to search for a product metric snapshot. Once a record is selected, you are brought to the maintenance portal to view the selected record.

For information about the data defined on the product metric snapshot, refer to embedded help.

Product Use Metrics

The Product Use Metrics portal includes a zone (or zones) that are used to perform a business review of your organization's implementation of the product to confirm licensing / subscription compliance. The information visible on this portal will depend on the product or products installed by your organization.

To view this portal, open **Main**, and then **Dashboards**, and then **Product Use Metrics.**

For more information about what each zone on the portal is reporting, refer to the embedded help.

External Messages

This section describes mechanisms provided in the product that enable an implementation to configure the system to communicate with an external application.

- Incoming Messages
- Outgoing Messages
- Web Service Category
- JMS Message Browser
- Oracle Integration Cloud Catalog

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- XAI Documentation Note

Incoming Messages

This section provides information about support for incoming messages.

- Inbound Web Services
- Guaranteed Delivery

Inbound Web Services

Inbound web service functionality is provided to support receiving web service requests from an external system.

- Understanding Inbound Web Services
- Configuring Inbound Web Service Options
- Deploying Inbound SOAP Web Services

Understanding Inbound Web Services

The system supports communicating with the system via RESTful services or via SOAP services. In both cases, the system uses an object called inbound web service (IWS) to store the configuration. A web service class is used to distinguish whether the IWS is used for REST or SOAP. There is also a distinct business object for each web service class value because there is different configuration for each type of IWS.

For both types of inbound web service, the system supports the configuration of one or more operations per web service. Each operation defines the schema-based object to invoke to perform the desired function. An operation may refer to a Business Service, a Business Object, or a Service Script. If the IWS supports multiple operations, each operation can refer to the same or a completely different schema-based object from other operations within the IWS.

REST APIs may be secured by OAuth client credentials grant in a cloud installation. Refer to the Identity and Access Management chapter in the *Oracle Utilities Cloud Services Administration Guide* for more information.

The following topics provide more information about the different configuration of IWS based on whether it is SOAP or REST.

- Inbound REST Web Services
- Inbound SOAP Web Services

Inbound REST Web Services

This topic provides more information about the product's support of REST services using IWS.

The REST engine checks the Accept-Language header and attempts to find a supported language whose locale matches the referenced language. If found, the web service response returns any translatable data in that language. Note that if no supported language is found for the languages provided in the Accept-Language header, the system uses the language of the user that submitted the request.

IWS REST records are marked with a REST engine version of 1.0 or 2.0. Version 2.0 is the version used for new services. Version 1.0 is introduced for backward compatibility. Some of

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the system behavior differs based on the version of the REST service. The sections below highlight cases where this occurs.

HTTP Method and Parameters

When defining operations for inbound REST web services, the product supports the HTTP methods of Get, Patch, Post, Put, and Delete. Note that the product's support of these various HTTP methods are a means of communicating the purpose of the web service to the outside world. However, the actual behavior of the REST web service is driven by the behavior of the underlying schema based object (business object, business service or service script). For example, you may configure the HTTP Method of "Put" for an operation that references a service script that just retrieves a record. The product is not able to detect this type of discrepancy. Configuration users should carefully consider the correct method to use based on the logic of that service.

For operations that reference a business object, the transaction type must be provided. The REST syntax doesn't support defining the transaction type at runtime. There are some basic validation checks in this case related to the transaction type and the HTTP method. For example, a Get method only makes sense with the Read transaction type.

> **Note**
>
> Using the transaction type **Change** requires all values to be passed in. Using the transaction type **Update** allows the web service to pass only the primary key and the values to be updated. All other elements will retain their existing values.

You may additionally define parameters. For each parameter, you define an external reference to the element, which is how this parameter is exposed to the external callers and is defined in the API specification. Each of these parameters is mapped to the XPath of the schema element from the underlying business object, business service or service script. For each parameter, you indicate if it is a **Path** parameter or a **Query** parameter.

- Path parameters are parameters that are part of the endpoint and are required. Each path parameter must be included in the operation's URI component surrounded by curly brackets.
- Query parameters are optional. They are not part of the endpoint but rather are included in the endpoint URL after a question mark, followed by name value pairs.

Refer to the URL section below for examples of path and query parameters in the sample URLs.

URL Composition

When building the endpoint URL for a REST service, there are three main parts that make up the full URL.

- The first part is the one that is environment specific. This will differ for an on premise implementation as compared to a cloud implementation. Both will have the host and the port and then additional components that identify the environment.
- The second part is a hard coded path designated by the product, namely "/rest/apis".

  These two parts of the URL are defined in the substitution variable `F1_REST_BASE_URL`. This is defined when initializing your environment. Refer to the Server Administration Guide for more information.

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The remaining part of the URL is built dynamically based on configuration for each IWS and its operations. The components are "/ownerURIComponent/resourceCategoryURIComponent/iwsURIComponent/operationURIComponent"

- The owner URI component is taken from the owner flag of the inbound REST web service. A special extendable lookup (Owner Configuration for REST Services) defines this component for each owner flag.
- Each Inbound REST Web Service must reference a resource category. This category is used to associate related web services to a common category of resources. For multiple IWS records linked to the same resource category, external catalogues can use this information to group together related web services. The resource category is an extendable lookup and the URI component is an attribute of this record.
- Each REST IWS record defines a URI component that serves as an external identifier of this IWS record. The value must be unique within a given owner flag.
- Each operation must define the HTTP Method and optionally a URI component. When defining path parameters, the path parameters must be included in the URI component using curly braces.

In all cases, the URI component must begin with a slash ('/').

The following are some examples of the dynamic portion of the URL for a REST service. The last example illustrates the use of a query parameter.

IWS Name URI Component	Owner URI Component	Resource Category URI Component	Operation HTTP Method URI Component	Dynamic URL Component	Run Time Example
c1rateCalculation / rateCalculation	C1 /customer	C1-RATES /rates	Post /	../customer/rates/rateCalculation/	../customer/rates/rateCalculation/
w1WorkActivity / workActivity	W1 /asset	W1-WORK /work	Get /{activityId}	../asset/work/workActivity/{activityId}	../asset/work/workActivity/5798165498
w1WorkActivity / workActivity	W1 /asset	W1-WORK /work	Patch /scheduleWindow/{externalSystem}/{activityId}/{windowStartDateTime}	../asset/work/workActivity/scheduleWindow/{externalSystem}/{activityId}/{windowStartDateTime}	../asset/work/workActivity/scheduleWindow/MY-COMPANY/5798165498/20190101
CM-AccountActivityHistory / accountActivityHistory	CM /cm	CM-ACCT-INFO / accountInformation	Get /{accountId}	../cm/accountInformation/accountActivityHistory/{accountId}	../cm/accountInformation/accountActivityHistory/123456789?activityId=5468976

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Payload Format

REST services support receiving a request payload in XML or JSON format and returns the payload in either XML or JSON. The default format returned depends on the value of the REST Engine Version.

- Version 2.0 services assume JSON format as the default. The default can be overridden by providing an accept header of `application/XML`.
- Version 1.0 services assume XML format as the default. The default can be overridden by providing an accept header of `application/JSON`.

Root Node for JSON Format

Version 2.0 services with the JSON formatted payload do not accept in the request or return in the response any root node around the payload. The following is an example of the response of a REST call for a version 2.0 service:

```
{
   "batchJobId": "string",
   "requestSuccessful": "string"
}
```

Version 1.0 services with the JSON formatted payload expect a root node in the request and return one in the response. The following is an example of the response of a REST call for a version 1.0 service:

```
{
  "F1CnclBatJob": {
    "batchJobId": "string",
    "requestSuccessful": "string"
 }
}
```

The Open API Specification visible on the inbound web service maintenance page displays the expected format based on the record's REST engine version when viewing the specification.

Data Type Format in JSON

In JSON format, strings are surrounded by quotes and numbers and Boolean data do not have quotes. All services for REST engine version 2.0 follow this standard. Originally services that are REST engine version 1.0 were incorrectly treating numbers and Boolean data as strings and returning the data with quotes. This has been corrected.

To accommodate any integration that may have worked around the behavior for version 1.0 services, the system provides the ability to identify inbound web services that are exceptions to this rule. For any inbound web service identified as an exception, the system continues to treat numbers and Boolean data as strings in JSON responses. To add one or more IWS records to the exception list:

- Go to Feature Configuration.
- Look for an existing feature configuration with the feature type **External Messages**. If one does not exist, create one.
- Add an option for the option type **IWS JSON Data Type Exceptions**.

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- In the option value, indicate the IWS record that is an exception. Note that multiple options for the option type may be added. Additionally, the option value supports a comma delimited list.

External Facing Schema

By default the schema of the underlying service (for example, service script, business object or business service) is also the schema for the REST inbound web service operation and acts as both its Request and the Response schema. The product provides the ability to define an explicit schema for a REST inbound web service (IWS) operation, allowing a user to adjust the schema for an external facing consumer. The IWS operation schema also supports some special configuration that allows additional features to be defined only for the IWS operation schema.

The operation schema supports the following capabilities:

- Declaring whether an element belongs only to the request schema, only to the response schema, both (default) or excluded altogether. This is used to establish a clear separation between request and response schema definitions.
- Assign a different element name to an internal element. This allows the internal service element name to more closely align to internal references to the element, if needed. The external facing element name can be different allowing for a more readable schema.
- Introduce specialized elements that support links and other types of structural standards in a way that does not impact internal service processing.

Refer to Web Service Schema Nodes and Attributes for more information.

The REST servlet uses the request and response schemas to map elements to and from the internal schema.

> **Note**
>
> While the caller should only provide elements defined by the request schema, the application does not filter out extraneous elements. Assumption is that the internal service is designed to ignore such elements. However, only elements defined by the response schema are included in the response.

Dynamic Links

There are use cases where the published API includes a "_self" element that contain the endpoint URL of the GET operation related to the data returned in the response. Additionally, response payloads may include foreign keys and for those entities, the response includes a "_link" element that contains the endpoint URL of the GET operation for that entity (if it exists).

Syntax is provided in the REST inbound web service operation schema to support building the runtime endpoint URL for the _self and _link elements. Besides dynamically building the static portion of the URL based on the current environment details, it also builds the dynamic portion of the URL, substituting the URL components for the operation and substituting the path parameters. The syntax allows you to define a specific IWS Operation or allows you to reference a maintenance object and at runtime, the system determines the GET operation for the maintenance object and builds the URL accordingly.

Example of the syntax:

```
<_link getOperation="mo:'TO DO ENTRY';pk1:toDoEntryId;"/>
```


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Example of the runtime endpoint URL:

```
_link: "http://.../common/toDos/toDoEntries/28937296450934"
```

A GET operation may be associated with a maintenance object to denote that this is the default GET operation for the entity. A **GET Operation** option at the Maintenance Object and Business Object level may be used to override this default. If the entity is not associated with a business object or the latter is not associated with such option then the operation associated with the maintenance object (if any) is used.

API Specification Documentation

The following documentation information may be provided for an Inbound Web Service:

- Short and detailed description for each operation.
- Help text may be provided for individual elements. The same text can be shared across multiple elements across all operations of the Inbound Web Service. If an element is not associated with help text then its internal field's label is used instead.
- Sample request and response documents may be provided for each operation.
- Operations may be associated with a sequence number that controls the order in which they appear in the Open API Specification.

> **Note**
>
> Detailed descriptions and element related help text are not translated since the published catalogue for base product APIs is in English language only.

Customization Options

Some base product REST web services may explicitly indicate that they allow customization. When allowed, your implementation may customize the following aspects of a service to meet integration requirements:

- Add more elements to the request and response schemas
- Implement custom logic to populate additional elements or enforce custom business rules.
- Provide help text for the additional elements and corresponding request and response examples when generating an API specification.

When an IWS allows customization, a **Custom Script** may be specified on any of its IWS operations to override the operation's underlying base service.

> **Note**
>
> The custom script must adhere to the base service schema it overrides and can only extend it. For that reason, the custom script's schema must at least include the operation's base service schema and may include additional custom elements as needed.

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Customizing an IWS operation does not change the URL used to access the web service. If the operation is customized then internally the custom script is called instead of the base service.

In the same way, the API specification of the operation is adjusted to use the custom script if any. If a custom web service schema is also provided then it is used instead of the base web service schema if any. If sample request and response sample documents are provided as options on the customized operation they are used instead of base samples. You may also provide custom help text for your custom elements by adding corresponding entries to the IWS help text list.

Inbound SOAP Web Services

For inbound SOAP web services, by default the system uses the Schema Name to dictate the Request and Response for the service. The API can be overridden with custom formats by specifying Request and Response XSLs to transform into the relevant schema formats. In addition, if desired, the Request and Response Schemas that document the expected message may be provided.

> **Note**
>
> The Request and Response Schema fields are not supported in a cloud implementation.

> **Note**
>
> The system supports defining the XSLs as a managed content record. For backward compatibility, the system supports defining the XSL as a file in the file system. This is a system wide setting, defined using a feature configuration option. The feature type is **External Messages** and the option type is **XSL Location**. Set the value to `F1FL` to support XSL in the file system. The file location is configured using a system property. To support the XSL in managed content, no option is needed as this is the default. You may explicitly define the value of `F1MC` if desired.

In addition, note that for business object based operations, when invoking the web service an action is required. This may be passed into the web service as part of the invocation or alternatively, the action may be defined when configuring the operation using the transaction type.

> **Note**
>
> Using the transaction type **Change** requires all values to be passed in. Using the transaction type **Update** allows the web service to pass only the primary key and the values to be updated. All other elements will retain their existing values.

Annotations Used for Security

When preparing to deploy inbound SOAP web services, the security aspects of the service must be decided. The product provides a default security policy that is applied when no other policy is defined: **@Policy(uri="policy:Wssp1.2-2007-Https-BasicAuth.xml", attachToWsdl=true)** which requires HTTP Basic over SSL and a WS-Security Timestamp.

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If a different security policy is desired, the following options are available:

- Security policies may be attached to the Inbound Web Service via the Java Enterprise Edition (Java EE) Web Application Server. This allows for multiple policies to be attached as supported by the Java EE Web Application Server. In order to enable this capability, explicit system configuration is required so that the product does not assume the default security policy. See the subsequent bullets for more information.
- Define a system wide security policy using a feature configuration option. Find the Feature Configuration record for the **External Messages** feature type. (It may need to be defined if it does not exist). Choose the option type **Default security policy** and define an appropriate value. If your implementation wishes for the policies to be attached at the Java EE Web Application Server, define this option type with an option value of `<none>`.
- Attach a security policy to the IWS via a Web Service Annotation. The base product provides annotation types that support the standard WS-Policy (`F1POLICY`) and OWSM Security Policy (`F1-OWSM`). No base annotation is supplied by the product for either annotation type.

  If your implementation wishes for the policy of a particular IWS to be attached at the Java EE Web Application Server, define a special annotation for the `F1POLICY` annotation type and configure the **uri** parameter value to `<none>`.

> **Note**
>
> Refer to WebLogic documentation for more information on supported security policies.

> **Note**
>
> In order to use the OWSM Policy, additional system configuration is necessary. Contact your system administrator to confirm if your implementation supports OWSM.

Inbound SOAP Web Service Deployment

A Inbound SOAP Web Service must be deployed to the Java EE Web Application Server in order for it to be available to the Web Service Clients to access the system. Refer to Deploying SOAP Web Services for more information.

- Deploying XAI Inbound Service via IWS

Deploying XAI Inbound Service via IWS

For implementations using XAI inbound services for external messages, the product recommends moving to the inbound web service mechanism, which uses the Java EE Web Application Server to communicate with the product rather than the XAI servlet.

For XAI inbound services that use the **Business Adapter**, it is straight forward to move to IWS because the configuration is similar. In both cases, the service is configured to reference a business object, business service or service script. The associated WSDL for each record is similar. Changing the interface for the incoming message to use IWS instead of XAI inbound services is similar.

However, for XAI inbound services that use the **Core Adapter**, these services reference an underlying "page service" in the product. For these services, the Request and Response schemas for the XAI inbound service were created using the Schema Editor. In order to support calling an underlying "page service" in IWS, first a business service must be created to

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reference the page service (if one doesn't already exist). However, the resulting schema for the business service is different from the Request and Response schemas related to the XAI inbound service. Moving this functionality to IWS using business services requires changes to the format of the incoming messages.

Moving all incoming messages over to use IWS instead of XAI is the product recommendation. However, to aid in implementations that have many integrations in place using the XAI inbound services that use the **Core Adapter** (or any adapter whose message class is **BASEADA**), the product provides the ability to deploy these types of XAI inbound services to the Java EE Web Application Server along with the Inbound Web Services.

To take advantage of this capability, you must define a feature configuration option. Under the **External Messages** feature configuration type, the **Support XAI Services via IWS** is used to indicate if this feature is supported. Setting the value to **true** turns on the feature. If no option is defined for that option type, it is equivalent to setting the value to **false**.

When the system is configured to support XAI services via IWS, the Inbound SOAP Web Service deployment includes XAI inbound services (that are configured with an Adapter that references the **BASEADA** message class). The deployment portal will also include a zone showing the deployment status of these XAI Inbound Services.

> **Note**
>
> There is no support for XAI inbound services via REST, only via inbound SOAP web services.

Configuring Inbound Web Service Options

This topic describes the configuration needed for using inbound web services.

- Configuring SOAP Inbound Web Service Options
- Configuring REST Inbound Web Service Options
- Maintaining Inbound Web Services
- Maintaining Inbound Web Service Operations

Configuring SOAP Inbound Web Service Options

This topics in this section describes the configuration needed for using inbound SOAP web services.

- Technical Configuration
- Maintaining Web Service Annotation Types
- Maintaining Web Service Annotations
- Maintaining XAI Inbound Services

Technical Configuration

In order to use inbound web services, there are tasks a system administrator must perform.

Refer to the Server Administration Guide for technical details of each of these processes.

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Maintaining Web Service Annotation Types

The product provides some base annotation types. Refer to the metadata for more information. If your implementation wishes to define additional annotation types, use the Web Service Annotation Type portal. Open this page using **Admin**, and then **External Message**, and then **Web Service Annotation Type.**

You are taken to the query portal where you can search for an existing web service annotation type. Once an annotation type is selected, you are brought to the maintenance portal to view and maintain the selected record.

> **Note**
>
> Use of custom policies should only be considered if the policies supplied by the Java EE Web Application Server are not sufficient for your implementation's needs.

> **Caution**
>
> Important! When adding new records, carefully consider the naming convention of the web service annotation type code. Refer to System Data Naming Convention for more information.

The **Web Service Annotation Type** zone provides basic information about the web service annotation type.

Please see the zone's help text for information about this zone's fields.

The system supports the ability for an IWS record to refer to multiple policies. In this situation, the annotation type for the policy should include a reference to a parent annotation type so that the system can properly build the array of annotations.

Maintaining Web Service Annotations

If your implementation wishes to define annotations, use the Web Service Annotation portal. Open this page using **Admin**, and then **Integration**, and then **Web Service Annotation.**

This is a standard All-in-One portal.

> **Caution**
>
> Important! When adding new records, carefully consider the naming convention of the web service annotation code. Refer to System Data Naming Convention for more information.

Maintaining XAI Inbound Services

XAI Inbound Service is a legacy mechanism for exposing system services to external systems as web services. The current supported mechanism for defining web services is Inbound Web Services, which should be used for any new web service.

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Some framework based products and existing implementations may have existing XAI inbound services that may need to be viewed. For these services, the product supports deploying them as SOAP inbound web services for execution. Refer to Deploying XAI Inbound Service via IWS.

The following sections describe basic information about the maintenance pages. Note that some of the information is related to legacy functionality that is no longer supported.

XAI Inbound Service - Main

To view an inbound service, open **Admin**, and then **XAI**, and then **XAI Inbound Service**.

Description of Page

XAI In Service Name is used in the system to identify the service. The service name is also the first XML element after the <Body> element in the XML request/response document. The **XAI Service ID** serves as the primary key.

Owner indicates if this XAI inbound service is owned by the base package or by your implementation (**Customer Modification**). This information is display-only.

The **Adapter** defines the interface with the target application server.

If adapter for this service invokes a system service, then the appropriate **Service Name** is visible.

If adapter is the **Business Adapter** then **Schema Type** and **Schema Name** reference the object to invoke.

Web Service Category is visible if the XAI inbound service is linked to one or more web service categories.

Use the **Description** and **Long Description** to describe the service.

Check the **Active** switch if this service is enabled and available for execution.

Post Error is not applicable.

Trace is not applicable.

Debug is not applicable.

Schema Definitions

> **Note**
>
> Request Schema and Response Schema are not applicable to services invoking schema-based objects. They do not appear when the **Business Adapter** is used.

The next two properties define the request and response XML schemas. The schemas are SOAP compatible. The schema XML files are expected to be stored in the Schemas Directory on the Web server running the XAI server.

The **Request Schema** is the XML schema defining the service request. The request sent to the server must adhere to the schema definition.

The **Response Schema** is the XML schema defining the service response. The response generated by the XAI server corresponds to the response schema definition.

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The same service may perform several actions on a business object. Use the **Transaction Type** to define the default action performed by a service. The transaction type can be provided when invoking a service, by dynamically specifying a transaction type attribute on the Service element of the XML request. This field may take the following values: **Read**, **Add**, **Change**, **Update**, **Delete**, **List** and **Search**.

> **Note**
>
> The difference between **Change** and **Update** is that for **Change**, all field values must be passed in with the request. Field values that are not passed in to the request are set to null. For **Update**, you need only pass the primary key field values and the values of the fields to be updated. All other fields retain their existing values.

Services, which perform a Search, may allow searching based on different criteria. When the Transaction Type value is **Search**, use the **Search Type** to define the default search criteria. The possible values are **Main**, `Alternate1`, `Alternate2`, `Alternate3`, `Alternate4`, `Alternate5` and `Alternate6`.

> **Note**
>
> This is a default definition only and it may be overridden at run time when the service is invoked. To override the search type at run time, you should specify the searchType attribute on the Service element of the XML request.

XSL Transformation Definitions

Sometimes, the XML request document does not conform to the request schema, or the response document expected by the service requestor is not the one generated by the adapter. In such cases the request and/or the response documents must be transformed. The XAI server supports transformation through XSL transformation scripts. Transformation scripts may be applied to the request before it is passed to the adapter or applied to the response document before it is sent to the service requestor.

The **Request XSL** is the name of the XSL transformation to be applied to the request document before processing it. The transformation is usually required when the incoming document does not correspond to the XAI service request schema therefore it has to be transformed before it can be processed by the adapter.

The **Response XSL** is the name of the XSL transformation to be applied to the response document when the requester of the service expects the response to have a different XML document structure than the one defined by the response schema for the service.

Click the **WSDL URL** hyperlink to launch a separate window that contains the WSDL definition for the inbound service. Note that the server name and port number for the URL are built using a setting in the common properties file using the XAI HTTP Caller URL setting.

Configuring REST Inbound Web Service Options

This topics in this section describes the configuration needed for using inbound REST web services.

- Owner Configuration Lookup
- Resource Category Lookup

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Owner Configuration Lookup

Refer to Inbound REST Web Service for an overview of REST IWS functionality.

When generating the URL for a REST web service, part of the URL is taken from the owner of the Inbound REST Web Service record. The component to add to the URL is defined in this lookup using the URI Component field. The values are provided by the product.

To view the values, navigate to the Extendable Lookup portal. Search for and select the **Owner Configuration for REST Services** business object.

Resource Category Lookup

Refer to Inbound REST Web Service for an overview of REST IWS functionality.

Each Inbound REST Web Service is associated with a Resource Category. The categories are defined as an extendable lookup. The REST URL is built using a component from the IWS record's resource category.

Navigate to the Extendable Lookup portal. Search for and select the **Resource Category** business object. Define values as needed. Typically the category is related to a logical grouping of entities, or maintenance objects, referred to as a 'resource' in REST nomenclature. In some cases, an edge application may have already delivered appropriate resource categories for your use.

Populate the appropriate URI component to include when building the URL for IWS records linked to this resource category.

Maintaining Inbound Web Services

Inbound Web Services are used to define a specific message that your implementation will receive from an external system and provides configuration needed to process the inbound message.

The product provides support for REST and SOAP services and provides several inbound web services out of the box.

For inbound SOAP web services, by default no annotations are defined for the base inbound web services. You may modify the message options or the annotations for any base IWS record. In addition, you may define additional IWS records for other incoming messages supported by your implementation.

To view an inbound web service, navigate using **Admin**, and then **Integration**, and then **Inbound Web Service.** You are brought to a query portal with options for searching for inbound web services.

Once an inbound web service has been selected, you are brought to the maintenance portal to view and maintain the selected record.

> ⚠ **Caution**
>
> Important! When adding new records, carefully consider the naming convention of the inbound web service code. Refer to System Data Naming Convention for more information.

The following zones may appear as part of the portal's **Main** tab page

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- **Inbound Web Service.** This zone displays the configuration information for the record and its operations.
- **Operations.** This zone lists the operations defined for the selected inbound web service. The zone is only visible for a REST inbound web service. You may navigate to the Inbound Web Service Operation portal to further describe the operation's web service schema.
- **Help Text Fields.** This zone maintains help text information for fields across all operations of the selected inbound web service. The zone is only visible for a REST inbound web service.

Refer to Inbound SOAP Web Services for specific information about Operations for SOAP records.

Refer to Inbound REST Web Services for specific information about Operations for REST records.

Note that in addition to standard actions available on this portal, there is also a special **Add to Category** button in the page action area. Click this button to link an inbound web service to one or more web service categories.

Maintaining Inbound Web Service Operations

This portal is used to maintain a REST inbound web service operation. You can access the portal from the **Operations** zone on the Inbound Web Service portal for a REST service.

Refer to Inbound REST Web Services for specific information about Operations for REST records.

The following zones may appear as part of the portal's **Main** tab page

- **IWS Operation.** This zone provides information about the selected operation.
- **Schema.** This zone describes the request and response schema as defined by the operation's web service schema. The zone is only visible when an operation schema is explicitly defined.
- **Schema Extensions.** This zone manages web service schema extensions that correspond to extensions made to the operation's internal schema. This zone is only visible if the underlying schema was extended using dynamic data area extension functionality. Each owner that extended the internal schema may provide web service schema information for their extension elements.
- **Options.** This zone lists various options for the operation such as request and response samples. The zone is visible when such options exist for the operation. Note that options are maintained as part of operation record.

The following zones may appear as part of the portal's **References** tab page

- **IWS Operation References.** This zone lists references to the current web service operation. The list includes other inbound web service operation records that reference the current operation via their web service schema. For a GET operation, the list also includes the maintenance object or business object that explicitly references the operation using a **GET Operation** option.
- Web Service Schema Nodes and Attributes

Web Service Schema Nodes and Attributes

A REST inbound web service (IWS) operation invokes a single schema based object, either a Business Object, a Business Service or a Service Script. The object has one schema which by default acts as both the Request and the Response schema. The product provides the ability

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to define an explicit schema for a web service operation that represents a view of the underlying internal schema for an external facing consumer. Note that the operation schema is a strict view of the internal schema and as such does not introduce structural changes.

While optional, defining an operation schema has the following benefits:

- Declaring the **usage** of an element as to whether it is part of the Request schema, Response schema, both or neither.
- Assigning an **external element name** to an internal element. Useful to avoid cloning of internal services for this purpose only.
- Better management and visibility of **GET operation** references.
- Support HATEOAS style structures outside of the internal schema. This allows for seamless internal processing.
- Providing help text for individual elements.

The following documentation is a complete list of the attributes available to you when constructing an IWS operation schema.

Operation Schema Definition

The following attributes defines the external facing operation schema that establishes the request and response schema for the operation.

Mnemonic	Valid Values	Description	Examples
usage=	"REQ"	Indicates that the element should be included in the request schema only. When specified for a group or list element the value applies to the entire container. A specific element in the container may override the container default.	`<customerName usage="REQ" />`
	"RESP"	Indicates that the element should be included in the response schema only. When specified for a group or list element the value applies to the entire container. A specific element in the container may override the container default.	`<customerId usage="RESP" />`
	"BOTH"	Indicates that the element should be included in both request and response schema definitions. This is the default value When specified for a group or list element the value applies to the entire container. A specific element in the container may override the container default.	`<customerName usage="BOTH" />`
	"EXCL"	Indicates that the element should not be included in either the request or the response schema definitions. When specified for a group or list element the value applies to the entire container. A specific element in the container may override the container default.	`<httpMethod usage="EXCL" />`

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Mnemonic	Valid Values	Description	Examples

mapTo=	"internal element name"	Maps a web service element to an internal element. By default the internal element name is assumed to be the same as the web service element name. Use this attribute to assign an external facing element name in the operation schema and map it to a corresponding internal element.
		
		Note that this is not an XPath expression but rather a reference to a valid element name that corresponds to the structure of the expanded internal schema.
		
		The owner of the element must be the same as the owner of the web service schema. If an operation's underlying schema was extended (using dynamic data area extension) then the extending owner may only reference their elements on their web service schema extension for the operation.
			Internal schema element:
			
			`<toDoPriority .../>`
			
			Operation schema element:
			
			`<priority mapTo="toDoPriority"/>`

role=	"FKGP"	Establishes a group structure that represents a foreign key to an entity.
		
		The element itself does not exist in the internal schema. It groups together the foreign key value element(s) along with a corresponding `_link` element that at run time provides the endpoint URL of that entity's GET operation. Consumers of the web service may use the link to get the data for the entity.
			Internal schema element:
			
			`<user .../>`
			
			Operation schema group:
			
			`<user role="FKGP">`
			`  <user>`
			`  <_link getOperation="mo:'USER';pk1:user;"/>`
			`</user>`

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Mnemonic	Valid Values	Description	Examples
	"COLL"	Establishes a group structure that represents a collection of entities that corresponds to an internal service list. The element itself does not exist in the internal schema. It groups together the internal list mapped to a _data element along with a corresponding _link element that at run time provides the endpoint URL for the collection's GET operation. Consumers of the web service may use the link to get a more detailed set of information for each entity in the list. By default all the elements in the referenced list are included in the operation schema. You may explicitly reference and define attributes for specific elements as needed.	Internal schema element: <alerts type="list"> <alert/> <startDate /> <endDate /> <version /> </_data> </alerts> Operation schema group: <alerts role="COLL"> <_link getOperation="..."/> <_data mapTo="alerts"> <version usage="EXCL"/> </_data> </alerts>
getOperation=	"expression" Expression components: • mo:'<maintenance object>'; • pk1:<relative xpath to an element in the internal schema>; • pk2:...; • pk3:...; • pk4:...; • pk5:...; Parameters pk2–5 are required to match the maintenance object's prime key definition.	Only valid on _self and _link elements. The attribute is used to reference the default GET operation for an entity as defined by its maintenance object or business object. The application determines the GET operation to use as follows: • If the entity's business object references an operation using the **GET Operation** option then it is used. • If the entity's maintenance object references an operation using the **GET Operation** option then it is used. • If a GET operation is found that references the maintenance object then it is used. If a GET operation cannot be determined for the entity a standard text indicating that a link is not available is returned instead.	<_link getOperation="mo:'TO DO ENTRY';pk1:toDoEntryId;"/>

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Mnemonic	Valid Values	Description	Examples
	"expression" Expression components: • `iws:`'<inbound web service name>'; • `operation:` '<operation name>'; • `parms:` [<external reference as defined on the GET operation record>:<relative xpath of an element name in the internal schema that holds the value>; <another external reference name>:<another relative xpath>;...];	Only valid on _self and _link elements. The attribute is used to reference a specific GET operation along with the information needed to compose its path parameters.	`<_self getOperation="iws:'F1-ToDoEntry'; operation:'getToDoEntry'; parms:[toDoEntryId:toDoEntryId;]"/>`

Specialized Elements

The operation schema definition makes use of specialized element names in the style of the Hypermedia as the Engine of Application State (HATEOAS) standard. These elements should only be defined by the operation schema as they are not relevant to nor should be managed by the internal operation service.

The following list describes each element and how it is used.

Element Name	Description	Examples
`<_self ... />`	Response payloads may include a "_self" element that contains the endpoint URL of the GET operation related to the entity returned in the response. This is an optional element and only one may exist in an operation schema. Refer to `getOperation=` schema definition attributes for more information.	`<_self getOperation="mo:'TO DO ENTRY';pk1:toDoEntryId;"/>`
`<_link ... />`	Response payloads may include foreign keys and for those entities, the response includes a "_link" element that contains the endpoint URL of the GET operation for that entity (if it exists). Refer to `role=` and `getOperation=` schema definition attribute for more information.	`<_link getOperation="mo:'TO DO ENTRY';pk1:toDoEntryId;"/>`

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Element Name	Description	Examples
<_data ... />	Provides a standard reference to a list of entities in the internal schema. Refer to role="COLL" schema definition attribute for more information.	<alerts role="COLL"> <_link getOperation="... "/> <_data mapTo="alerts"> </_data> </alerts>

Documentation Attributes

The following attributes provide additional documentation for individual elements that is included as part of the web service's Open API specification.

Mnemonic	Valid Values	Description	Examples
helpText=	"help text field name"	Associates an element with a specific help text record defined for the Inbound Web Service. If the element is included in both request and response schema the same help text is used in both. If this attribute is not specified, and a single Help Text Field record exists for the Field associated with the internal element, that help text record is used. If more than one such Help Text Field record exists the one where the help text name is the same as the Field name is used. Note that an internal element is associated with a Field name via the mdField= attributes, if any, else via the mapField= attribute. No valid for _self and _link elements.	<toDoEntryId usage="BOTH" helpText="TD_ENTRY"/> In this example the inbound web service defines a help text field name "TD_ENTRY" that provides help text for this element. The same help text is included for the element in both request and response schema.
helpTextResponse=	"help text field name"	Associates an element that is included in both request and response schema with a specific help text record to be used in the context of the response schema. Follows same rules as the helpText= attribute.	<toDoEntryId usage="BOTH" helpText="TD_ENTRY" helpTextResponse="TD_ENTRY_RESP"/> In this example the inbound web service defines the following help text records: • Help text field name "TD_ENTRY" describes the element sent in the request schema. • Help text field name "TD_ENTRY_RESP" describes the element populated in the response schema.

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Deploying Inbound SOAP Web Services

Once an Inbound SOAP Web Service is defined it is not automatically available to the Web Service Clients to access the system. The Deployment Status and the Active flag (set to true) indicate whether a Web Service is available or not. The last step is to deploy the Inbound SOAP Web Services to the Java EE Web Application Server. This deployment phase has a number of steps that are automatically performed when a deployment is initiated:

- The Web Service files are generated and policies are attached.
- The WSDL is generated with appropriate annotations and enumerations.
- The necessary Java stub code to implement the Web Service in the Java EE Web Application Server is generated and compiled.
- The Web Services are built into a valid Web Application Archive (WAR) file.
- Optionally, the newly created Web Services WAR file is deployed to the Java EE Web Application Server. This can also be done manually for clustered deployments, if desired.

There are two methods available for deploying inbound SOAP web services:

- Deployment at the command line using the **iwsdeploy[.sh]** command as outlined in the Server Administration Guide. This method is recommended for native installations and production implementations.
- Deployment using the Inbound Web Service Deployment portal. This method is only supported in development (non-production) environments.

Inbound Web Service Deployment Portal

To use the online Inbound Web Service Deployment portal, navigate using **Admin**, and then **Integration**, and then **Inbound Web Service Deployment**.

The following sections describe the base zones that are provided on the portal.

Deploy Inbound SOAP Web Services

The Deploy Inbound SOAP Web Services zone provides information about the last deployment. If the region is a development (non-production) region you may use the **Deploy** button to deploy or re-deploy inbound web services. All inbound web services whose Active switch is Yes will be deployed. All whose active switch is No will be undeployed.

> **Note**
>
> When an Inbound SOAP Web Service is deployed, the value of its service revision field is captured. Certain changes to configuration will require re-deployment to take effect. When any of the following changes occur, the IWS service revision value is incremented. This will cause the deployment status to show **Needs Deployment**.
>
> - Active switch is changed
> - An Annotation is added or removed
> - An Operation is added or removed.
> - The Operation Name, Schema Type / Schema Name, Request or Response Schema, Request or Response XSL for an Operation is changed.

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> **Note**
>
> In addition, if the implementation supports XAI services deployed through IWS, the appropriate XAI inbound services will also be deployed or undeployed as required.

Deployment Status

The Deployment Status zone displays a list of inbound SOAP web services in the product, including the deployment status.

The deployment status is determined by comparing the internal Service Revision field on each IWS against the value captured at the time of deployment.

- **Deployed**. Indicates that the IWS has been deployed and no changes have been detected to the configuration.
- **Needs Deployment**. Indicates that the IWS has never been deployed or has been deployed but in the meantime, changes have been detected to the configuration that require redeployment.
- **Undeployed**. Indicates that the IWS is marked as inactive and the IWS is not found to be deployed at this time.
- **Needs Undeployment**. Indicates that the IWS is marked as inactive but the IWS is found to be deployed at this time.

If the IWS has been deployed, the View column will include a **WSDL** link allowing you to launch a separate window to view the WSDL definition.

> **Note**
>
> For cloud installations, the system supports defining the WSDL URI via a substitution value defined for the token URI: @F1_BASE_IWS_URI@. The system will use this value per the functionality described in URI Substitution. When no value is defined, the system uses a default URL, which is the appropriate URL for on-premise installations.

Use the broadcast button adjacent to any of the inbound web services listed in the zone to view the details of the IWS record. This causes the **Inbound Web Service** zone to appear. It is the same zone that appears on the Inbound Web Service maintenance portal.

XAI Inbound Service Deployment Status

The XAI Inbound Service Deployment Status zone is only visible if the feature configuration option **Support XAI Services via IWS** is configured on the **External Messages** feature type or if the system detects that there are XAI inbound services that have been deployed. (The latter condition is checked for the case where an implementation has XAI inbound services deployed and then chooses to discontinue using this functionality. After changing the feature configuration option to false, one more deployment is required to "undeploy" the XAI services.) The zone displays a list of XAI inbound services in the product that are related to page services. Refer to Deploying XAI Inbound Service via IWS for more information.

The deployment status is determined by comparing the record's Version field against the value captured at the time of deployment.

- **Deployed**. Indicates that the XAI inbound service has been deployed and no changes have been detected to the configuration.

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- **Needs Deployment**. Indicates that the XAI inbound service has not been deployed or has been deployed but in the meantime, changes have been detected to the configuration.
- **Undeployed**. Indicates that the XAI inbound service is marked as inactive or the **Support XAI Services via IWS** is not set to **true** and the XAI inbound service is not found to be deployed at this time.
- **Needs Undeployment**. Indicates that the XAI inbound service is marked as inactive or the **Support XAI Services via IWS** is not set to **true** but the XAI inbound service is found to be deployed at this time.

XAI inbound service does not have the equivalent of a Service Revision field that inbound web service has, which is only incremented when changes are made to the record that impact deployment. For XAI inbound service, the version number on the record is used. This field is incremented when any changes are made, even ones that may not impact deployment. As a result, some XAI Inbound Services may indicate "Needs Deployment" in cases where a redeployment may not be necessary. The recommendation when this occurs is to simply Deploy again to be safe.

If the IWS has been deployed, the View column will include a **WSDL** link allowing you to launch a separate window to view the WSDL definition.

Guaranteed Delivery

There are alternatives for sending messages to the system besides using inbound web services. An external system may be able to send messages to the system in a generic manner where a new web service does not need to be defined for every new type of message. These types of messages may provide a payload (the message) and the service script or business service to invoke. An example of this type of communication is a message sent from a mobile application using RESTful operations.

The external system may have no mechanism for retrying failed messages. For this situation, the product provides an algorithm that may be used to capture incoming messages that should "guarantee delivery". A servlet processing this type of message may invoke the installation algorithm - Guaranteed Delivery, passing the details of the message and an indication if a response should be returned. The algorithm is responsible for storing the message information in a table so that it can be subsequently processed.

Outgoing Messages

"Outgoing messages" is the term used to describe messages that are initiated by our system and sent to an external system. Messages may be sent real time or near real time. The system provides the following mechanisms for communicating messages to external systems.

- **Outbound Messages.** This method allows implementers to use configurable business objects to define the message format and to use scripts to build the message. If sent near real-time the message is posted to the outbound message table waiting for Oracle Service Bus to poll the records, apply the XSL and route the message. If sent real time, the message dispatcher routes the message immediately.
- **Web Service Adapters.** Using a web service adapter, an implementation can consume a WSDL from an external system and create an "adapter" record that references the URL of the external system and creates appropriate request and response data areas to expose the payload information in a format understood by configuration tools. A script may then be written to build the request information and initiate a real-time web service call from within the system.

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- **Send Email.** The system supplies a dedicated business service that may be used to send an email real-time from within the application.

All these methods are described in more detail in the following sections.

- Outbound Messages
- Web Service Adapters
- Sending Email

Outbound Messages

Outbound messages provide functionality for routing XML messages to an external system real-time or in near real time. In addition the functionality supports collecting related messages into a batch to then be sent to an external system as a consolidate XML message.

For each outbound message that your implementation must initiate you define a business object for the outbound message maintenance object. Using the business object's schema definition, you define the fields that make up the XML source field. These are the fields that make up the basis for the XML message (prior to any XSL transformation).

Each outbound message requires the definition of its schema by creating a business object whose schema describes the information that is provided to the external system. An XSL transformation may then be performed when routing the message to an external system.

For each external system that may receive this message, you configure the appropriate message XSL and routing information.

Because the outbound message type is associated with a business object, your implementation can easily create outbound message records from a script using the **Invoke business object** step type. Such a script would do the following:

- Determine the appropriate outbound message type and external system based on business rules
- Access the data needed to populate the message detail
- Populate the fields in the schema and use the **Invoke business object** script step type for the outbound message type's business object to store the outbound message.
- The resulting outbound message ID is returned to the script and the scriptwriter may choose to design a subsequent step to store that ID as an audit on the record that initiated this message.

The following topics provide more information about functionality supported by outbound messages.

- Polling Outbound Messages Using OSB
- Batch Message Processing
- Real Time Messages
- Designing the System for Outbound Messages
- Configuring the System for Outbound Messages
- Managing Outbound Messages

Polling Outbound Messages Using OSB

If the outbound message that needs to be sent to an external system can be sent as an asynchronous message (in 'near real time'), the process initiating the outbound message

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should create a record in the outbound message staging table. Oracle Service Bus (OSB), is the recommended tool to use to process outbound messages in near real-time.

Outbound messages that should be processed by OSB should be configured with a processing method defined as **SOA** for the external system / outbound message type. No other information is required for defining outbound message types that are processed by OSB.

For the OSB part of the processing, the product provides a custom transport: OUAF Outbound Message that may be used by an implementation to define messages to process and how to process them. This transport processes outbound messages in order of the priority defined on the outbound message type.

This section provides an overview of steps required to develop OSB integrations for outbound messages created by your product.

Before developing OSB integrations, a developer should be familiar with OSB development such as creating proxy services, business services, and message flow/routing. These terms are defined as follows:

Proxy Service: In OSB, a Proxy Service is the entity that processes a given type of message and routes it to a Business Service. A separate proxy service should be defined for each type of outbound message. If a given outbound message type may be routed to different external systems, it is the responsibility of the proxy service to query the external system defined on the outbound message and invoke the appropriate business service (see below). If any transformation is required prior to routing a message to a business service, it is the proxy service's responsibility to perform the transformation.

Business Service: In OSB, a Business Service is an entity that receives a message from OSB and routes it to the appropriate destination. This should not be confused with the Business Service object provided in the product in the configuration tools.

NOT_SUPPORTED

Refer to the technical reference paper *OSB Integration* for more information.

Batch Message Processing

Your implementation may be required to send messages to the same destination as a single XML file with multiple messages include. The following points describe this logic:

- The individual messages that should be grouped together must have a processing method of **batch** on the external system / outbound message type record. The appropriate batch code that is responsible for grouping the messages must also be provided.
- A separate "consolidated message" outbound message type should be configured for the external system with a processing method of **SOA**.
- When outbound message records are created for the individual messages, the batch code and current batch run number are stamped on the record.
- When the batch process runs it is responsible for building the XML file that is a collection of the individual messages. This batch process should include the following steps:
  - Format appropriate header information for the collection of messages
  - Apply the individual message XSL to each message before including the message

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  - Insert a new outbound message for the external system with the "consolidated message" outbound message type.
- The consolidated message is ready to be processed by Oracle Service Bus.

> **Note**
>
> **No process provided**. The system does not supply any sample batch job that does the above logic.

Real Time Messages

The system supports the ability to make web service calls, i.e. sending real time messages, to an external system.

The system supports special functionality for sending an Email message real-time. Refer to Sending Email for more information.

For other types of real-time messages, the system also uses outbound message type and external system configuration to format and route the message. When defining the configuration for real time messages, an additional step is required to define the mechanism for routing the message using a message sender. The system supports routing messages via HTTP and via JMS. Note that for HTTP routing, the system also supports sending the message using a JSON format.

Just like near real-time messages, initiating a real-time outbound message may also be done from a script. When a real time message is added, the system immediately routes it to the external system. If the external system provided a response message back, the system captures the response on the outbound message. If the outbound message type for the external system is associated with a response XSL it is applied to transform the response. In this case the system captures the raw response as well on the outbound message. Note that the outbound message BO should be configured to capture a response XML in its schema.

Any error (that can be trapped) causes the outbound message to be in a state of **Error**. It is the responsibility of the calling process to check upon the state of the outbound message and take a programmatic action. When the outbound message state is changed back to **Pending** the message will be retried.

The base package provides two business services: Outbound Message Dispatcher (`F1-OutmsgDispatcher`) and Outbound Message Mediator (`F1-OutmsgMediator`) that further facilitate making web service calls. Both business services are similar, allowing the calling script to configure the following behavior (with differences noted):

- Whether or not exceptions encountered while sending the message are trapped. Trapping errors allows the calling script to interrogate any errors encountered and take some other programmatic action.
- Whether or not the sent message is persisted as an actual outbound message record.
  - If a persisted message is desired, the recommendation is to use the Outbound Message Dispatcher. This business service creates the message using standard BO processing, relying on the outbound message logic to route the message and store the record. The message is routed after the BO pre-processing algorithm and after the record is persisted but before the BO post-processing and audit plug-ins are executed. If you need to send the outbound message ID as part of the message, refer to Capturing the Outbound Message ID in the Message for more information.

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- If the message should not be persisted, then the recommendation is to use the Outbound Message Mediator. As mentioned, the Outbound Message Dispatcher creates the outbound message record, relying on the outbound message logic to route the message. If it should not be persisted, it is subsequently deleted. In contrast the Outbound Message Mediator executes the BO pre-processing algorithms and then routes the message explicitly without creating a message record. It is more efficient for scenarios that don't require persistence. Note that the Outbound Message Mediator also supports persistence, but it does so by creating the records without using BO processing. This is not recommended. The Dispatcher is the better option if persistence is desired.

Refer to the descriptions of the two business services for more information.

- OAuth Configuration

OAuth Configuration

This section describes the various OAuth Grant Types supported by the system and highlights any special steps needed when using the grant type for a given use case. The information here is used to correctly configure the message sender context for senders that need this authorization type.

The following context entries apply to all OAuth grant types.

- **OAuth Access Token URL**
- Either the **OAuth Client Credentials Key Ring** or the **OAuth Client ID** and **OAuth Client Secret**. Refer to OAuth Configuration for more information about defining OAuth key rings.
- **OAuth REST API Scope**
- **OAuth Token Request Details in Body**

Client Credentials

The client credentials grant type requests the access token using the client ID and secret credentials as defined above.

JWT Assertion

The system supports both the JWT client assertion grant type and the JWT user assertion grant type. Client assertion proves the identity of the application making the request. User assertion, is for use cases where the specific application end-user is making the request.

Besides the context values applicable for all OAuth grant types, the JWT grant types also requires the following:

- **OAuth Signature Key Ring**. This defines the public / private signature key pair used to sign the assertion. Note that a prerequisite step required for contacting Oracle Identity Cloud Service is to upload a certificate based on this key.
- OAuth JWT Audience

Designing the System for Outbound Messages

The following sections describe the setup required when using Outbound Messages to communicate with an external system. The configuration walks you through the steps to configure a single external system and all its messages.

- Define the Outbound Message Business Object and Type

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- Real-Time Message Configuration
- Define the External System and Configure the Messages
- Outbound Message Schema Validation

Define the Outbound Message Business Object and Type

The product supplies many outbound message Business Objects along with Outbound Message Types for out of the box functionality.

In addition, implementations may need to define configuration for custom outbound messages. For each outbound message that must be sent to an external system, create a business object for the outbound message maintenance object. Using the business object's schema definition, your implementation defines the elements that make up the XML Source field (XML_SOURCE). These are the elements that are the basis for the XML message. XSL transformations may be applied to this XML source to produce the XML message.

If your integration is real-time and a response is expected, the Outbound Message business object should also map to the XML Response field (XML_RESPONSE).

- You may decide to capture the response as is and define the element as “raw”. For example

  ```
  <responseDetail mapXML="XML_RESPONSE" type="raw"/>
  ```

  In this scenario, a Response XSL may or may not be needed.
- Alternatively, if the details of the response are needed, you may define specific elements for the response. For this option, depending on how the integration is designed, a Response XSL may be needed to transform the response into the expected XML format.

Once you have your business object and schema, define an outbound message type for each unique outbound message.

Referencing an XSL

The system supports defining the XSLs as a managed content record. For backward compatibility, the system supports defining the XSL as a file in the file system. This is a system wide setting, defined using a feature configuration option. The feature type is **External Messages** and the option type is **XSL Location**. Set the value to `F1FL` to support XSL in the file system. The file location is configured using a system property. To support the XSL in managed content, no option is needed as this is the default. You may explicitly define the value of `F1MC` if desired.

Capturing the Outbound Message ID in the Message

If your integration would like to use the system generated Outbound Message ID as a unique identifier with the external system, the following configuration is needed:

- Define an element within the XML Source that should be populated with the system generated outbound message.
- Configure a BO Option on the outbound message’s business object using the Option Type **Outbound Message ID XPath** and set the Option Value to the XPath of the element defined to capture the ID.

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> **Note**
>
> This functionality is only applicable if the outbound message is persisted.

Support for Dynamic URLs

The product supports the ability to build a dynamic URLs. These are cases where the URL requires information determined at runtime. This is supported with a combination of BO schema definition, URL configuration and appropriate code when creating the outbound message. The following points highlight the steps needed to support this functionality.

- When defining the Message Sender's URL, use the syntax `${pathParms}` in the location of the URL where runtime information must be inserted. For example: `http://[SERVER_NAME]:1000/rest/services/${pathParms}`
- Include the data area `F1-OM-DynamicConfig` (Outbound message dynamic configuration) in the schema of the business object for the outbound message. This data area includes elements for **pathParms** and **queryParms**.
- In the code that creates the outbound message, populate the **pathParms** and if applicable **queryParms** elements with the appropriate information. The system will build the URL by plugging in the **pathParms** element value followed by a question mark, followed by the **queryParms** element value into the `${pathParms}` location in the URL.

The following is an example of run time values.

```
<dynamicConfiguration>
 <pathParms>job/1234</pathParms>
 <queryParms>firstName=John&lastName=Doe</queryParms>
<dynamicConfiguration>
```

Dynamic HTTP Headers

HTTP headers are typically static and the HTTP message senders support defining this static information as sender context. However, it is possible to support HTTP header information that may differ based on the individiual message and can only be provided at runtime. The following points highlight the steps needed to support this functionality.

- Include the data area `F1-OM-DynamicConfig` (Outbound message dynamic configuration) in the schema of the business object for the outbound message. This data area includes the list element **httpHeaders**, which supports a list of **httpHeader** elements.
- In the code that creates the outbound message, populate each 'header-key:header-value' pair that you want included in the HTTP header in the outgoing message. For example:

  ```
  move 'Lang:CHN' to "CM-RealTimeMessage/dynamicConfiguration/+httpHeaders/
  httpHeader";
  ```

Add SOAP Header Parameters at Runtime

The product supports the ability to add SOAP header parameters to an external message at runtime. The following points highlight the steps needed to support this functionality.

- Include the data area `F1-OM-DynamicConfig` (Outbound message dynamic configuration) in the schema of the business object for the outbound message. This data area includes the element **soapHeaders** .

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- In the code that creates the outbound message, populate the **soapHeaders** element with the self contained XML to add to the SOAP header section of the outgoing SOAP request.

Real-Time Message Configuration

Messages are routed to an external system real-time using the outbound message dispatcher or using the real-time send email business service. The system supports routing messages using HTTP and routing messages using JMS. In addition, there is a special type of message sender used for sending emails. The following sections highlights the supported real-time communication and the configuration needed for each.

Email Messages

For sending emails, the following configuration is needed:

- Define a message sender configured for email. Senders of this type should be configured with the **RTEMAILSNDR** class. The sender context is used to configure the connection information for the connecting to the SMTP server.
- This sender may be defined as the default email sender on the message option table. Alternatively, the message sender can be provided to the business service as input. Refer to Sending Email for more information.

Outbound Messages

For other outbound messages that are routed using the real-time outbound message dispatcher, a message sender must be configured to define how to route the message. The following points highlight more detail related to this configuration.

Determine the communication mechanism prior to configuring the sender.

- When routing the message using JMS, the following configuration must be defined
  - Define an appropriate JNDI Server that indicates where the JMS resources are located.
  - Define a JMS Connection to define additional configuration needed for the connection.
  - Define the JMS Queue or JMS Topic to define the queue or topic to use.
- When communicating using a JSON format, determine the method to use to convert the XML to JSON. The desired method is driven by how the request should be sent.
  - If choosing the **Base JSON Conversion** method, if XSL transformation needs to be applied prior to the conversion to JSON, then the target XML Request Schema must be defined (using a data area) so that the conversion logic knows the format of the XML it is converting. The XSL is applied to the outbound message's XML Source, resulting in the defined XML Request Schema, which is then converted to JSON. If XSL transformation is not required, then the outbound message's XML Source is converted to JSON.
  - If choosing the **Rootless JSON Conversion** method, the group element mapped to the XML source field is removed by the conversion, resulting in a rootless JSON request document.
  - If the XML source on the outbound message can be converted to JSON using an XSL, then the **XSL Transformation** method may be chosen.
  - You may also choose to convert the XML Source to JSON via the **Standard API Conversion** method (using a Jettison library). With this method, an XSL may optionally be provided. The conversion will be performed on the transformed XML.

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- For the response, if the outbound message BO defines detailed elements for the XML Response field, then the JSON should be converted to this format.
    - If your conversion method is **Base JSON Conversion**, then if the JSON response cannot be converted directly to the XML Response elements on the outbound message BO, then define a Response Schema (data area) that represents the results for the base JSON conversion. In addition, define an XSL that can transform the response from the converted XML to the XML format expected on the BO.
    - If your conversion method is **Rootless JSON Conversion**, the response document is assumed to be rootless. The group element mapped to the XML response field is added by the conversion process, resulting in a well formed XML response document.
    - If the conversion method is **Standard API Conversion** or **XSL Transformation**, the standard API is used to convert JSON to XML. An XSL may be defined to convert the response to the XML Response if needed.
- If the outbound message BO defines a "raw" element to capture the response, then a response schema and XSL are not necessary. In this case, the system will perform a JSON to XML conversion using the **Standard API Conversion** method (regardless of the conversion method defined) and the result is captured in the XML response.

- For HTTP senders including JSON senders, the system provides the following support for sending messages secured by OAuth authentication:
    - Using Oracle Web Services Manager (OWSM). The system provides a pre-configured set of policies for OAuth (`F1-OAUTH`) using a special extendable lookup. Note that the values of this policy set defines a specific CSF key repository that the implementation should use for capturing its CSF keys. In addition, there is a substitution value defined for the token URI: @F1_OAUTH2_URI@. Configure the appropriate URI for this implementation as described in URI Substitution. By default the system does not support additional policy sets to be defined. If your implementation requires a different policy set, contact support.
    - You may provide OAuth related settings as part of the message sender configuration for a REST API.

Define a message sender configured for each appropriate routing method. The invocation type should be configured as `Real-time`. For routing via HTTP, use the **RTHTTPSNDR** - HTTP sender class. For routing via HTTP with SOAP format automatically applied, use the **SOAPSNDR** - HTTP SOAP sender class. For routing via HTTP using JSON format, use the **RTJSONSNDR** - JSON sender class. For routing via JMS, use the **RTJMSQSNDR** - JMS queue sender class or **RTJMSTSNDR** - JMS topic sender class and configure the JMS Connection and JMS Queue or JMS Topic. Use the sender context to configure the required values for connecting to the appropriate destination.

> **Note**
>
> Refer to Support for Dynamic URLs for configuration needed to support dynamic URLs when sending an outbound message. There is specific configuration expected when defining the URL on the Sender in order to support dynamic URLs.

Configure the external system / outbound message type collection. The processing method defined for the external system / outbound message type must be `Real-time`.

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Define the External System and Configure the Messages

Define an external system and configure the valid outgoing messages and their method of communication (processing method). Refer to Outbound Messages for more information.

Outbound Message Schema Validation

The outbound messages that are generated by the system should be well formed and valid so that they do not cause any issues in the external system. To ensure this validity you may configure the system to validate messages before they are routed to their destination. Note that the validation is applied just before communication with the sender and therefore after any Request XSL has been applied.

- Define a directory where the valid W3C schemas are located using the Message option **Outbound Message Schema Location**.
- Each external system message must indicate the appropriate W3C schema to use for validation.

You may turn on or off this validation checking using the Message option **Schema Validation Flag**.

This feature is not supported for cloud implementations.

Configuring the System for Outbound Messages

The following sections describe the setup required when using Outbound Messages to communicate with an external system.

- JNDI Server
- JMS Connection
- JMS Queue
- JMS Topic
- Message Sender
- Defining Outbound Message Types
- External Systems
- Message Option

JNDI Server

If using JMS to communicate outbound messages, define a new JNDI Server. Open **Admin**, and then **Integration**, and then **JNDI Server**.

Description of Page

Enter a unique **JNDI Server** and **Description**.

Indicate the Provider URL to indicate the location of the JNDI server. A variable may be used in place of all or part of the URL. The variable must be predefined in the substitution variable property file. The value here should enclose the variable name with @. Refer to Referencing URIs for more information.

Indicate the **Initial Context Factory**, which is a Java class name used by the JNDI server provider to create JNDI context objects.

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JMS Connection

To define a JMS Connection, open **Admin**, and then **Integration**, and then **JMS Connection**.

Description of Page

Enter a unique **JMS Connection** and **Description**.

Indicate the **JNDI Server** to be used. Refer to JNDI Server for more information.

Use the **JNDI Connection Factory** to indicate the lookup keyword in the JNDI server used to locate the JMS connection.

Where Used

JMS Queue

To define your JMS Queue values, open **Admin**, and then **Integration**, and then **JMS Queue**.

Description of Page

Enter a unique **JMS Queue** and **Description**.

Enter the **Queue Name** as defined in the JNDI server. This is the JNDI lookup name identifying the queue.

Use the **Target Client Flag** to indicate whether or not the target client is **JMS** or **MQ**.

Select the **JNDI Server** where the queue is defined. Refer to JNDI Server for more information.

JMS Topic

To define your JMS Topic values, open **Admin**, and then **Integration**, and then **JMS Topic**.

Description of Page

Enter a unique **JMS Topic** and **Description**.

Select the **JNDI Server** where the topic is defined. Refer to JNDI Server for more information.

Enter the **Topic Name** as defined in the JNDI server. This is the JNDI lookup name identifying the topic.

Message Sender

The topics in this section describe the maintenance of a message sender

- Message Sender - Main
- Message Sender - Context

Message Sender - Main

To define a new sender, open **Admin**, and then **Integration**, and then **Message Sender.**

Description of Page

Enter a unique **Message Sender** and **Description**.

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> **⚠ Caution**
>
> Important! When adding new records, carefully consider the naming convention of the message sender code. Refer to System Data Naming Convention for more information.

Set **Invocation Type** to `Real-time`.

Indicate the **Message Class** for this sender, which indicates the method used to route the message. The valid sender classes are as follows:

Message Class	Description
RTEMAILSNDR	Email sender.
RTHTTPSNDR	HTTP sender.
RTJMSQSNDR	JMS queue sender.
RTJMSTSNDR	JMS topic sender.
RTJSONSNDR	HTTP JSON sender.
SOAPSNDR	HTTP SOAP sender.

> **ⓘ Note**
>
> For backward compatibility, the sender class HTTPSNDR is also supported, but should only be used if indicated by a specific integration configuration.

Indicate whether or not this sender is currently **Active**.

For JMS related senders, indicate whether the **Message Encoding** is **ANSI message encoding** or **UTF-8 message encoding**. (Note that for all other types of senders, the Character Encoding context type is used to configure encoding.)

If the Message Class is one that connects to a JMS Queue or JMS Topic, indicate the appropriate **JMS Connection**

> **NOT_SUPPORTED**
>
> Refer to JMS Connection for more information.

If the Message Class is one that connects to a JMS queue, indicate the name of the **JMS Queue** to define where the message is to be sent.

> **NOT_SUPPORTED**
>
> Refer to JMS Queue for more information.

If the Message Class is one that connects to a JMS topic, indicate the name of the **JMS Topic** to define where the message is to be sent.

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NOT_SUPPORTED

Refer to JMS Topic for more information.

Message Sender - Context

The sender may require context information to define additional information needed by the system to successfully send outgoing messages. Open **Admin**, then **Integration**, then **Message Sender** and navigate to the **Context** page.

Description of Page

Define the **Context Type** and **Context Value**, which contain parameters for senders when more information is required. See below for the supported context values for different types of senders.

Email Sender Context

The email sender is used by the business service that sends email messages real-time.

An email sender must point to the Message Class **RTEMAILSNDR**. In addition, the following context records should be defined for senders of this type.

Context Type	Description
SMTP Host name	The SMTP server host name.
SMTP Username	The user ID used to access the SMTP server.
SMTP Password	The password used to access the SMTP server.
SMTP From Address	The email address to use in the "from" field when sending the email.
SMTP TLS Enable	Set to 'true' or 'Y' to send emails using the Transport Layer Security (TLS) protocol.
Response Time Out	The amount of time the system should wait for a real time response.

Once you have your email senders defined, configure on Message Option the default email sender to use when an explicit email sender is not defined.

HTTP Sender

An HTTP sender is one that sends messages to an HTTP server using the HTTP protocol. HTTP senders should reference a Message Class of **RTHTTPSNDR**, **RTJSONSNDR** or **SOAPSNDR**. (Note that your implementation may use a specific integration that requires the **HTTPSNDR** message class. It should only be used if indicated that the integration's documentation.)

Various parameters are required to establish a session with the target HTTP server. You specify these parameters by defining a collection of context values for the sender. A set of context types related to HTTP variables is provided with the product. The following section describes the context types and where appropriate, indicates valid values.

Before defining the HTTP sender, you need to find out how the HTTP server on the other side expects to receive the request, and in particular, to answer the following questions:

- What is the address of the HTTP server?
- Is the HTTP server using a POST or GET HTTP method?

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- If the server is using POST, how are message contents passed? Does it use an HTTP FORM or does it pass the data in the body of an XML message?

Context Type	Description	Values
HTTP URL1 - URL9	Used to construct the URL of the target HTTP server. Since the URL may be long and complex, you can break it into smaller parts, each defined by a separate context record. The full URL is built by concatenating the values in URL1 through URL9. You may use substitution variables when entering values for URL parts. Note that the substitution string `@XMLMSG@` may be used for **GET** calls if an XSL has been applied to convert the message into HTTP GET parameters. It is useful if the HTTP Form is not applicable to the type of message. Refer to Support for Dynamic URLs for configuration needed to support dynamic URLs when sending an outbound message.	
HTTP Method	The HTTP method used to send the message. **Note** The SOAP sender message class **SOAPSNDR** only supports the **POST** method.	**POST** or **GET**

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Context Type	Description	Values
HTTP Transport Method	Specifies the type of the message. You can either send the message or send and wait for a response. For either method, be sure to set the HTTP Timeout parameter.	**Send** or **sendReceive**
HTTP Form Data	Used when the message is in the format of an HTML Form (`Content-Type: application/x-www-form-urlencoded`). This context specifies the form parameters (data) that should be passed in the HTTP message. Since a form may have multiple parameters, you should add a context record for each form parameter. The value of a form parameter takes the format of *x*=*y* where *x* is the form parameter name and *y* is its value. If *y* contains the string @XMLMSG@ (case sensitive) then this string is replaced by the content of the service response XML message. The @XMLMSG@ string can be used in the HTTP Form Data or in the HTTP URL, but not in both. If a context record of this type is defined for a sender, the sender uses the HTML Form message format to send the message even if @XMLMSG@ is not specified in one of the context records. If a context record of this type is not defined for a sender, then the XML is sent with `Content-Type: text/plain`. When using POST it is put in the HTTP message body. Always required when using the GET method. If you are using the GET method and do not specify a Form Data context record, no message is transferred to the HTTP server. You may use substitution variables when entering values for Form Data.	

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Context Type	Description	Values
HTTP Login User	The HTTP server may require authentication. Add a context record of this type to specify the login user to use.	
HTTP Login Password	The HTTP server may require authentication. Add a context record of this type to specify the login password to use.	
HTTP Header	Sometimes the HTTP server on the other side may require the addition of HTTP headers to the message. For each HTTP header that has to be specified you should add a context record with a value having the following format *x:y* where *x* is the header name and *y* is the value for the header **Note** The product also supports Dynamic HTTP Headers that may be included in the message at runtime.	

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Context Type	Description	Values
HTTP Time Out	Indicates the amount of time to wait for a connection to be established with the remote system. Be sure to indicate something here, otherwise users may wait a long time if an external system is not responding.	
Character Encoding	Indicates if the message should be encoded. The sender will add to the HTTP's content type header the string `;charset=x` where *x* is the value of this context and when sending the message it will encode the data in that encoding.	`UTF-8` or `UTF-16`
Response Time Out	The amount of time the system should wait for the remote system to send a response.	

When sending messages, authorization is important. The following context types are related to authorization.

Context Type	Description	Values
Sender Security Type	Indicate the desired security type to apply. (Note that additional security types are applicable only to the SOAP Sender. See below for more information.)	**BASIC** (HTTP Basic), **TEXT** (Username Token plain text), **DIGEST** - Username Token Digest, **OWSM** - OAuth Security via OWSM, **OAUTH** - OAuth Security.
OWSM Policy Set	Applicable only if the Sender Security Type is **OWSM**. Defines the policy set to apply.	Enter a valid value for the extendable lookup Set of Policies (`F1-SetOfPolicies`). The product provides the value `F1-OAUTH` that may be used here.
OAuth Grant Type	Applicable only if the Sender Security Type is **OAUTH** . Defines the OAuth specification method for acquiring an access token. Refer to OAuth Configuration for more information on defining OAuth security types.	`client_credentials`, `jwt_user_assertion`, `jwt_client_assertion`
OAuth Access Token URL	Used to construct the URL of the target authorization server. You may use substitution variables to construct the URL.	
OAuth Client ID	The generated identifier for the current application in the external system's authorization server.	

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Context Type	Description	Values
OAuth Client Secret	The secret paired with the OAuth Client ID as provided by the external system's authorization server.	
OAuth Client Credentials Key Ring	Defines the key ring used to store the OAuth Client ID and secret provided by the external system's authorization server. If a key ring is specified, the OAuth Client ID and OAuth Client Secret context entries are not allowed.	
OAuth JWT Audience	This is applicable when the OAuth Grant Type is one of the JWT assertion types. If populated, it is used as the JWT audience (aud) claim. If not provided, the OAuth Token URL is used as the audience.	Example: `https://identity.oraclecloud.com/`
OAuth REST API Scope	The authorization level requested from the token end point.	
OAuth Signature Key Ring	This key ring is applicable when the OAuth Grant Type is one of the JWT assertion types. It is used to sign the JWT request sent to the Identity Cloud Service.	
OAuth Token Request Details in Body	By default, the authorization token request includes the Client ID and Secret information in the message header. This context type may be used to indicate that this information should be sent in the body of the request instead.	Set this to 'Y' to send the Client ID and Secret information as part of the body of the authorization token request.

Real-time HTTP Sender

The following context type is only applicable to senders with the **RTHTTPSNDR** message class.

Context Type	Description
Content Type	Populate a value here to override the `Content-Type` attribute in the HTTP header, which defaults to `text/xml` .

SOAP Sender

A SOAP sender is an HTTP sender that automatically adds support for the SOAP format. For this type of sender (message class of **SOAPSNDR**), besides the context values listed above, the following context entries may also be supplied.

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Context Type	Description	Values
Message Namespace URI	Used to indicate a specific namespace to be included in messages for this sender. Note that this value is used only when the External Message link to this sender is configured with a **Namespace Option** of **Configured on Sender**.	
SOAP Insert Timestamp	Indicate whether a timestamp should be added. Default value is 'N'.	Y or N
SOAP Expiration Delay (in seconds)	Indicate an expiration delay to add to the timestamp. The default value is 60.	
Sender Security Type	Additional security types are supported for SOAP senders for specific third party integrations.	**CIM** - Uses an appropriate namespace and adds security information in the SOAP header specific to Landis+Gyr, MS_V30 - Uses an appropriate namespace and adds security information in the SOAP header specific to MultiSpeak v3.0, MS_V41R - Uses an appropriate namespace and adds security information in the SOAP header specific to MultiSpeak v4.1.**ITRON** - Uses appropriate SOAP header information security information in the SOAP header specific to Itron.

> **Note**
>
> Refer to Add SOAP Header Parameters at Runtime for information about dynamically including SOAP Header parameters when sending a message.

JMS Sender

A JMS sender is one that sends messages to a JMS queue or JMS topic. JMS senders should reference a Message Class of **RTJMSQSNDR** or **RTJMSTSNDR**, respectively.

The following parameters are used to connect to the JMS resource.

Context Type	Description	Values
JMS Message Type (Bytes(Y)/ Text(N)	Indicates whether the data is sent as a bytes message or as a text message.	Y or N

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Context Type	Description	Values
JMS User Name	Enter the user name to connect to the JMS resource.	
JMS User Password	Enter the password to use to connect to the JMS resource.	
JMS Header	If JMS header values are required for the message, use this context type. For each JMS header that has to be specified, add a context record with a value having the following format *x:y* where *x* is the header name and *y* is the value.	

Application Variables

Some APIs may require application identifying variables to be included in the message payload. These values are typically available at provisioning time and need to be captured in relation to these API configurations.

> **Note**
>
> This type of context is not involved in the process of orchestrating and routing the API call. It needs to be incorporated into the payload by the application logic that composes the message using the "Get Application Variables (F1MsgVars)" service script.

The following parameters may be used to capture application variables.

Context Type	Description	Values
Application ID	Identifies the current environment for this API.	Determined at provisioning time by the API provider.
Tenant ID	Identifies the current tenant for this API.	Determined at provisioning time by the API provider.

Defining Outbound Message Types

Refer to Outbound Messages for an overview of this functionality.

Use this page to define basic information about an outbound message type. Open this page using **Admin Menu**, then **Integration**, then **Outbound Message Type.** You are brought to a query portal with options for searching for outbound message types.

> **Note**
>
> This page is not available if the **External Message** module is turned off.

Once an outbound message type has been selected, you are brought to the maintenance portal to view and maintain the selected record.

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The following zones may appear as part of the portal's **Main** tab page.

- **Outbound Message Type.** This zone provides basic information about an outbound message type. Besides the code and description, the outbound message type captures the outbound message business object and the relative priority of the outbound message. The priority is only applicable if the outbound message is processed using OSB. In addition, if the outbound message type is linked to any web service categories, they are displayed.

> ⚠ **Caution**
>
> Important! When adding new records, carefully consider the naming convention of the outbound message type code. Refer to System Data Naming Convention for more information.

- **External System Links.** This zone is visible if the outbound message type is linked to any external systems.

Note that in addition to standard actions available on this portal, there is also a special **Add to Category** button in the page action area. Click this button to link an outbound message type to one or more web service categories.

The following zones may appear as part of the portal's **Help Text** tab page.

- **Help Text Fields.** This zone maintains help text information for fields associated with the outbound message business object.

> ⓘ **Note**
>
> Help text is not translated.

External Systems

Use this page to define an external system and define the configuration for communication between your system and the external system.

- External System - Main
- External System - Template Use

External System - Main

Open this page using **Admin**, and then **Integration**, and then **External System.**

> ⓘ **Note**
>
> This page is not available if both the **External Message** and the **Open Market Interchange** modules are turned off.

Description of Page

Enter a unique **External System** and **Description**.

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> **⚠ Caution**
>
> Important! When adding new records, carefully consider the naming convention of the external system code. Refer to System Data Naming Convention for more information.

Use the field **Our Name In Their System** to specify the identity of your organization (i.e., your external system identifier) in the external system.

> **ⓘ Note**
>
> The workflow process profile and notification download profile are only applicable to products that support workflow and notification. They and are not visible in the product if the **Open Market Interchange** module is turned off.

If this external system sends inbound communications through notification upload staging, the type of workflow process that is created is controlled by the sender's **W/F (Workflow) Process Profile**.

If you send notifications to this external system, select a **Notification DL** (download) **Profile** that is used to define the configuration of the outgoing messages.

> **ⓘ Note**
>
> The remaining fields are not visible if the **External Message** module is turned off.

Set **Usage** to **Template External System** for external systems whose outbound message type configuration is inherited by other external systems.

If the outbound message type configuration should be inherited from a template external system, define the **Template External System**. If this field is specified, the outbound message type collection displays the data defined for the template system as display-only.

The **Outbound Message Type** accordion contains an entry for every type of outbound message defined for this external system. For each type of outbound message identify its **Outbound Message Type**.

Define the **Processing Method** for messages of this type. Valid values are **Batch**, `Real-time`, **SOA** and **XAI**.

Define an appropriate **Message Sender** if the processing method is **XAI** or `Real-time`.

Refer to Exchanging Date / Time Information With External Systems for more information about date/time formats.

Namespace Option is used when your message should include a namespace in the resulting XML. The valid option are **Standard Namespace** and **Configured on Sender**. If the value is Standard Namespace, the system will generate a namespace for the resulting WSDL with the following value: `http://ouaf.oracle.com/outbound/boName`, where boName is the business object code of the outbound message (configured on the outbound message type defined for this profile). If the value is Configured on Sender, then the value of the namespace is taken from the sender context with context type **Message Namespace URI**.

Define an appropriate **Batch Control** if the processing method is **Batch**.

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If the message sender is one with a message class of **RTJSONSNDR**, indicate the **JSON Conversion Method**. The valid values are **Base JSON Conversion**, **Standard API Conversion** and **XSL Transformation**. Refer to Real Time Message Configuration for more information about these methods and the additional configuration that may be applicable.

If the **JSON Conversion Method** is **Base JSON Conversion**, the **Request Schema** is enabled. Populate a data area that defines the schema for the XML format to convert the outbound message's BO schema to prior to performing the JSON conversion. Refer to Real Time Message Configuration for more information.

The **Message XSL** is the schema used to transform information from the format produced by the system to a format understood by the sender, who receives a message of this type. This is not applicable for Processing Method of **SOA**. Refer to Referencing an XSL for information about configuring where the XSL is defined.

Enter the file name of the appropriate **W3C Schema** if you want to validate the message built for outbound messages for this external system / outbound message type prior to being routed to their destination. Refer to Outbound Message Schema Validation for more information. This is not applicable for Processing Method of **SOA**. This feature is not available for cloud implementations.

If the **JSON Conversion Method** is **Base JSON Conversion**, the **Response Schema** is enabled. Populate a data area that defines the schema for the XML format that the JSON message is initially converted to. The XML is then converted to BO XML. Refer to Real Time Message Configuration for more information.

Response XSL will only be displayed when the processing method is `Real-time`. Refer to Real Time Messages for more information on how it is used. Refer to Referencing an XSL for information about configuring where the XSL is defined.

External System - Template Use

If you are viewing an external system whose usage is a **Template External System**, use this page to view the other external systems that reference this one. Open this page using **Admin**, and then **Integration**, and then **External System** and then navigate to the **Template Use** tab.

Description of Page

The tree shows every external system that references this external system as its template.

Message Option

The Message Option page defines various system settings used by the system when processing external messages.

To define options for your environment, open **Admin**, and then **Integration**, and then **Message Option**.

Description of Page

The following options are supported.

Option	Description	Option Name
Default Email Sender	This is the default Message Sender used for sending e-mails when no explicit Message Sender is specified.	`defaultEmailSender`

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Option	Description	Option Name
Default User	The default user is used by the system to access your product when no other user is explicitly specified.	`defaultUser`
Email Attachment File Location	This is the default location of e-mail attachment files. If not specified, the e-mail service provided with the product assumes a full path is provided with each attachment file.	`emailAttachmentFileLocation`
Email XSL File Location	This is the default location of e-mail XSL files. If not specified, the e-mail service provided with the product assumes a full path is provided to an XSL file as part of an e-mail request.	`emailXSLFileLocation`
Messages Language	The default language to use for the messages.	`language`
Outbound Message Schema Location	Enter the full path of the virtual directory where valid W3C schemas are stored if your implementation wants to validate outbound message schemas. For example: http:/localhost/cisxai/schemas.	`xaiOuboundSchemaLoc`
Schema Validation Flag	Enter `Y` to turn on schema validation for outbound messages. Enter `N` to turn this off.	`xaiSchemaValidationCheck`

Note that the following options are no longer applicable.

Option
To Do Type for Inbound JMS Message Errors
To Do Type for Outbound Message Errors
XSD Compliance

Managing Outbound Messages

Use this page to view information about outbound messages.

- Outbound Message - Main
- Outbound Message - Message
- Outbound Message - Response

Outbound Message - Main

Open this page using **Menu**, and then **Integration**, and then **Outbound Message**.

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Description of Page

Outbound Message ID is the system-assigned unique identifier of the outbound message. These values only appear after the outbound message is added to the database.

The **Processing Method** indicates whether this record will be processed by a **Batch** extract process or `Real-time`. (The value of **XAI** is no longer supported). The value defined on the external system / outbound message type collection populates this value.

When records are created with a processing method of **Batch**, the system sets Extract to **Can Be Extracted**. Change the value to **Not to be extracted** if there is some reason that processing should be held for this record.

For records with a processing method of **Batch**, **Batch Control** indicates the process that will extract this record. This value is populated based on the on the external system / outbound message type's value. **Batch Number** indicates in which batch run this record was extracted or will be extracted.

The **Retry Count** is no longer applicable..

The **Creation Date** indicates the date that this record was created.

The status is no longer applicable.

Outbound Message - Message

Use this page to view the XML source used to build an outbound message. Open this page using **Menu**, and then **Integration**, and then **Outbound Message** and then navigate to the **Message** tab.

Description of Page

The **XML Source** is displayed.

If a message XSL is defined on the external system / outbound message type record linked to this outbound message, the **Show XML** button is enabled. Click this button to view the XML that is a result of applying the Message XSL to the XML source.

Outbound Message - Response

Use this page to display the XML response. Open this page using **Menu**, and then **Integration**, and then **Outbound Message** and then navigate to the **Response** tab.

Description of Page

The **XML Response** and optionally the **XML Raw Response** is displayed.

XML Response displays the response data from the system called by the real-time message. If a response XSL is defined on the external system / outbound message type record linked to this outbound message, a transform is performed and the XML Raw Response displays the original, unchanged response.

Web Service Adapters

The base product provides a configuration object called Web Service Adapter that is used to help build configuration objects to allow for functionality in the system to initiate a web service call from within the system. A Web Service Adapter provides the following functionality:

- WSDL (web service description language) import. An implementer can use the WSDL import functionality to read the details of a WSDL into the system

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- Internal API generation. The system generates internal data areas that have two main purposes: they provide the API for custom code to define the appropriate input and they provide output data for the web service call using Oracle Utilities Application Framework schema language. In addition, the web service dispatcher uses element mapping defined in the data areas to transform the internal XML into the structure expected by the external system as described in the WSDL.
- Defines the URL needed to perform the web service call at runtime.
- Understanding Web Service Adapters
- Setting Up Web Service Adapters

Understanding Web Service Adapters

The following topics describe the system functionality in more detail.

Importing a WSDL

Configuring a Web Service Adapter starts by identifying the WSDL (the web service description language document used to define the interface) that will be provided by the external system. The following steps describe the base product functionality provided to allow a user to import a WSDL.

- Navigate to the **Web Service Adapter** page in add mode and select the appropriate base business object.
- Enter a meaningful Web Service Name and appropriate descriptions.
- Provide the URL of the given WSDL.
- Click **Import** to retrieve the details of the WSDL. The system then parses the WSDL details and populates the WSDL Service Name, WSDL Source, WSDL Port, URL and a list of Operations (methods) defined in the WSDL.
- Determine which Operations should be **active** based on the business requirements for invoking this web service. **Active** operations are those that the implementation is planning to invoke from the system. These require appropriate request and response data areas generated for them. The following section provides more information about that.
- Specify the appropriate Security Type to configure the type of security to use when invoking this web service.
- Click Save.

At this point, a web service adapter record is created in pending status. The next step is to generate the request and response data areas for the operations configured as active.

Generating Request and Response Data Areas

Each **active** operation for the web service adapter requires a pair of data areas, request and response, that represent the request and response XML messages for the operation.

The base product provides steps to generate the data areas as follows:

- As described in the Importing a WSDL section above, the operations listed in the WSDL are generated for the web service adapter and the implementer should indicate which operation to activate.
- After saving the **pending** web service adapter, the display lists all the active operations and for each one includes a **Generate** button.

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- After clicking **Generate** for an operation, a window appears where the names of the new Request and Response Data Areas may be defined. Click **Save** to generate the data areas.

The generated data areas provide the API for the implementer to use when implementing the web service call in an appropriate algorithm or service in the system. The data areas contain the appropriate mapping from the elements that the implementer works within the code that invokes the web services and the WSDL definitions.

To facilitate generating the request and response data areas, the base product invokes a special business service used to create the appropriate mapping. The business service is defined as a BO option on the Web Service Adapter business object. This allows an implementation to provide a custom business service to further enhance the request and response mapping where appropriate.

> **Note**
>
> **Generated data areas.** It is possible to edit and modify the generated data areas after they are created. An implementer can change element names or remove unneeded elements if desired. Manually changing the generated data areas must be done only when absolutely necessary. This is because the system is not able to validate manual changes and issues with the data areas would only be detected at run time.

Activating Web Service Adapters

The business objects provided by the base package for web service adapters include a simple lifecycle of **Pending** and **Active**. Configure the web service adapter and its data areas while in **Pending** status and activate it when it is ready to be implemented in the appropriate system functionality.

Invoking Web Services

To make a call to a web service using a web service adapter, the system has provided a Web Service Dispatcher business service (**F1-InvokeWebService**) to submit a web service call. The calling program is responsible for retrieving all the information to correctly populate the request data required by the web service call before invoking the business service.

> **Note**
>
> Refer to the detailed description of the business service for more information.

Limitations

The following points highlight limitations associated with the types of web services that the system supports:

- It is possible for one WSDL document to contain definitions for several web services. The system currently supports only one port or service per WSDL document.
- It is possible for a WSDL to support multiple message patterns. The system currently supports only request / response.

Setting Up Web Service Adapters

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Use the Web Service Adapter portal to define the configuration needed to communicate with an external system using a web service call. Open this page using **Admin**, and then **Integration**, and then **Web Service Adapter.** You are brought to a query portal with options for searching for web service adapters.

Once a web service adapter has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The **Web Service Adapter** zone provides basic information about the web service annotation type.

Please see the zone's help text for information about this zone's fields.

> **NOT_SUPPORTED**
>
> Refer to Understanding Web Service Adapters for information about common web service adapter functionality.

Sending Email

The framework provides the ability to initiate an email from within the system. The following topics highlight the functionality available.

- Sending email "real time" using a specific business service. The framework provides a business service `F1-EmailService` that supports sending an email. The schema supports elements for all the information required to create an email real time. The SMTP information (host, user name, password and 'from' address) may be provided or may be defined on a message sender, that may be provided as input. In addition, the business service supports using a default message sender defined as a message option. Review the business service schema for information about the input elements.

  > **Note**
  >
  > **Retry setting**. An option in the system properties file allows your implementation to configure the number of times to retry (if any) if the SMTP server is unavailable. Refer to the server administration guide for more information.

- The business service supports sending attachments. The may either reference attachments from the file system (file name and content ID) or reference attachment records captured in the system's attachment table. Note that attachments in the file system are not supported in a cloud implementation.
  - For references to the attachment records, refer to Emailing Attachments for information about the location and size of attchment content and how that affects how attachments are included in the email.
  - For referencing attachments from the native file system, an entry must be defined for the file path in the File Storage Configuration extendable lookup. Refer to URI Substitution for more information on defining this configuration. The extendable lookup records are acting as a type of allowlist.
    The system supports defining a 'parent' directory in the file storage extendable lookup. When invoking F1-EmailService, providing a directory within the registered 'parent' directory is supported. For example, if you register the path D:\systemFiles\, at runtime, when invoking F1-EmailService, you can provide a file in the path D:\systemFiles\CMA.

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You may also use the `file-storage://XXXX` syntax described URI Substitution when providing the file location to the F1-EmailService.

> **Note**
>
> Validating attachments. If a Validate Email Attachment algorithm is plugged into the installation record, it is called to validate the attachments supplied, if applicable.

- Using an outbound message to send an email. This option allows for different variations as described in Outbound Messages.
  - Some emails may be created en masse (for example a large group of emails routed to users for a given set of To Do entries). In this case, the records can be created in the staging table for processing using OSB.
  - Messages may still be sent real time using one of two business services described in Real Time Messages. This option is an alternative to the dedicated email service described above when aspects of the outbound message functionality are needed, such as the ability to instantiate a record as an audit or to include additional logic via BO plug-ins as part of sending the email.

Web Service Category

The product provides the ability to categorize web services that are defined in the system. The term web services refers to Outbound Message Types, Inbound Web Services, and for those implementations where they are applicable, XAI Inbound Services.

A given web service may be linked to more than one category. The product supplies web service categories and most base delivered web services are configured with appropriate categories. Implementations may define new categories and may link custom web services to base delivered categories or to custom categories. In addition, implementations may link additional categories to base delivered web services. However, implementations may not remove base delivered web services from base delivered categories.

If your implementation uses the Integration Cloud Service Catalog, the integration provides the categories for each web service that is sent to the catalog.

The web service category portal supports adding and removing web services from the category. In addition, the Outbound Message Type portal and Inbound Web Service portal each provide a page action button to **Add to Category**.

- Defining Web Service Categories

Defining Web Service Categories

Refer to Web Service Category for an overview of this functionality.

Use this page to define basic information about a web service category. Open this page using **Admin**, and then **Integration**, and then **Web Service Category.** You are brought to a query portal with options for searching for web service categories.

> **Note**
>
> This page is not available if the **External Message** module is turned off.

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Once a web service category has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The **Web Service Category** zone provides basic information about a web service category.

> ⚠ **Caution**
>
> Important! When adding new records, carefully consider the naming convention of the web service category code. Refer to System Data Naming Convention for more information.

Once a web service category exists, an **Add Web Services** zone is provided to find and select web services to link to the web service category.

When viewing a category that already has web services linked to it, they are visible in the zone **Included Web Services** . This zone allows a user to remove a customer owned web service from the list.

JMS Message Browser

The JMS Message Browser portal allows you to select a JMS queue and view messages currently in the queue.

In order for a JMS queue to be available on the portal, a message sender must be defined that is configured for the appropriate JMS queue with the credentials to connect to the queue.

- If your organization sends real-time outgoing messages to a JMS queue, this configuration would exist as per the details in Real-Time Message Configuration.
- If inbound web service messages are routed to the system via a JMS queue, no configuration is needed in the system. However, if you would like to view the messages in the queue in the JMS message browser portal, configuration for the JMS queues as described for outgoing messages is required.

Navigate to the portal using **Main**, and then **Integration**, and then **JMS Message Browser.**

The JMS Senders zone provides a list of configured message senders eligible for selection.

The JMS Message List zone is visible for the JMS Sender broadcast from the first zone. This zone supports selecting one or more records to delete from the queue. Use the message selector to limit the results to messages that satisfy the message selector. This uses standard JMS API message selector functionality. Refer to the zone embedded help for information about the supported syntax.

The JMS Message Details zone displays a message broadcast from the list zone.

Oracle Integration Cloud Catalog

Oracle Integration Cloud (OIC) is an offering that serves as integration infrastructure for Oracle cloud solutions. The product provides an adapter for OIC to streamline integration between your edge application and OIC.

The product provides a mechanism (referred to as an adapter) for OIC to retrieve the REST catalog and another to retrieve the SOAP catalog from a given product. The expectation is that a given implementation would use either REST or SOAP and not both, but for those implementations that do support both classes of web services, OIC can retrieve both catalogs.

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For the SOAP catalog, the adapter retrieves the name, the source system, the WSDL location and namespace for each web service.

For the REST catalog, the adapter retrieves the name, the source system and the OpenAPI Specification for each web service.

It is possible that not every web service supported by an edge product is managed by OIC. In order to only include the appropriate web services in the adapter, configuration is needed to identify which web services to include.

The web service catalog is used to identify the records that should be retrieved by the adapter. Separate catalogs exist for REST and for SOAP

- For SOAP inbound messages, the system supports both the use of inbound web services and XAI inbound services that are deployed via IWS. Each IWS or XAI inbound service that should be included in the catalog must be flagged in the SOAP catalog. Note that only deployed services are returned to the catalogue.
- For REST inbound messages, each IWS that should be included in the catalog must be flagged in the REST catalog.
- For outbound message, the system requires the creation of an External System that includes each outbound message type that the external system receives. For outbound messages that are integrated through OIC, the external system itself will represent OIC. Rather than identifying each outbound message type to include in the catalog, only the external system needs to be flagged. The adapter will return web service information for all the outbound message types configured for the external system. If an implementation supports both REST and SOAP, separate external systems should be created to separately group the REST and SOAP outbound messages.

> **Note**
>
> The subordinate catalog functionality is no longer applicable and will be removed in a future release.

> **NOT_SUPPORTED**
>
> Refer to Maintaining the Web Service Catalog for more information.

- Web Service Catalog Configuration

Web Service Catalog Configuration

The topics in this section describe the configuration needed in your edge application to integrate with OIC.

- Web Service Catalog Master Configuration
- Maintaining the Web Service Catalog

Web Service Catalog Master Configuration

The **Service Catalog Configuration** (master configuration) record defines several system wide settings related to integrating with the service catalog.

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It includes configuration for the WSDL base URL for the SOAP catalog. Note that this element supports the functionality described in Referencing URIs. Note that for the REST catalog, the system will use the URL defined in the substitution variable `F1_OPEN_API_BASE_URL`

The subordinate server section is no longer applicable and will be removed in a future release.

For more information about specific fields in the master configuration, refer to the embedded help.

Maintaining the Web Service Catalog

Refer to Oracle Integration Cloud Catalog for an overview of web service catalog functionality.

To add or remove services that are reported to the OIC catalog, navigate to the portal using **Admin**, and then **Integration**, and then **Web Service Catalog.**

The Catalog by Class zone provides the list of classes (REST and SOAP). Broadcast the web service class that you want to work with.

The Catalog zone provides a list of services that are currently in the catalog based on the web service class chosen. Users may use this zone to remove services from the catalog.

The Candidate Services zone provides a list of external systems and inbound web services that are not currently linked to the catalog. Users may use this zone to add services to the catalog. The inbound web services will be limited to those with the same web service class as the one broadcast. All external systems are shown regardless of the web service class because there is no web service class configuration on external systems.. The expectation is that implementers will create the external system to include either only REST or only SOAP services and will know which external system to include in which catalog. For the SOAP web service class, if XAI inbound services are applicable, they are also visible.

> **Note**
>
> For inbound SOAP web services and XAI inbound services, they may be selected for the SOAP catalog at any time. However, only deployed services are returned to the catalog by the OIC adapter.

XAI Documentation Note

The XAI functionality is legacy functionality and not recommended for new implementations. The help topics are no longer provided.

Integrations

The primary integration methods supported by products built on the Oracle Utilities Application Framework are (a) inbound and outbound files, and (b) inbound and outbound web services.

File Based Integrations

Files are uploaded to Object Storage or your local file system and processed via scheduled batch processes. Your specific product provides many out of the box upload processes. In addition, the system provides a plug-in driven upload process if you have specific upload requirements that are not met by base product processes. Refer to Uploading Records for more information.

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File-based extracts can be generated and made available for download and further processing. Several out of the box extract processes are provided by your specific product. Implementation-specific file processing and generation logic can be introduced using the plug-in driven Extract Record Processing.

Web Services Integration is supported through Inbound Web Services and Outbound Messages. Refer to those respective chapters for more detail.

This remaining topics in this chapter provide high level information about product integrations supported for all products that use Oracle Utilities Application Framework.

- Creating Application Links in External Applications
- LDAP Integration
- Oracle Identity Manager Integration
- Provision Users with SCIM Open Standard
- User Redirection
- Data Synchronization
- Operational Analytics
- Analytics Integration
- Business Flags

Creating Application Links in External Applications

When integrating Oracle Utilities applications with other external applications, you can create links from external applications to specific portals and pages within the Oracle Utilities applications (also known as "deep linking"). These links typically leverage Business Process Assistant (BPA) scripts to help navigate the user to the appropriate target portal or page and to make provided parameter values available for use on the portal or page.

> **Note**
>
> This technique may also be used within the product to launch a new browser tab from within the application when it's important to maintain the current screen. For example, launching the GIS Viewer in Oracle Utilities Work and Asset Management by creating a new browser tab.

To do this, parameters are added to the application URL by appending a question mark (?) to the end and using the syntax "key=value". If you require more than one parameter, use an ampersand (&) to separate each key=value pair. There are several predefined parameter key values recognized by the application. In addition, specific parameters understood by the script may be provided. The following list highlights the predefined parameters.

- `location`=<navigation key> - If the exact page to launch is known, the navigation key value of that page can be part of the URL using 'location='. For example, if an approval process has sent an email to a user to approve an adjustment, the link configured in the email may include the adjustment's navigation key.
- `locationNavOpt`=<navigation option> - If the exact page to launch is known, the navigation option value of that page can be part of the URL using 'locationNavOpt='. For example, if an approval process has sent an email to a user to approve an adjustment, the link configured in the email may include the adjustment's navigation option. Assumption is

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that the navigation option provided is for a portal unless the URL explicitly defines "portal=false".

- `script=`<BPA script name> - In almost every use case, a script is needed to help navigate to the correct page and display the correct information. Even if a location is known and provided in the URL, if there is context data provided as a parameter, it is the responsibility of a script to move that parameter data from the URL into the page data model, so that the page can access the information and display the correct record. In cases where the target page is dynamic based on information provided by parameters, the script may be used to determine what page to launch.
- `portal=true` - When using the location parameter where the target page is a portal page and passing context data, use this parameter. The allows the system to know that the parameter data must be pushed into portal context.
- `initNav=false` - By default, if a script is provided but the location attribute is not provided, the system navigates to the user's home page prior to executing the script. If the script itself includes a step to navigate to a target page as one of its initial steps, the navigation to the home page is unnecessary and may degrade performance. This optional attribute may be included in the URL to bypass the home page.

> **Note**
>
> The system still requires a page to be launched for technical reasons. A blank portal with no zones is used for this purpose. Users may see this portal (called **Launching Application**) briefly before the navigation initiated by the script. In addition, this is the portal that the user will remain on if there are any errors in the script or if the script does not navigate anywhere.

- `minSidebar=true` - This option minimizes the sidebar area as part of launching the application. (The user will be able to maximize the sidebar themselves if needed). You would use this option to potentially improve the speed at which the application is launched. Whether this is useful will depend on the use case. If the reason for launching the application is to bring the user to a specific record to view details about that record, the sidebar may be providing valuable information about the record. In this case, it may be correct to display the sidebar by default (and not include this parameter in the URL). On the other hand if the use case is that a user is already in the application and clicks a link that opens a new browser tab to show the user specific detail about a chosen record, while keeping the original page open on the first tab, the sidebar may contain the same information already visible on the original tab. In this case, minimizing the sidebar may be beneficial.

> **Note**
>
> For backward compatibility, the system still supports the original parameter `minDashboard=true`, which has analogous functionality.

For example, the following URL illustrates launching the script `CM-StopAutoPay` for a given account, assuming the application URL for launching the system is http://system-server:1234/cis.jsp:

- **http://system-server:1234/cis.jsp?script=CM-StopAutoPay&ACCT_ID=1234512345&location=accountMaint**

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It doesn't matter in which order the parameters are provided. The system processes them in the correct order. For example, the following examples are processed by the system in the same way:

- **http://system-server:1234/cis.jsp?ACCT_ID=1234512345&script=CM-StopAutoPay&location=accountMaint**
- **http://system-server:1234/cis.jsp?ACCT_ID=1234512345&location=accountMaint&script=CM-StopAutoPay**

These parameters are kept in a common area accessible by any script for the duration of the session. To use these parameters on a script you may reference the corresponding `%PARM-<name>` global variables. In this example, after the system is launched any script may have access to the above account ID parameter value by means of the `%PARM-ACCT_ID` global variable. Also note, these parameters are also loaded into temporary storage (to continue the example, there would also be a temporary storage variable called `ACCT_ID` that holds the passed value).

Determining the Application URL

When building the link from within application logic, the service script `F1-EnviURL` may be used the retrieve and build the application URL information.

Navigate to a Given Record's Maintenance Portal

The product provides a script `F1-GotoPrtl` (Navigate to portal for an MO and key values) that may be used for any use case that simply navigates to the maintenance page for a given record and displays that record. This script is only applicable to records that are governed by a business object (and define a navigation option as a BO option). It requires the parameters `mo=` with the maintenance object code of the record and the parameters `pkValue1=` through `pkValue5=` for providing the key values. It looks up the appropriate portal navigation option from the record's BO, populates keys into the 'page data model' and navigates to the portal.

It is also recommended to include the `initNav=false` attribute when building a URL with this script. The example below navigates to the appropriate Migration Data Set portal for the given ID's business object.

- **http://system-server:1234/cis.jsp?script=F1-GotoPrtl&pkValue1=1234512345&mo=F1-MIGRDS&initNav=false**

LDAP Integration

Organizations commonly use a Lightweight Directory Access Protocol (LDAP) security repository as a source of security credentials. The system provides support for importing users and groups from an external LDAP repository into the product to populate Users and User Groups in the system. Once imported, all user and group functions are available. You can resynchronize your LDAP users and groups at any time.

> **Note**
>
> **Import only**. The system currently supports importing LDAP information. Exporting users and groups from the system to LDAP is not provided.

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> **Note**
>
> Additional configuration. When importing new users and / or groups, additional configuration is needed in the base product. For example, after importing a new user group and its users, the user group configuration should be updated to define the valid application services for the user group. After importing a new user, additional configuration may be needed on the user such as valid To Do Roles, valid Home Page, etc.

> **NOT_SUPPORTED**
>
> Refer to Users and User Groups for more information about the application security and what it controls.

This section the functionality provided in the framework application that supports LDAP. Refer to the *LDAP Integration* technical reference paper for more information about typical steps related to the full integration.

- LDAP Integration Overview
- Configuring LDAP Integration

LDAP Integration Overview

This topic provides a high level overview of the integration process.

At a high level, the base product provides a process to import user group and / or user definitions from and LDAP repository. This is a one way integration.

- When importing a user, if it is not already found in the system, it will be added; otherwise its attributes will be updated according to the imported information.
- When importing a user group, if it is not already found in the system, it will be added; otherwise its attributes will be updated according to the imported information.
- When importing a user, its user group links will be updated as per the information in the import file. In addition, if there are any user groups linked to the user that are not found in the system, they will be added (however, the other users linked to that group in the LDAP repository will not be added as part of this step).
- When importing a user group, its user links will be updated as per the information in the import file. In addition, if there are any users linked to the user group that are not found system, they will be added (however, the other user groups linked to that user in the LDAP repository will not be added as part of this step).
- The import will not cause any deletions of the User or User Group to occur.

A Batch Process Initiates the Import

A batch process is used to initiate the import of information from the LDAP repository. F1–LDAP may be submitted ad hoc or may be set up in a scheduler to periodically re-sync the information from the LDAP repository into the application.

The batch process uses parameters to define how to connect to the LDAP repository. In addition, parameters are used to indicate which user or group is being imported.

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Adjusting Data to Import

The system provides several mechanisms for adjusting data that is being added to the system:

- There is an **LDAP Import Preprocess** algorithm plug-in spot on the installation record. Algorithms plugged in here are called by the batch process prior to the add or update of any records. It may be used to make adjustments to the data before doing updates in the application.
- Specifically for creating or updating Users, the `F1-IDMUser` business object is used to add and create the user. The standard BO Preprocessing algorithm plug-in spot may be used to adjust data prior to creation. Note that the system does not support defining a characteristic to support a template user that can aid in populating configuration for a new user. However, this integration can take advantage of using a default template user as an algorithm parameter. Refer to Template User for more information.
- The LDAP mapping file supports some attributes to perform simple modifications to data.
  - The **transform** attribute supports values to truncate values or to convert data to upper case.
  - The **autoGenerate** attribute is specific to the User ID field. Setting this to true will trigger code that will automatically populate the User ID based on the user's name. Refer to LDAP Mapping for more information.

Performing Additional Processing After Import

The system provides a plug-in spot on the installation record called **LDAP Import**. Algorithms plugged into this spot are called after users or user groups have been added or updated. It may be used to perform any extra processing that may need to be executed.

Configuring LDAP Integration

To interface the LDAP based security repository with the authorization component of the Oracle Utilities Application Framework product the following must be performed:

- The location and port number of the LDAP based security repository must be defined to in the JNDI Server.
- • The LDAP based security repository must be mapped to the Oracle Utilities Application Framework security model. This mapping is expressed as an XML file containing the LDAP query, rules and defaults used in the transformation.
- • The mapping file must be configured on the `F1-LDAP` batch job.

Define the JNDI Server

The first step in the configuration process is to define the location of the LDAP based security repository server so that the interface can connect to the physical attributes of the interface. This is done by creating a JNDI Server.

> **Note**
>
> The LDAP server is strictly not a JDNI source but is treated as a JNDI source for the integration.

Enter a reasonable JNDI Server name and description.

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Populate the **Provider URL** using the format `ldap://<hostname>:<portnumber>` where `<hostname>` is the host of the LDAP server and `<portnumber>` is the port used for the interface.

For the **Initial Context Factory**, the interface uses the standard `com.sun.jndi.ldap.LdapCtxFactory` provided with java for the LDAP interface. If your vendor supplies a custom context factory it may be used. Refer to the documentation provided with your LDAP based security repository for further information.

Define Mapping

The critical component of the interface is a file that describes the mapping between the LDAP based security repository and the system's security model. This file contains the mapping, rules and queries used by the LDAP batch program to provide the interface. The LDAP batch job includes the reference to the mapping file as a parameter. Refer to LDAP Mapping for more information on defining the mapping file.

Configure LDAP Batch Process

At this point, many parameters for the `F1-LDAP` batch control can be updated with system wide configuration.

- JDNI Server, User and Password may all be configured appropriately. Note that it is recommended that the **Security** setting for the Password be set to **Encrypt**.
- The **LDAP Configuration File** should be populated with the name and location of the LDAP Mapping file.
- If the LDAP service has any limitation to the number of objects that may be imported, configure the **LDAP Query Page Size** parameter to enable querying.

> **Note**
>
> **Group and User Parameters.** The assumption is that the Group or User input parameters are specific to a given import request and as such would not be populated as part of a configuration step.

> **Note**
>
> **L2 Cache**. The LDAP Import batch process requires the L2 Cache to be disabled since it needs to perform some updates in the outside of the worker threads. Any environment using LDAP Import must set `spl.runtime.batch.L2CacheMode=OFF` in the `threadpoolworker.properties` file. It is recommended to run the LDAP import in its own dedicated threadpoolworker.

- LDAP Mapping

LDAP Mapping

An LDAP repository consists of multiple entries. Each entry represents an object in the directory that is identified by a Distinguished Name (DN) and may contain one or more attributes. In a typical LDAP repository there is usually an entry for users and an entry for groups. The connection between users and groups may be implemented in two different ways:

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- The users belonging to a group are defined in a special multiple-value attribute on the Group entry.
- The groups to which a user belongs are defined in a special multiple-value attribute on the User entry.

The mapping between LDAP security objects and base security objects is stored in an XML document that can be processed by the LDAP import batch job. As part of setting up your system for LDAP import, you need to define this mapping. The base package provides a sample mapping file called `ldapdef.xml` that can be used as a starting point and changed per your business requirements and your particular LDAP repository.

Once you have defined the mapping XML document, this is configured as a parameter in the `F1-LDAP` batch job.

The XML structure:

- The **LDAPEntry** element maps the LDAP entries to system objects (User or Group). The mapping file must contain one and only one LDAPEntry element for User and one for Group.
- The **LDAPCDXAttrMapping** element within the LDAPEntry element maps attributes in the LDAP entry to attributes in the system object.
- The **LDAPEntryLinks** element describes objects linked to the LDAP entry. When mapping the user entity you need to describe how the groups the user belongs to are retrieved. When mapping the group entity you need to describe how the users contained in the group are retrieved.

The following table describes the attributes to define for each element.

Element	Attribute	Description
LDAPEntry	name	The name of the LDAP entry: - **Group** - **User**
	baseDN	The base distinguished name in LDAP for this entry.
	cdxEntity	The name of the base product entity to which the LDAP entry is mapped: - **Group** - **User**
	searchFilter	An LDAP search filter that is used to locate LDAP entries. A %searchParm% string in that filter is replaced by the value from the user or group parameter from the `F1-LDAP` batch job submission.
	Scope	Sets the scope of the search. Valid values are: - onelevel (the value normally used) - subtree
LDAPCDXAttrMapping	ldapAttr	The name of the LDAP attribute to be mapped. Note that this may be referenced more than once to allow one LDAP element to map to multiple base product elements. For example, if an email address should be used both for the Login ID and the Email Address.

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Element	Attribute	Description
	cdxName	The name of the base product attribute to be mapped. For User, this is the element within the F1-IDMUser business object. For Group, this is either the ‘group’ or the ‘description’.
	default	The default value that will be assigned to the element referenced in the cdxName attribute when one of the following occurs: - The LDAP attribute contains a null or empty value - The LDAP attribute does not exist or is not specified. Default values are applied only when creating a new entity and are not applied to updated entities.
	autoGenerate	Set this to **true** in order to turn on auto generation of the user ID. If this is true, the system will define the user id as <first initial of first name>+<last name> all uppercase, to a maximum of 8 digits. If an existing user is found for the generated ID, a number will replace the eight digit (or be appended to the end). The system will increment the number until a unique ID is found.
	transform	Use this attribute to indicate if a transformation of the data should occur. Valid values: `uppercase|truncate`. Note that this attribute should not be used in conjunction with the autoGenerate attribute.
LDAPEntryLink	linkedToLDAPEntity	The name of the linked entity (**User** or **Group**). Use User when describing the Group entity. Use Group when describing the User entity.
	linkingLDAPAttr	The multiple-value attribute name on the LDAP entity that contains the linked entity.
	linkingSearchFilter	The search filter to be applied to retrieve the list of linked objects, for example: (&(objectClass=group)(memberOf=%attr%)) The search filter may contain the string % attr % that acts as a substitution string and is replaced at run time by the value of the attribute named "attr" of the imported entity. If the LDAP entry you are describing is a Group and the string is %name%, it is replaced by the value of the "name" attribute of the group you are importing. If the LDAP entry you are describing is a User and the string is %dn%, it is replaced by the "dn" attribute of the User you are importing.
	linkingSearchScope	Sets the scope of the search. Valid values are: - **onelevel** (the value normally used) - **subtree**

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Sample Mapping

The following XML describes a sample mapping. The example makes the following assumptions:

- The base product attribute **displayProfileCode**is defaulted to "NORTHAM" when adding a new user.
- The LDAP Group entry contains the list of users belonging to the group in the **departmentNumber** attribute.
- The groups to which a user belongs are retrieved by applying a search filter.

```
<LDAPEntries>
  <LDAPEntry name=" User" baseDN="ou=people,dc=example,dc=com" cdxEntity="
   user" searchFilter=" (&amp;(objectClass=inetOrgPerson)(uid=%searchParm%))">
    <LDAPCDXAttrMappings>
      <LDAPCDXAttrMapping ldapAttr="uid" cdxName=" user" />
      <LDAPCDXAttrMapping ldapAttr="cn" cdxName="externalUserId" />
      <LDAPCDXAttrMapping cdxName="language" default=" ENG" />
      <LDAPCDXAttrMapping ldapAttr="givenName" cdxName="firstName"/>
      <LDAPCDXAttrMapping ldapAttr="sn" cdxName= "lastName"/>
      <LDAPCDXAttrMapping cdxName="displayProfileCode" default="NORTHAM" />
      <LDAPCDXAttrMapping cdxName="toDoEntriesAge1" default="30" />
      <LDAPCDXAttrMapping cdxName="toDoEntriesAge2" default="90" />
      <LDAPCDXAttrMapping cdxName="userEnable" default="ENBL"/>
    </LDAPCDXAttrMappings>
    <LDAPEntryLinks>
      <LDAPEntryLink linkedToLDAPEntity="Group"
linkingLDAPAttr="departmentNumber" />
    </LDAPEntryLinks>
 </LDAPEntry>
  <LDAPEntry name="Group" baseDN="ou=people,dc=example,dc=com" cdxEntity="
   Group" searchFilter=" (&amp;(objectClass=organizationalUnit)
(ou=%searchParm%))">
    <LDAPCDXAttrMappings>
      <LDAPCDXAttrMapping ldapAttr="name" cdxName="Group" />
      <LDAPCDXAttrMapping ldapAttr="description" cdxName=" Description"
default="Unknown" />
    </LDAPCDXAttrMappings>
    <LDAPEntryLinks>
      <LDAPEntryLink linkedToLDAPEntity="User" linkingSearchFilter="
      (&amp;(objectClass=inetOrgPerson)
(departmentNumber=%distinguishedName%))"
     linkingSearchScope="onelevel" />
    </LDAPEntryLinks>
  </LDAPEntry>
</LDAPEntries>
```

Oracle Identity Manager Integration

The *Oracle Identity Manager* product allows a site to centralize their user definitions and password rules to manage and deploy across the enterprise set of products. When an employee joins an organization, changes their name or departs an organization their security

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presence across an enterprise must be appropriately managed. Oracle Identity Manager allows for users to be provision and managed in a central location.

An integration is provided to allow the ability to create, maintain and remove users in the identity management product and sync those changes to the users defined in the application. The following sections provide additional details about the integration with respect to configuration steps required in an Oracle Utilities Application Framework based product. For more information about the configuration required in the identity management product, refer to the *Identity Management Suite Integration* technical reference paper.

In order to use this functionality, feature configuration options for the **External Messages** feature type must be configured.

- Set option type **Support SPML Deployment in IWS** to **true**.
- Set option type **Default SPML service security policy** to an appropriate value per your implementation rules.

Template User Functionality

The user object in this product captures configuration used to control access but also preferences. The identify management product allows for extending the configuration to capture user configuration that is specific to this product. However, it does not support providing searches or dropdowns to select valid values. For example, to define the user's Home Page requires the reference to a navigation option. To set up your business process such that the home page is configured when defining the user in the identity management product dictates that the security user types in the correct navigation option reference.

On the other hand, to define a minimal amount of user information in the identity management product may result in a two step process for defining users: first define them in the identity management product with the basic authentication details and setting system defaults for some important fields, then after submitting the new user to be added to this product, navigate to the user page in this product and fill in all the configuration that is specific to this product.

The product provides support for defining a template that can facilitate the definition of users and reduce some of the challenges listed above. Refer to Template User for information about defining template users along with other details around this functionality.

Once you have template users defined, you should look at extending the configuration in the identity manager product.

- Map the information that is unique to a user and in addition, define a field for the template user. For example, you may choose to only capture the Name (first and last), Email address and User IDs for the user along with its Template User (which is mapped to a user characteristic). Additional fields may be included for capture in the identity management product when defining new users as per an implementation's business needs. For example, if the organization covers multiple time zones, perhaps it is easier to define the user's time zone when defining the user in the identity management product.
- When the new user is uploaded to the system, the algorithm used by the system to create the user looks for the existence of a template user sent as a characteristic of type `F1-TMUSR`.
- Once the new user is created, its configuration can now be adjusted, if applicable.

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> **Note**
>
> There is configuration needed in Oracle Identity Management to capture the template user and any other information that the implementation has chosen to define in the identity management product when provisioning a new user. Refer to the *Identity Management Suite Integration* technical reference paper for more information.

Provision Users with SCIM Open Standard

The product provides a REST web service `F1-SCIMUser` (SCIM User Provisioning) that supports adding, changing or viewing details of a user where the API follows the SCIM standard.

The following points highlight some of the mapping between the SCIM API and the application's user record.

- The user record in the application supports only first name and last name. The SCIM standard supports additional detail such as middle name, suffix and prefix. These elements are ignored when adding or updating a user.
- The SCIM standard supports a collection of email addresses. The application only supports one email address. As such, only the first email address is used when adding or updating a user.
- The integration relies on the use of a Template User so that the user is created with appropriate application configuration associated with each user. The system copies application settings from the template user to the new user being provisioned. If the external system is able to support referencing a template user such that it can be provided with the payload, the integration expects the user type element in the API to reference the template user. If it's not possible to provide a template user ID in the user type element, you should define a default template user using an algorithm parameter. Refer to Template User for more information.

Refer to the web service definition for more information about the supported integration.

Template User Functionality

The user object in this product captures configuration used to control access but also preferences. The identify management product allows for extending the configuration to capture user configuration that is specific to this product. However, it does not support providing searches or dropdowns to select valid values. For example, to define the user's Home Page requires the reference to a navigation option. To set up your business process such that the home page is configured when defining the user in the identity management product dictates that the security user types in the correct navigation option reference.

On the other hand, to define a minimal amount of user information in the identity management product may result in a two step process for defining users: first define them in the identity management product with the basic authentication details and setting system defaults for some important fields, then after submitting the new user to be added to this product, navigate to the user page in this product and fill in all the configuration that is specific to this product.

The product provides support for defining a template that can facilitate the definition of users and reduce some of the challenges listed above. Refer to Template User for information about defining template users along with other details around this functionality.

Once you have template users defined, you should look at extending the configuration in the identity manager product.

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- Map the information that is unique to a user and in addition, define a field for the template user. For example, you may choose to only capture the Name (first and last), Email address and User IDs for the user along with its Template User (which is mapped to a user characteristic). Additional fields may be included for capture in the identity management product when defining new users as per an implementation's business needs. For example, if the organization covers multiple time zones, perhaps it is easier to define the user's time zone when defining the user in the identity management product.
- When the new user is uploaded to the system, the algorithm used by the system to create the user looks for the existence of a template user sent as a characteristic of type `F1-TMUSR`.
- Once the new user is created, its configuration can now be adjusted, if applicable.

> **Note**
>
> There is configuration needed in Oracle Identity Management to capture the template user and any other information that the implementation has chosen to define in the identity management product when provisioning a new user. Refer to the *Identity Management Suite Integration* technical reference paper for more information.

User Redirection

The product allows an implementation to support the ability for a customer to authorize a customer service representative (CSR) to view the customer's account information in a customer facing portal (Digital Self Service), to see exactly what the end customer is seeing/ experiencing.

When the request for the CSR to view the customer information is received, the following steps occur:

- The security server for the customer facing portal is contacted to obtain a temporary grant code.
- The redirection response returns the grant code and the URL of the target customer facing portal.
- The browser redirects to the user to this URL with the grant code, which is further authenticated and automatically exchanged for an authorization token, allowing the CSR to log in.

Standard security measures with private/public key encryption using JSON Web Tokens (JWT) ensures that only the implementation's enterprise application is allowed to communicate with the implementation's customer facing portal server. The system also provides a plug-in spot to allow for additional information, such as the customer's name and email address, to be included in the call to the security server.

This feature works in conjunction with functionality provided by the enterprise customer application. Refer to the documentation for that product for information about how this feature is supported.

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> **Note**
>
> The product has been designed to potentially support other types of redirection besides the mentioned use case by adding another entry in the Redirection Target lookup (F1_REDIRECTION_TARGET_FLG). However, the internally provided services work specifically for the Digital Self Service use case. There is no guarantee that they would work for a different redirection use case. Please contact product support if your implementation would like to implement a different redirection scenario.

Redirection Security Context Plug-in

The product supports a plug-in spot to allow for the system to populate additional keys and values to add to the JWT (JSON Web Token) when calling the external security service.

In addition, the product provides an Extendable Lookup BO **Redirection Security Context (F1-RedirectionSecurityContext)** to define the key mnemonic values. For an enterprise product or implementation to populate additional keys, use the extendable lookup to define the key mnemonics. Then provide an algorithm that uses the available information about the customer and populates the security context keys and values by determining the related data in the system.

Master Configuration

The master configuration **Redirection Targets Configuration (F1-RedirectionTargetsConfig)** defines the information needed to contact the security server to obtain a grant code. It also defines the redirection URL.

Build an Anchor Hyperlink

The service script **Return a Hyperlink to the Redirect Servlet for a given Target (F1TargetLink)** is provided to allow for a link to be placed on a UI map or in a zone to initiate the redirection request. Refer to the service script detailed description in the metadata for more information.

Data Synchronization

Your implementation may need to communicate certain data to external systems. This may be part of a data warehousing requirement or an integration effort. The synchronization process has two main parts. First, the change to the data must be detected and captured. Once that is accomplished, the next step is to manage the communication of that change to the external systems involved. The changes must be captured in chronological order so as to avoid systems going out of sync.

- Understanding Data Synchronization
- Maintaining Sync Requests

Understanding Data Synchronization

The product supports various options for managing an ongoing synchronization of an entity to an external system. While each integration involves unique business rules, in many cases the process is quite similar and involves the following overall steps:

- When an entity is added, changed or deleted logic determines whether the change is eligible for synchronization and if so a sync request record is initiated to manage the

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synchronization process. The base product uses the **Audit** plug-in spot on the maintenance object to allow for such logic to be performed when a change is detected to a record for that MO. The framework calls the algorithm defined on this plug-in spot in the event a change to the MO has been detected. Refer to the description of the plug-in spot on Maintenance Object - Algorithms for more information about when this plug-in is called.

- The processing of the sync request is deferred to batch so that the communication with the external system does not impact the updating transaction. It also ensures that the data being shared with the external system is fully committed to the database.

> **Warning**
>
> Do not remove the deferred batch contol from business object status definitions of such synchronization requests. These flows must remain deferred as designed for data integrity reasons.

- When processed, sync request logic manages the following aspects of the process:
  - Determines whether the synchronization is still needed and if not discards the request.
  - Prepares the outbound message with the entity's synchronization details and sends it to the external system.
  - Manages errors and retry attempts as needed.

The following sections describe the various data synchronization options supported by the product.

- Accumulative Data Synchronization
- Generic Data Synchronization

Accumulative Data Synchronization

The product supports a data synchronization method by which several changes made to an entity may be accumulated and sent together as a single message to the external system.

The following points describe the functionality at a high level:

- When an entity is added, changed or deleted, a snapshot of the entity’s data from before the change is captured on one or more sync requests, one for each external system the data needs to be interfaced to. The before-update snapshot is used as a base line for detecting all changes made since then at the time of sending the message to the external system.
- Sync requests are processed by the next monitor batch process.
- The processing of the sync request typically involves business rules that compare the before-update snapshot with the current content of the entity to detect all change made. If changes were made, logic may decide to proceed with the sending the synchronization message otherwise the request is discarded. These rules are also responsible for handling any errors encountered while communicating with the external system and manage retry attempts as needed.

This functionality is supported by logic supplied in the base business object Sync Request (**F1-SyncRequest**). Note that each edge application delivers an appropriate child business object for this BO for each specific synch scenario supported in that product. Some of the functionality below is accomplished using configuration on the parent BO delivered by the framework while other functionality may be delivered by the child BO. In addition, there may be more complex use cases supported by your specific product integration. Refer to your specific application’s

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library of Sync Request business object along with the documentation related to your specific product integration for more information.

The following sections describe key aspects of this data synchronization approach.

Capturing the Change

The base product provides a change data capture (MO Audit) algorithm `F1-GCHG-CDCP` that may be used by maintenance objects that need to be synchronized by this method. This algorithm creates a Sync Request record for the changed record, capturing the MO code and the primary key, if it doesn't find an existing sync request for the same record (and the same business object) in the initial state. The sync request business object used is the one defined in the **Sync Request BO** option on the MO for the record that was changed. If more than one such option exists then multiple sync requests are created.

Your specific product may also introduce additional Audit algorithms to cater for more sophisticated examples.

When creating the sync request record, typically the Sync Request BO will have a pre-processing plug-in that captures a snapshot of the record's data prior to its change. This will be used in subsequent steps to verify that the external system needs to be notified of the change.

Confirming that a Sync is Needed

Once a sync request is captured, there are several steps performed prior to any information being sent to the external system.

> **Note**
>
> This section only highlights key steps. Please refer to the business object configuration, its lifecycle and algorithms for a thorough picture of the full functionality..

- When a Sync Request record is created, its initial state (**Pending**) is configured to be processed by a batch monitor. That way, records are added to the sync request table throughout the day but all are processed together. The MO audit algorithm ensures that a new synch request is not created if a Pending record already exists for a given MO / PK combination (for the same business object). However, it is possible that a record for that MO / PK exists in a subsequent "non-final" (such as **Awaiting Acknowledgement**). This state includes a monitor algorithm to check for that condition and to skip transitioning if another record exists. This is done to ensure that the existing record is fully processed before this new record is processed.
- The next state of the lifecycle is **Determine if Sync Needed**. This step uses an algorithm to take a snapshot (called the 'final snapshot') of the data and compare it against the initial snapshot taken when the record was created. Based on the logic of the algorithm, it may decide to proceed (transition to **Send Request** or to discontinue (transition to **Discarded**.

Communicating to the External System

Once it is confirmed that the sync should occur, a message must be sent to the external system. The following points highlight the basic functionality.

- An algorithm linked to the **Send Request** state. The expectation is that this algorithm creates an outbound message that routes the information to the external system appropriately. The algorithm must determine the external system and outbound message type to use. Business objects for Sync Request support BO options to define the external system and outbound message type to use for this algorithm.

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- Once the outbound message is triggered, the record transitions to the **Awaiting Acknowledgement** status. This state is used to hold the sync request from further state transitions until an acknowledgement is received from the external system. Note that this step relies on implementation of a response mechanism from the external system. It is recommended to implement a response as this helps control the chronological flow of information. The product supplies the business service `F1-UpdateSyncRequest` that transitions the sync request to either the next default state (in this case the **Synchronized** state) if a positive acknowledgement is received; or the state associated with the Rejection transition condition (in this case the **Error** state) if a negative acknowledgement is received. In addition, this state may be configured with a monitor algorithm that detects that a timeout limit has been reached.
- For records that enter the **Error** state, it is recommended to configure an algorithm that creates a To Do entry to alert someone of the problem. Refer to the integration documentation for more information. The state is already preconfigured with an algorithm to complete To Dos when exiting the state.
- The final state **Synchronized** is used to mark the successful synchronizations. However, for more complicated use cases, this state may be used to trigger some additional action. Refer to the documentation for your specific product integration for more information.

Generic Data Synchronization

The product supports a generic data synchronization method by which each change to an eligible entity triggers a synchronization flow that communicates details about the entity to one or more external systems.

The following points describe the functionality at a high level:

- The integration of a specific entity (maintenance object) and an external system is enabled and configured using a **Data Synchronization Control** (F1-DataSyncControl) extendable lookup record.
- Rules supporting the integration reside in a **synchronization script** referenced on the control record.
- When an entity is added, changed or deleted, a sync request may be initiated for each integration according to business rules defined by the corresponding synchronization script.
- Sync requests are processed by the next monitor batch process.

> **Note**
>
> In a cloud installation, near real-time processing is supported for time depenent synchronizations. Refer to Deferred Requests Queue for more information.

- When the sync request is processed, data is synchronized to the external system according to business rules defined by the corresponding synchronization script.

This functionality is supported by logic supplied in the base business object Generic Data Sync Request (**F1-GenericDataSync**). This business object does not need to be extended to support specific integration rules as these rules reside in the synchronization script associated with each integration's data synchronization control record.

The following sections describe key aspects of this data synchronization approach.

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Data Synchronization Control

The **Data Synchronization Control** (F1-DataSyncControl) extendable lookup defines the configuration needed to support an ongoing data synchronization of an entity to an external system. The configuration defines the entity's maintenance object, the external system it is synchronized with and references a synchronization script that manages the specific synchronization rules for this integration. An integration is considered enabled when its corresponding control record is in active status.

The data synchronization script is called in the following modes:

- When the entity is added, changed or deleted, the script is called in **Check** mode to determine whether a sync request should be created for the changed entity and a specific external system.
- When the sync request is processed, the script is called in **Process** mode to prepare and send the outbound message to the external system. Alternatively the script may request to discard the request or indicate that it should be processed later. The latter may be used when there is a need to wait until certain conditions are met before sending the message to the external system.

Note that the configuration for a maintenance object and a specific external system may be overridden by another configuration defined with a higher sequence number.

Confirming that a Sync is Needed

The base product provides a change data capture (MO Audit) algorithm `F1ONGDATASYN` that may be used by maintenance objects that need to be synchronized by this method. The algorithm consults the synchronization script associated with each active integration control record configured for the entity as to whether the external system needs to be notified for this change. Once confirmed, the algorithm creates a Sync Request record for the changed record, capturing its MO code and the primary key, along with the corresponding external system.

Note that the decision as to whether to create a sync request or not is controlled by the integration specific synchronization script while the creation of the sync request is the responsibility of the audit algorithm. As such, the same sync request BO is used for all integrations, with no provision for capturing integration specific details.

It is recommended to design the synchronization script to only approve the creation of a synchronization request when it is needed. This prevents unnecessary creation of sync requests that would otherwise be discarded when eventually processed.

Managing the Synchronization Process

Once a sync request is captured, there are several steps performed prior to any information being sent to the external system.

> **Note**
>
> This section only highlights key steps. Please refer to the business object configuration, its lifecycle and algorithms for a thorough picture of the full functionality..

- When a Sync Request record is created, its initial state (**Pending**) is configured to be processed by a batch monitor. That way, the changes that triggered the request are fully committed before being communicated to an external system.

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- When the sync request record is processed, a monitor algorithm calls the synchronization script associated with the corresponding integration's control record to manage the synchronization process. The synchronization script may indicate either of the following:
  - The request is not yet ready to be processed, i.e. it should remain in its current status and get processed again by the next batch run.
  - The request should be canceled. This indication results in the transition of the record to the **Canceled** status.
  - The request was successfully processed. The synchronization script has prepared the outbound message and routed the information to the external system appropriately. This indication results in the transition of the record to the **Sent** status.
- If an error occurs while processing the request, a To Do Entry is raised to capture the error details and the record is set to the **Error** status. Retry processing of the sync request continues with each batch process until the request is either sent or canceled.

Communicating to the External System

Typically the communication with an external system is finalized when the message is successfully sent and successfully processed by the external system. Depending on the specific integration, the message may not be processed right away by the external system but rather queued and processed later. In this situation, the sync request may need to be further acknowledged as successfully processed (set to the **Acknowledged** status) upon an explicit response mechanism from the external system. The product supplies the web service `F1-UpdateAndTransitionSyncRequest` that may be used to process such acknowledgements.

Maintaining Sync Requests

The system provides a Sync Request portal that is used to view the in progress or completed sync request records.

The menu location of the portal depends on your specific edge product. It may be in a Data Synchronization menu or perhaps in the Batch menu. You are brought to a query portal with options for searching. The options may differ based on your specific product.

Once a sync request has been selected, you are brought to the maintenance portal to view and maintain the selected record.

An **Actions** zone may appear to display specific actions. Alternatively, the actions may be displayed directly in the display area of the **Sync Request** zone.

The **Sync Request** zone provides basic information about the sync request record.

Depending on your specific product additional zones may appear.

Operational Analytics

The framework provides several building blocks and tools that the edge applications may use to implement analytic reports directly from the operational application using Oracle Utilities Analytics Visualization product (referred to in this section as the analytics visualization product). The following sections provide more information about this functionality.

- Understanding Operational Analytics
- Calendar and Time Dimensions
- Maintaining Bucket Configurations

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- Defining Analytics Options
- Defining Analytics Tables
- Defining Analytics Attribute Mapping

Understanding Operational Analytics

The following sections describe the type of configuration supported in your product to integrate with the analytics visualization product. Refer to the Oracle Utilities Analytics Visualization documentation for more information.

Direct Data Access

The analytics visualization product's canvases report directly off of the operational system (with the exception of batch run analytics) thus eliminating the need of an ETL process. Selected tables and views have been designated as dimensions and facts for the purpose of generating the Start Schemas used by these canvases.

Batch Run Analytics

There is a high volume of batch run data in the operational system that changes frequently and is recorded in a complex set of relationships. The product provides snapshot tables to capture only the batch run and thread data required for analytics. Using these tables for batch subject area views both improves performance and supports extracting the data for upload to other environments.

The snapshot tables are populated in increments. The **Batch Run Analytics Snapshot Update** and the **Batch Thread Analytics Snapshot Update** processes are run on an ongoing basis; each snapshot update selects only the batch runs and threads not yet included in the snapshot. Parameters are supplied to restrict the selected data based on a range of days from the current date, to support the initial uptake of data. It is recommended that batch run data is updated before the batch thread data, as only threads with corresponding records in the batch run snapshot will be added. Refer to batch controls `F1BRANSN` and `F1BTANSN` for more information.

The **Batch Run Analytics Data Export** and **Batch Thread Analytics Data Export** processes are provided to extract the batch data in increments for upload to other environments. These processes assume that a **Data Export Control** exists for each of the snapshot maintenance objects, to capture the date of the previous extract as a reference point for selecting the next set of records. Refer to batch controls `F1BRANEX` and `F1BTANEX` for more information.

Calendar and Time Dimensions

Analytic reports rely on calendar and time dimensions to support various hierarchical grouping by date and time.

The Calendar dimension provides a level-based definition of the standard calendar and fiscal calendar in a flattened representation that is commonly used in data warehouses. This is necessary to enabling customers to group by calendar week, months, quarter and fiscal calendar period, quarter and fiscal year etc. Note that fiscal information about a specific date is optional and sourced from your edge application specific accounting calendar

In the same way, the Time dimension provides a level-based definition of each minute in a day, supporting reports that group by hours, AM/PM etc.

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> **Note**
>
> Calendar dimension records are generated by a batch process; one record for each date in a specified period of time. You need to run the **Generate Calendar Dimension** batch process on an ongoing basis to cover the standard and accounting calendar days needed to support your business. Refer to `F1-BICDD` batch control for more information.

> **Note**
>
> Time dimension records are also generated by a batch process; one record for each minute in a day. You need to run the **Generate Time Dimension** batch process once to generate all the records. Refer to `F1-BITMD` batch control for more information.

Bucket Configuration

The analytics visualization product provides support for defining a set of ranges, each representing a bucket for which extracted measures can be grouped and classified under the relevant bucket. The framework product provides support for viewing and defining the buckets. Refer to Bucket Configuration for more information.

Analytics Attribute Mapping

The product supports mapping of characteristics to user defined fields associated with dimensions in the analytics visualization product. Each characteristic table that is associated with a dimension table is provided with pre-generated user defined fields identified by unique column sequence numbers in the analytics visualization product. The mapping of characteristics to dimension user defined fields is maintained directly on the dimension portal. You may also review these mappings using the Analytics Attribute Mapping portal.

Logical Dimension

The Element Name of a foreign key field to a dimension represents a distinct logical version of the dimension. This allows for different logical dimensions to be based on the same dimension table. For example, a "Location" dimension may be referenced as a "Main Location" on one fact and also as an "Alternate Location" on the same or other fact. While both elements refer to the same dimension as foreign keys, each represent a distinct logical dimension via their element names. In the same way, while each date field is implicitly considered as a foreign key to the Calendar dimension, each distinct element name establishes a unique logical dimension. For example, a "Start Date" element name and an "End Date" element name are distinct logical dimensions of the underlying Calendar dimension.

Some logical dimensions may represent an aggregated or summarized form of another logical dimension. They are also known as "shrunken" dimensions. For example, the "Calendar Month Dimension" view is an aggregated dimension of the Calendar dimension. Establishing a link between a summarized dimension and its detailed dimension allows the analytics visualization tool to drill from one fact to another for performance reasons when they are indirectly linked via the same logical dimension but at different aggregation levels. For example, "Fact A" represents daily records and "Fact B" aggregates the same measures at a monthly level. Associating the "month" field in "Fact B", which is a foreign key to the "Calendar Month Dimension" view, with the logical dimension name of the "date" field in "Fact A" allows analytic queries to use "Fact B" for queries at the monthly level or above which perform better than performing them on the more granular "Fact A".

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Analytics Configuration

Depending on which product or products you have installed, there may be some configuration needed for the analytics visualization product. Refer to Defining Analytics Options for more information.

Calendar and Time Dimensions

This portal is used to view generated calendar and time dimension records.

Refer to Understanding Operational Analytics for an overview of operational analytic functionality.

Navigate using **Admin**, and then **Analytics**, and then **Calendar and Time Dimensions**.

The following zones may appear as part of the portal's **Main** tab page:

- **Calendar Dimension.** This zone lists most recent calendar dimension records. You may filter the list to review records generated up to a specific date.
- **Calendar Date.** This zone provides information about a selected calendar date.
- **Time Dimension.** This zone lists all time dimension records.

Maintaining Bucket Configurations

Several key performance indicators in the analytics product look at measurement values (for example: the age of an asset or the age of debt) classified into a number of pre-defined groups also known as buckets. The overall metric can then be reported by the different buckets and allow various analyses.

For example, the age of an asset can be classified into the following buckets:

- Less than 6 Months
- 6-12 Months
- One Year and Older

The age of debt, also known as arrears can be classified onto the following buckets:

- 0-30 Days
- 30-60 Days
- 60-90 Days
- 90+ Days

The definition of the buckets is extracted to the Business Intelligence data warehouse, to be used as dimensions.

Bucket Definition Considerations

Each type of bucket is defined using a bucket configuration Business Object. The bucket definition considerations and/or rules will vary based on the bucket configuration business object used. The business objects available are driven by your specific product. For a list of available bucket configurations business objects, navigate to the business object page and view the business objects for the Bucket Configuration maintenance object.

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Setting Up Bucket Configurations

To maintain the bucket ranges for the bucket configuration(s) applicable to your product, open **Admin**, and then **Analytics Configuration**, and then **Bucket Configuration.**

You are taken to the query portal where you can search for an existing bucket configuration. Once a record is selected, you are brought to the maintenance portal to view and maintain the selected record.

> **Note**
>
> Your specific product may also include an Analytics Configuration portal that displays the list of existing and potential bucket configuration records, allowing you to drill into this page to view the record in detail.

The **Bucket Configuration** zone provides basic information about the bucket configuration.

For more information about the elements supported refer to the zone help or to the relevant analytics integration documentation for your product.

Defining Analytics Options

Refer to Understanding Operational Analytics for an overview of the operational analytics functionality.

Your specific product may require some system wide configuration to be defined when using operational analytics.

Navigate to the Extendable Lookup portal. Search for and select the **Analytics Options** business object.

Use the embedded help to review information about the options to define.

Defining Analytics Tables

This portal is used to search for Analytics Table definitions. An Analytics Table record exists for each table or view in the operational system that represent dimension and fact tables in the Operational Analytics product.

Refer to Understanding Operational Analytics for more information.

You can access the portal from the**Admin Menu**, and then **Analytics Configuration**, and then **Analytics Table.** You are brought to a query portal with options for searching for a specific record. Once a record has been selected you are brought to its maintenance portal to view and maintain the selected record.

- Defining Analytics Dimensions
- Defining Analytics Facts

Defining Analytics Dimensions

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This portal is used to maintain metadata for Analytics Dimension tables. A dimension record exists for each table in the operational system that represents a dimension table in the Operational Analytics product.

Refer to Understanding Operational Analytics for more information.

You can access the portal from the**Admin Menu**, and then **Analytics Configuration**, and then **Analytics Table.** You are brought to a query portal with options for searching for a specific record. Once a dimension record has been selected you are brought to this portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page

- **Analytics Table.** This zone provides information about the selected dimension record.
- **Fields.** This zone lists all the fields that define the dimension table. Fields may be selected from the dimension's underlying operation table using the **Excluded Fields** zone or added as computed fields.
- **Dimensions.** This zone lists dimension tables that this dimension references via foreign key constraints.
- **Referenced By.** This zone lists dimension and fact tables that reference this dimension via foreign key constraints.
- **Characteristic Mapping.** This zone manages characteristic mapping extensions for the dimension. Refer to analytics attribute mapping for more information.
- **Excluded Fields.** This zone lists fields from the dimension's operational table that are not included in the dimension table.

> **Note**
>
> The ability to introduce custom analytics dimensions is currently not supported.

Defining Analytics Facts

This portal is used to maintain metadata for Analytics Fact tables. A fact record exists for each table or view in the operational system that represents a dimension table in the Operational Analytics product.

Refer to Understanding Operational Analytics for more information.

You can access the portal from the**Admin Menu**, and then **Analytics Configuration**, and then **Analytics Table.** You are brought to a query portal with options for searching for a specific record. Once a fact record has been selected you are brought to this portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page

- **Analytics Table.** This zone provides information about the selected fact record.
- **Fields.** This zone lists all the fields that define the fact table. Fields may be selected from the fact's underlying operation table or view using the **Excluded Fields** zone or added as computed fields.
- **Dimensions.** This zone lists dimension tables that this fact references via foreign key constraints.

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- **Excluded Fields.** This zone lists fields from the fact's operational table or view that are not included in the fact table.

> **Note**
>
> The ability to introduce custom analytics facts is currently not supported.

Defining Analytics Attribute Mapping

This portal maps extensions to user defined fields provided for tables associated with an analytics dimension table that capture well defined extension data. A common example of this type of data are characteritics.

These mappings may be directly maintained on the operational Analytics Dimension portal. Refer to Understanding Operational Analytics for more information.

If your system is integrated with the Oracle Utilities Analytics product refer to Understanding Analytics Integration for more information about ETL based characteristic mapping.

You can access the portal from the **Admin Menu**, and then **Analytics Configuration**, and then **Analytics Attribute Mapping.** You are brought to a query portal with options for searching for a specific mapping record. Once a record has been selected you are brought to the this portal to review the information for the selected record.

The **Analytics Attribute Mapping** zone on the portal's **Main** tab page provides information about the mapping record.

> **Note**
>
> For characteristic mapping, only **Adhoc** and `Pre-defined` characteristic types are supported.

> **Note**
>
> For the product provides support for identifier mapping for operational analytics in this release but only the metadata definition is supported. The support for these types of attributes in the operational analytics product is in a future release.

Analytics Integration

The framework provides several building blocks and tools that the edge applications may use to implement integration with the Oracle Utilities Analytics product (referred to in this section as the analytics product). The following sections provide more information about this functionality.

- Understanding Analytics Integration

Understanding Analytics Integration

The following sections describe the type of configuration supported in your product to integrate with the analytics product. Refer to the Oracle Utilities Analytics documentation for more information.

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Master Configuration

Edge applications that include an integration to the analytics product typically include a master configuration record that captures information needed for the extract, load and transformation step, such as extract parameters. These records are provided by the specific edge products and my be viewed and maintained on the master configuration portal.

Note that your specific edge application may deliver an **Analytics Configuration** portal that displays the information from the master configuration record along with other analytics related configuration.

Bucket Configuration

The analytics product provides support for defining a set of ranges, each representing a bucket for which extracted measures can be grouped and classified under the relevant bucket. The framework product provides support for viewing and defining the buckets. Refer to Bucket Configuration for more information.

ETL Based Characteristic Mapping

The product provides objects to allow mapping configuration of characteristics in the product to user defined fields on dimensions in the analytics product. The mapping is used by the extract process to populate target user defined columns with corresponding characteristic data.

This type of mapping relies on configuration in the Allowed Target Dimensions extendable lookup. The extendable lookup is used to define each Target Table in the analytics product that has one or more user defined fields that may be populated with characteristic values. It also defines the valid characteristic entities that may act as the source for the characteristic data.

> **Note**
>
> The framework does not provide any values in this lookup, but edge products that support mapping provide values in this lookup. Please refer to your specific product's integration chapter and refer to the Oracle Utilities Analytics documentation for more information.

Refer to Defining Analytics Attribute Mapping for more information.

Change Data Capture Using Sync Request

Depending on the specific edge application and version you are using, there may be components of the integration that use Sync Request for the change data capture step. If that functionality applies to your implementation, the following points highlight how to get more information:

- Refer to the administration guide for Oracle Utilities Analytics to confirm if your product integration is using Sync Request for any change data capture functionality.
- Review the Sync Request Business Objects provided by your product for analytics integration.
- Refer to Data Synchronization for a high level understanding of the process.

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Business Flags

It is possible that information detected in one product may be useful or even critical to share with another product. The framework provides functionality for receiving information from an external system that acts as a type of flag or alert that may need investigation. This allows any system to store detected business flags in a common way and share that information with one or more other systems.

- Understanding Business Flags
- Setting Up Business Flag Configuration
- Maintaining Business Flags

Understanding Business Flags

The following is an example of a use case for business flags. Imagine that DataRaker highlights potential theft of service at a certain location. That product may initiate a business flag alert to various products owned by the implementation with a recognized "standard name" for the business flag, such as "TAMPER".

- If Oracle Utilities Meter Data Management receives this business flag, it may initiate a service investigation monitor.
- If Oracle Utilities Mobile Workforce Management receives this business flag, it may initiate a service investigation activity.
- If Oracle Utilities Customer Care and Billing receives this business flag, it may initiate a hold on billing for that location.

Note that the framework product supplies basic functionality to support logic that is common to all edge applications that implement business flag functionality. However it is the individual edge applications that supply more specific functionality (business objects and algorithms) for specific use cases, if applicable.

The following sections highlight functionality supported for business flags in the framework. Refer to the edge application product documentation for more details for supported use cases.

- Standard Name
- Business Flag Type Defines Behavior for a Standard Name
- Business Flag Type Algorithms
- Objects Linked to a Business Flag
- Impacted Business Process
- Dates
- Creating Business Flags
- Confidence

Standard Name

To ensure that Business Flags are universally understood across all edge applications and to simplify integration each Business Flag will have a Standard Name. This is a name that is used by all the products when sending information to each other. That way, if DataRaker product sends Oracle Utilities Meter Data Management a "TAMPER" business flag, it should result in

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the same functionality as when Utilities Customer Care and Billing sends a "TAMPER" business flag.

Standard Names are defined using an extendable lookup. In addition to common extendable lookup fields, the standard name also references a category and a class. The lookup also supports defining one or more external names, for cases where information is communicated from an external system that does not send the expected Standard Name.

The framework delivers the class values but does not deliver any standard names or category values. Refer to your specific edge application products to verify if any standard names or categories are delivered. Your implementation may configure appropriate standard names and categories based on your business rules.

Business Flag Type Defines Behavior for a Standard Name

Although the definition of the business flag standard names should be universally understood by the various integrated products that support them, each individual product defines what should occur when a business flag with a given standard name is created. This is configured using a business flag type. Only one active business flag type may exist for a given standard name. Business flags that are received from an external system will define the standard name, but will not have knowledge of the specific business flag types defined. The business flag type is determined based on the standard name.

The business flag type defines the business object to use when creating the resulting business flag record. The business object defines the lifecycle of a resulting business flag record.

Business Flag Type Algorithms

The business flag type includes support for algorithms. This allows for an implementation to define a common business object that may be used for different business flag types (if a common lifecycle is followed) but allow for different functionality to kick in depending on the business flag type.

The product supplies a plug-in spot for **Additional Processing** that may be invoked by a business flag that enters the Additional Processing state. Refer to your product's library of business objects to determine if there is an Additional Processing state that supports calling algorithms on the business flag type.

Objects Linked to a Business Flag

There are two types of links between an object in the system and a given business flag.

Affected Entity

Each business flag is associated with a single record in the system that is considered the "affected entity" or the entity that the business flag is associated with. The affected entity is defined by the specific business objects designed for the use cases supported by your edge product. For example, many utility base products may configure service point as the affected entity for its business flag use cases. Each business flag created is linked to a specific service point. Linking a specific entity to each business flag allows for algorithms to trigger functionality for that entity such as an investigation order. In addition, algorithms may be implemented in other business process areas that look for the existence of a business flag and act accordingly.

Related Objects

The business flag supports linking one or more related objects to a business flag to make it easier to trigger functionality or for impacted business processes to look for business flags. For

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example, when creating a business flag for a given service point, it may be useful to link all the accounts that are currently linked to the service point. Then, if an account oriented process should check for a business flag, it can look directly for a business flag linked to the account in its related object.

Impacted Business Process

The product supplies support for associating one or more impacted business processes to a business flag type. This configuration is used when functionality for that business process is impacted in some way based on the existence of a business flag of a given type. For example, maybe some process is put on hold when a certain type of business flag exists.

Note that configuring a business process on business flag type is not enough to trigger any impact on that business process when a business flag exists. There must also be some logic implemented in the business process functionality itself that knows to look for a business flag for a given record that is configured to impact the business process.

The definition of the business process is at the discretion of the edge application that supplies functionality to support this. For example, the business process could be defined as something broad such as "billing" or could be something more granular such as "billing estimation". The system supplies an extendable lookup to use for configuring the supported business processes. Refer to the values of the business process extendable lookup in your edge application or to the edge application specific Business Flag documentation for more information about supported business processes.

Dates

A business flag supports two dates: a Business Flag Date/Time and a Business Flag **End** Date/Time

- The business flag date / time is required for all business flags. For some types of business flags only one date is needed.
- For business flags that have a start and end period, the business flag date/time acts as the start date and the other field is the end date.

For a business flag that has a date range, it may be important for functionality implemented for impacted business processes. How the process treats the date will depend on its functionality.

- For some processes, the business flag is essentially expired after the end date has passed. This applies to impacted processes that are only looking at the current status of data in the system. For example, collection processing could be held if there is a business flag currently in effect (where the current date is within the date range). It would never look at historical business flags.
- For some processes where historical data may be relevant, a business flag effective during that same historical period may impact the process. For example if a business flag denotes an outage event for a given time period, perhaps estimated consumption should never be calculated for that time period.

Note that because business flags have a status, the design for the lifecycle of the business objects for the above effective dated use cases must carefully consider the states. For business flags that are considered expired after the end date passes, the BO lifecycle may be designed to transition to a final state after that date such that the record is no longer included in active processing. For business flags that continue to impact processing for a historic period, the BO lifecycle may be designed to remain in a non-final state such that it is clear that the record is still applicable.

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Creating Business Flags

Business flags may be created in a system for one of the following reasons:

- A message is received from an external system that initiates the creation of a business flag. In this case, logic in the external system has detected some situation that this product is being alerted about.
- Business logic in this product detects a situation that should be investigated or should act as a flag. In this scenario, there may not be any integration needed depending on the business rules.
- Business logic in this product detects a situation that another integrated product should be alerted about. In this scenario, the business flag record is used to send out information to the integrated product.
- A user manually creates a business flag based on knowledge of the affected entity. For example, a customer service representative may create a business flag as a result of contact with the customer.

Creating a Business Flag from a Web Service

The system supplies both a REST and SOAP inbound web service that may be used for an external system to initiate (or update) a business flag. The REST service is `F1-BusinessInsights`. The SOAP service is `F1-BusinessFlagSync`. In both cases, the web service invokes a "driver" service script whose ultimate responsibility is to determine the appropriate Business Flag Type based on the standard name or external standard name, and therefore the appropriate business object for the new business flag. Because different products may have different logic related to creating a business flag, the service script calls another service script linked to the maintenance object using the Business Flag Sync MO option.

The "driver" service script includes a "contextData" group, which in turn references the data area `F1-BusinessFlagContext`. This data area is to allow for an external system to provide additional information for a given business flag use case. For any integration that requires additional information to be passed in from the external system, a separate data area should be used to define the additional elements; and that data area should refer to `F1-BusinessFlagContext` as its extended data area.

The framework does not supply a Business Flag Sync service script, however individual edge applications supply a service script based on the use cases it supports out of the box.

> **Note**
>
> For products that are continuing to use XAI for external messages, the product also includes an XAI inbound service for the same Business Flag Sync Driver service script. Note that the product recommendation is to discontinue use of XAI and use inbound web services instead.

Error Handling

If there is a problem in trying to create a business flag based on incoming information, the Business Flag Sync Driver service script creates a special business flag record using the Business Flag Error Business Object. This is also configured on the maintenance object as an option. The framework product supplies the business object Business Flag Error (`F1-BusinessFlagError`) for this functionality. Refer to the business object description and configuration for more information.

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Confidence

There may be use cases where a condition is suspected, but not confirmed. The originating system should be able to assign a "confidence" level to the business flag.

For example, Oracle Utilities Analytics Insights or other machine learning platforms will aggregate and analyze large amounts of data to identify potential insights that need investigation. These platforms can initiate a business flag with a **Suspected** confidence.

An application receiving this business flag may adjust the confidence to either **Confirmed** or **Rejected**.

- – Setting the confidence to **Confirmed** is the equivalent of a true positive.
  - – Setting the confidence to **Rejected** is the equivalent of a false positive.

Note that the application that receives a business flag is responsible for acting on the value based on business rules. Any updates to the confidence can be communicated to the other products that received the same business flag, if desired.

Additionally, creating a business flag in the application with a confidence of **Missed** provides a way to denote a missed insight. This is the equivalent of a false negative.

Because a utility implementation may have multiple applications installed that support business flags, the following guidelines are suggested for designing where the confidence flag should be updated.

- If Oracle Utilities Service Order Management is implemented, it has the responsibility of updating the confidence flag and communicating the update to other products.
- Otherwise, the assumption is that Oracle Utilities Customer Care and Billing owns field work orchestration and that it will have the responsibility for updating the confidence flag and communicating the update to other products.

No product logic is provided to enforce the above suggestions, however, the business objects supplied by the different edge applications will support the recommended implementation.

Business Flag Updates from External System

When the product that is responsible for updating the Confidence flag makes a change, it should initiate an outbound message to alert other products. On the receiving side, the same inbound web service and Business Flag Sync service script is responsible for the update. Refer to Creating Business Flags for more information.

Setting Up Business Flag Configuration

The following topics highlight the general configuration steps required to use business flag functionality. Your specific product may supply additional functionality to support specific use cases for business flags. Refer to your specific product documentation and the library of business objects supplied for Business Flag in your product for more information.

- Standard Name Category Characteristic Type
- Standard Name Lookup
- Business Process Lookup
- Integration Configuration
- Defining Business Flag Types

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Standard Name Category Characteristic Type

Define one or more categories for grouping your standard names into logical business groupings.

Navigate to the Characteristic Type page. Search for and select the Business Flag Category characteristic type (`F1-BUSFC`).

Define desired category values and descriptions to be used for the standard names.

Standard Name Lookup

Navigate to the Extendable Lookup portal. Search for and select the **External Insights Standard Name** business object.

Define values that are recognized in the external systems that your implementation is receiving business flag details from.

Define a **Category** for the standard name that is appropriate for your product. Note that the category does not have to be in sync with standard name definitions in external products.

Select a **Class** for the standard name that is appropriate for its usage.

Refer to the embedded help for more information about configuring this object.

Business Process Lookup

If your specific product supports configuring business processes that may be impacted by the existence of a business flag, they are defined as an extendable lookup.

Navigate to the Extendable Lookup portal. Search for and select the **Business Process** business object.

Integration Configuration

The following points highlight configuration required to support receiving business flag information from an external source:

- Define a record for each External System that the product may be receiving business flag records from. This should be a value known by the external system and provided when new business flags are sent to this product.

When this product should initiate business flag information to be sent to an external system, configure one or more Outbound Message Type records. For each one, update the External System to configure how each outbound message type is communicated to the external system.

Defining Business Flag Types

Refer to About Business Flags for an overview of business flag functionality.

To maintain the business flag types applicable to your product, open **Admin**, and then **Integration**, and then **Business Flag Type.**

This is a standard All-in-One portal.

The information captured on the business flag type depends on the business objects supported by your product. Refer to the embedded help text for more information.

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Maintaining Business Flags

This section describes the functionality supported for viewing and maintaining business flags.

Refer to About Business Flags for an overview of business flag functionality.

Navigate using **Main**, and then **Integration**, and then **Business Flags**. You are brought to a query portal with options for searching for business flags.

Once a business flag record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The **Business Flag** zone provides basic information about a business flag. Refer to the embedded help for more information.

Market Transaction Management

This section describes various entities and aspects involved in the configuration and maintenance of market transactions. The framework product supplies basic functionality to support the objects related to market transaction management. However more specific functionality (business objects and algorithms) for specific use cases are supplied by the edge applications.

- Understanding Market Transaction Management
- Configuring Market Transaction Management
- Maintaining Market Transactions

Understanding Market Transaction Management

Several objects are provided to support market transaction management.

- Market Message Type. This object is used to define the different types of market messages, both inbound and outbound and to define the appropriate market message Business Object to use when creating objects of this type.
- Inbound Market Message. This object captures the instance of a market message received from an external source.
- Outbound Market Message. This object captures the instance of a market message that will initiate a message to an external source.
- Market Process Type. This object is used to define configuration related to processes that may be initiated to support steps that should be execute to support an inbound or an outbound market message. It defines the market process Business Object to use when creating market processes of this type. It may also define one or more market process event business objects to initiate events that are generated to support steps within the market process.
- Market Process. This object captures the instance of a market process that may be created to carry out business logic related to a specific inbound or an outbound market message.
- Market Process Event. This object is used to orchestrate individual events that may occur to support steps in a given market process.

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- Market Configuration. This object may be used to capture configuration needed to support market transactions. Each type of configuration should use a Business Object to define what information needs to be captured. Each type of configuration may define up to five key fields that may be used to uniquely identify an individual configuration instance.

Configuring Market Transaction Management

The following sections describe market transaction management configuration options.

- Defining Market Configurations
- Defining Market Message Types
- Defining Market Process Types

Defining Market Configurations

Each market configuration is used to define one or more options for a given type of configuration (based on a delivered business object).

The product defines a generic set of portals, described here, that may be used to define any type of market configuration. However, it may be that your implementation includes more specific configuration portals for certain types of market configurations.

Open this page using **Admin**, and then **Market Transaction Management**, and then **Market Configuration.**

You are brought to the **Market Configuration Query** where you need to search for the market configuration (i.e., its business object).

Once you have found the appropriate market configuration, select the value and you are brought to a standard All-in-One portal that lists the existing values for the market configuration. The standard actions for an All-in-One portal are available here.

Defining Market Message Types

Refer to Understanding Market Transaction Management for an overview of market messaging functionality.

Open this page using **Admin**, and then **Market Transaction Management**, and then **Market Message Type.**

This is a standard All-in-One portal.

The information captured on the market message type depends on the business objects supported by your product. Refer to the embedded help text for more information.

Defining Market Process Types

This page is used to define market process types which control behavior of the resulting market processes and the valid market process events that could be triggered as a market process progresses through its lifecycle.

Refer to Understanding Market Transaction Management for an overview of market messaging functionality.

Open this page using **Admin**, and then **Market Transaction Management**, and then **Market Process Type.**

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This is a standard All-in-One portal.

The information captured on the market process type depends on the business objects supported by your product. Refer to the embedded help text for more information.

Maintaining Market Transactions

The following sections describe various pages available to view and work on market transactions.

- Maintaining Market Processes
- Maintaining Market Process Events
- Maintaining Market Messages

Maintaining Market Processes

Refer to Understanding Market Transaction Management for an overview of market messaging functionality.

Open this page using **Main**, and then **Market Transaction Management**, and then **Market Process.**You are brought to a query portal with options for searching for market processes.

Once a market process record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The **Market Process** zone provides basic information about a market process. Refer to the embedded help for more information.

Related Objects

The related object tab includes several zones that display various objects that may be related to the market process.

Related Market Messages and Processes

This zone displays any entries in the related object collection that are outbound market messages, inbound market messages or market processes.

Related Processes

This zone displays market processes that are linked to this market process using the explicit related process table. The market processes linked here are marked either as a parent, a child or a sibling market process.

Other Related Objects

This zone displays market process events linked to this market process. In addition, the zone displays any miscellaneous objects that are linked to the market process in the related objects collection, besides outbound market messages, inbound market messages and market processes.

Maintaining Market Process Events

Refer to Understanding Market Transaction Management for an overview of market messaging functionality.

You can view this page when drilling into a market process event from the Market Process related objects tab.

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Once a market process record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The **Market Process Event** zone provides basic information about a market process. Refer to the embedded help for more information.

Related Objects

The related object tab includes a zone that displays all entries in the market process event's related object collection.

Maintaining Market Messages

Refer to Understanding Market Transaction Management for an overview of market messaging functionality.

Open this page using **Main**, and then **Market Transaction Management**, and then **Market Message.**You are brought to a query portal with options for searching for market messages. Both inbound market messages and outbound market messages may be queried here.

Once a market message record has been selected, you are brought to the appropriate maintenance portal (inbound market message or outbound market message) to view and maintain the selected record. The inbound market message portal and the outbound market message portal have similar portal tabs and zones.

The **Market Message** zone provides basic information about the market message. Refer to the embedded help for more information.

Related Objects

The related object tab includes several zones that display various objects that may be related to the market process.

Related Market Messages and Processes

This zone displays any entries in the related object collection that are outbound market messages, inbound market messages or market processes.

Other Related Objects

This zone displays any miscellaneous objects that are linked to the inbound / outbound market message in the related objects collection, besides outbound market messages, inbound market messages and market processes.

Content Migration Assistant (CMA)

This chapter describes the Content Migration Assistant (CMA), a facility to enable the export of data from one environment to another.

> ⚠ **Caution**
>
> This chapter is intended for users responsible for creating environments for testing.

- Understanding CMA
- CMA Configuration

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- The CMA Execution Process
- Running Batch Jobs
- CMA Reference

Understanding CMA

The Content Migration Assistant (CMA) provides implementers with a flexible, extensible facility for migrating data from one environment to another (e.g., from a development environment to a production environment). Data is exported from the source system to a file. The file can then be checked in to a version control system for reuse, or can be immediately imported into the target system and applied.

> **Note**
>
> As used in this chapter, *source* systems are those on which export-related activities are conducted and *target* systems are those on which migration updates are to occur.

The following points highlight some common use cases for using this tool:

- Seeding a newly created environment with configuration data. For example, if you are creating test environments, you can import configuration data from a development environment. In this case, you will probably set up a "copy all configuration" type of migration. Another use case is if you want to troubleshoot an issue in production, you may want to copy all production configuration to a test environment.
- Updating an existing test environment with new configuration or updates to configuration from a development environment. In this case your set of objects will be more targeted and you are doing more of an incremental migration.
- Promoting tested configuration to your production environment.
- Migrating selected master and transaction entities from one environment to another for testing purposes.

Here are key aspects of the import process that apply to all cases:

- When records exist in both the target and the source, the CMA tool will fully **replace** the object with the version from the source. Special consideration should therefore be given to records whose primary key is system generated to ensure the correct entity is being replaced.
- While typically the source version of an object is applied directly onto the target environment, CMA does provide a way to Adjust Imported Data.
- The import process **does not handle deletion** of entire entities in the target environment. Refer to Configuration Data Deletion for more information.

Configuration steps are mainly used to define the data to migrate at the source system but also involve tasks to be performed at the target environment. Note that the products provide base delivered configuration that may be used as is or used as a template for building more specific configuration for a given implementation. At a high level, configuration tasks involve the following entities:

- System wide settings are defined in the **Migration Assistant Configuration** master configuration record.

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- Each type of record that may be copied requires a **Migration Plan**. The migration plan is used to identify the maintenance object (MO) for the record (using a business object) and allows for instructions to specify related records that may be included in the migration.
- A **Migration Request** is used to define the data to include in a given migration export.

Refer to CMA Configuration for more information.

Once you have a migration request defined to include desired data to export, the next steps are to export from the current environment and import to the target.

- The **Export** process includes all the steps needed to select records to be exported from the source environment and create the export file. For more information, refer to Exporting a Migration.
- The file created by the export, which is a BINARY file, needs to be transferred from the export directory to the import directory. The transfer needs to be done in such a way as to preserve the file structure. Refer to Additional Migration Considerations for more information.
- The **Import** processes include all the steps needed to read an imported file, compare the data in the file to the data in the target, review the proposed changes and apply the updates. For more information, refer to Importing and Applying a Migration.

The topics in this section provide a general understanding of the Content Migration Assistant (CMA) tool.

- Types of Migrations
- Migrating Configuration Data
- Migrating Business Data
- Data with System Generated Primary Keys
- Importing Data that References a User
- Importing Environment-Specific Data
- Configuration Data Deletion
- Additional Considerations
- Versions and CMA

Types of Migrations

The Content Migration Assistant is used for two general types of migrations: wholesale and targeted. The following topics provide some additional information about these concepts.

Wholesale Migrations

Wholesale migrations are used when migrating all the configuration and/or administrative data from one environment to another. For example, a wholesale migration might be used when migrating administrative data from a development or test environment to a production environment.

A wholesale migration may be comprised of one or more migration requests that in total include all the administrative data to move. Migration plans used in wholesale migrations may be designed to omit subordinate instructions related to explicit foreign keys that are identified through constraints as they are not needed, assuming that the data they are referring to will also be included in the migration.

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With the ability to group migration requests, the expectation is that implementations follow these guidelines:

- Multiple migration requests using the Criteria-based or Entity List migration request classes are used to group information logically together to allow for more reuse.
- A Group migration request is used for the export. This allows for one data set to export and one data set on the import side, simplifying the process. Note that depending on the amount of data, this may be a large import set to process. An implementation may find it easier to create multiple migration requests that break down the process into several steps.

You should consider that the framework product provides base migration requests and your specific edge product may provide base migration requests as well that may or may not include framework migration plans. Using the product provided migration requests is beneficial with respect to maintenance. As features are added to the product (including new administrative maintenance objects), any impact on CMA should be included in the product owned migration requests. If your implementation introduces new custom administrative maintenance objects that should be included in CMA, then custom migration plans and a custom migration request should be added. Your implementation can build a Group migration request that includes the base migration request and your custom migration requests to have a consolidated export.

> **Note**
>
> Refer to Framework Provided Migration Objects for information about migration requests provided in the framework product. Refer to your specific product's documentation for information about addition base provided migration requests.

Targeted Migrations

A targeted migration refers to migrating a specific subset of data from one environment to another. Migration plans used in targeted migrations are designed to be self-sufficient and include all necessary subordinate instructions needed to ensure that the exported entity can be imported without encountering referential integrity errors. With this type of migrations, any relationship explicitly excluded from the migration plan assumes the related entity already exists in the target environment. Examples of targeted migrations include:

- Migration of a new portal, its zones, and its application service.
- Migration of all outbound message types.
- Migration of selected accounts and their related master and transactional entities to a lower environment for testing purposes.

Migrating Configuration Data

A main use of CMA is to migrate configuration data, where the source environment is considered a kind of system of record and the target environment is getting updates based on changes to the source environment. Alternatively, you may be seeding a new environment. The expectation is that the target record is updated to look like the source record.

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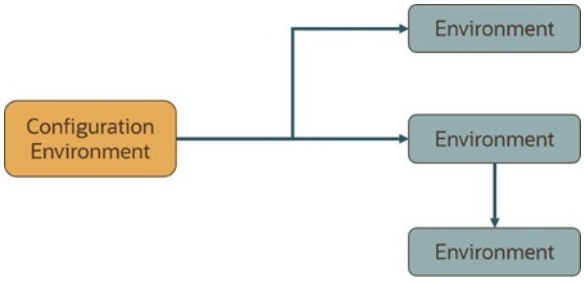
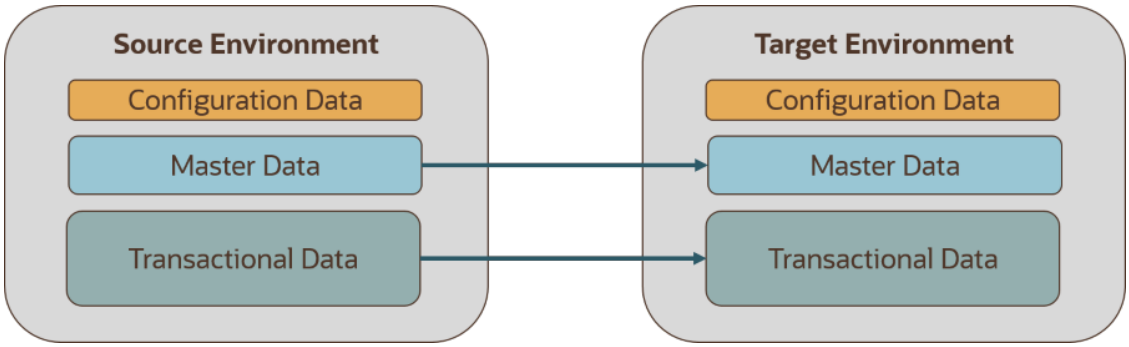


Configuration data may include a mixture of records that have an owner flag and ones that do not. The comparison step of the import process will generate appropriate insert or update SQL statements for the following data found in the export:

- Configuration data in a maintenance object with no owner flag. This is purely implementation data.
- Configuration data in a maintenance object with owner flag, where the owner is **Customer Modification**. For example, implementer-specific business objects.
- Configuration data in a maintenance object with owner flag, where the main record is owned by the product but where a child record exists with an owner of **Customer Modification**. For example, implementer-specific algorithms added to a base owned business object.
- Customizable fields in a record that is owned by the product. For example, the priority of a based owned To Do type.

Migrating Business Data

CMA may be used to perform a targeted migration of selected master entities and their related transactional data from one environment to another. For example, migrating a subset of accounts and their related data for testing purposes.



The following points highlight key differences between business data and configuration data that call for special considerations when designing your business data migrations:

- Migration of business data typically involves a much higher number of records in a data set compared with a configuration-only data set. While there is no explicit limit to the size of a data set, some reasonable limit has to be assumed.
- Having large sets of entities depend on relatively few entities in the same data set significantly slows the import process. This situation occurs when mixing configuration data, master data and high volume transaction data in a single migration. We therefore recommend designing separate migrations for these data classes. Refer to the **Reduce Dependency Between Migration Objects** section below for more information.

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- All business entities have a system generated key. Refer to Data with System Generated Primary Keys for more information.

The following sections expand on topics and concepts related to business data migration.

Reduce Dependency Between Migration Objects

CMA leverages the application's referential integrity and business rules to ensure entities remain compliant and valid when imported into another environment. These rules are there to prevent an entity from being imported when any of the entities it references do not exist in the target environment. When both the referencing entity and the entity it references are part of the same data set they establish a **dependency** that dictates the sequence in which these entities should be processed in order to be successfully imported. Note that the tool supports even the more complex and rare situations wherein the dependency between entities is cyclical, i.e. entity A (directly or indirectly) refers to entity B while entity B (directly or indirectly) refers back to entity A, for which sequential processing is not enough to guarantee a successful import.

The tool uses foreign key relationships between entities in the same data set to identify sets of dependent entities and group them into separate migration transaction records. Note that these foreign keys are defined in the application's data model repository and not at the database level for greater flexibility. The larger the migration transaction the more complex the process is to successfully import all its objects. So while the tool is designed to support all types of dependencies (sequential and cyclical), handling very large sets of dependent objects may incur a significant performance cost.

While configuration entities tend to be highly inter-dependent, the total number of entities that comprise the entire set of configuration objects is relatively small. Therefore, the impact on performance such dependencies have when importing a configuration-only data set is negligible. On the other hand, configuration entities tend to be referenced on many master and transaction entities as they control many aspects of the latter's business rules. As such, mixing configuration and business data in the same data set is likely to form extremely large sets of business entities that dependent on a small number of configuration entities. It is therefore strongly recommended to import or set up configuration data in the target environment prior to importing business data into it.

In a similar way, some transactional data tends to be of a much higher volume compared to the master data entities they reference. Here too, it is strongly recommend to migrate master data entities prior to their high volume related transactional data. For example, many interval measurement records (transaction data) reference the same measuring component (master data). Migrating a large volume of measurement data along with their measurement component would result in a very large migration transaction that may take long to import. Importing the measurement components prior to migrating their interval measurements will eliminate unnecessary dependencies within the measurements only data set and significantly improve the performance of the overall process.

Reasonable Data Volume

The overall volume of all business entities to migrate in a single data set should be reasonably sized. For example, importing several hundreds of accounts and their related master and transactional data is considered a reasonable size. Migrating too much data may reach physical and performance limitations of the tool.

You may use any supported migration request methods for describing the entities to export. If you opt for an Entity List migration request, consider using the Collect Entity zone to build the list of entities as you browse them on their respective portals.

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Single Source of Data

CMA uses an entity's prime key to determine if it is new to the target environment and therefore should be added or refers to an existing record and therefore needs to be replaced with the new version. All business entities have system generated keys, which are environment specific. It is therefore possible to have different entities in separate environments having the same prime key. When migrating entities whose keys are system generated, it is strongly recommended to migrate data to a target environment from a single source environment and avoid creating such entities in the target environment using the application. This practice ensures that prime keys for an imported entity are always in sync with their source environment. Refer to Data with System Generated Primary Keys for more information and considerations.

No Deletion

CMA does not handle deletion of entities of any kind, whether they are configuration or business entities. If a test needs to be repeated using an initial snapshot of the data, you should restore your target environment to a backup taken before test data was imported and import the latest version of the test data. If there is no need to delete previously imported entities, you may keep reloading test data from a single source environment as needed.

Bulk Import Mode

By default, the import process creates a migration object for each imported entity. This allows for granular reporting and error handling at the entity level. When importing a high volume data set of business entities, this granular management has a performance toll. In this situation, you may want to use the **Bulk Import** option on the migration data set import request. In this mode, a single migration object record is created for multiple entities of the same maintenance object. In the same way, a single migration transaction record is created for multiple logical transaction groups. Using this option reduces the migration object management effort throughout the process and thus results in better performance.

Note that each entity is still individually compared and validated, as in regular import processing, but if one entity is invalid the entire migration object is not applied hence impacting all entities grouped together with it. Bulk import mode is useful when importing a large set of data from a validated data source such that almost no errors are anticipated.

This option is only supported for master and transaction maintenance objects, i.e. it is not applicable to configuration migrations.

Insert Only Mode

By default, the comparison step of the import process needs to determine whether the imported entity is new and therefore should be added, represents a change to an existing entity and should be updated or the entity is unchanged. When importing a high volume data set of business entities that are all new to the current environment, this check is time consuming and can be avoided. In this situation, you may use the **Insert Only** option on the migration data set import request to indicate that all imported entities are assumed to be new additions to the current environment. By doing so, the import process avoids unnecessary steps to determine whether the entity should be added or updated and thus contributes to a faster import process.

This option is only supported for master and transaction maintenance objects, i.e. it is not applicable to configuration migrations.

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Separate Batch Processes for Managing Business Migration Objects

By default, the same import related batch processes manage configuration and business data migrations. Typically, business data migrations involve high volume of records compared to much lighter configuration data sets. Processing them together by the same batch process may slow down the performance of configuration migrations, preventing them from completing faster and more frequently. The issue mainly affects test-like environments where mixed data class migrations are more common: configuration data is imported from a lower environment and large test data is imported from a higher environment. You may adjust the base product's configuration in such environments to benefit from separating the import processes for configuration and business data.

Note that the ability to separate import processes applies to migration objects only because of their volume. Migration data set and transaction records are of low volume and as such remain managed by the same batch processes.

Designated batch processes are provided for importing migration objects containing business data but they are not used by default:

- F1-MGOPB - Migration Object Monitor (Business)
- F1-MGOAB - Migration Object Monitor (Business) - Apply

Follow these steps to use these separate designated batch processes for business data:

- Update the **Migration Object Business Data** (F1-MigrObjectBus) business object to reference the business data related batch controls on the following statuses:
  - **Pending, Error Applying, Needs Review** - Migration Object Monitor (Business) - F1-MGOPB
  - **Approved** - Migration Object Monitor (Business) - Apply - F1-MGOAB
- If your organization uses event driven job submissions for CMA batch processes then refer to Running Batch Jobs for additional configuration steps.

Data with System Generated Primary Keys

For records with system generated keys, there is an issue if the target environment already has a record with the same key but doesn't represent the same record. The tool shouldn't be just updating that target record with the view of the source in case this will break foreign key relationships that exist in the target.

The tool provides support for administrative data with system-generated primary keys. The logic relies on the maintenance object to use a method that looks at other attributes of the record (considered a "logical key") to detect whether the record being migrated already exists in the target region or not. The examples in this section are based on the Attachment maintenance object. Common attachments are considered administrative data. The attachment MO uses the file name and the creation date as the "logical key".

Imagine a common attachment for the "standard rate codes" file exists in a source region with the key 123456789. The table below highlights possible situations at the target region and actions supported in CMA.

Scenario	Target Situation	Action	Comments
1	No matching record	Record can be added with key 123456789.	

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Scenario	Target Situation	Action	Comments
2	Record exists with key 123456789 and logic confirms that it is also the "standard rate codes" attachment.	Record can be updated.	
3	Record exists with key 123456789, but logic detects that it is not the "standard rate codes" attachment.	Record is not updated. An error is issued.	The system cannot update this record because it's not the right attachment record.
4	The system detects that another attachment record exists for the "standard rate codes" attachment with a different ID.	Record is not updated. An error is issued.	Assumption is that the record was created directly in the target or was copied from a different source.

The use cases described in scenarios 3 and 4 above would require key mapping to keep track of the id from the source to the id in the target so that any other records from the source that reference this key as a foreign key would be updated as part of the migration. This functionality is not supported.

Scenarios 1 and 2 above are supported for maintenance objects that use the method to detect the logical key.

> **Note**
>
> If a maintenance object with a system generated key does not supply a method to detect the logical key, CMA will update an existing record with the same ID. For maintenance objects in the framework that provide this method, refer to Framework Provided Migration Configuration. For your specific edge application, refer to the CMA addendum for information about support for data with system generated keys.

The product recommends that an implementation establishes a migration strategy such that records with system generated keys are always created in the same region and always follow a standard migration path for promoting the data from this source region to other regions. Following this strategy, you would minimize or eliminate the possibility that a record for the same logical key is created in multiple places such that different IDs would be generated as described by scenario 4 above.

MOs with a Mixture of Administration and Non-Administration Data

There are some MOs that contain a mixture of master or transaction data and administrative data. The Attachment is an example of this. The product supports common attachments and owned attachments. Owned attachments are records that are specific to its owner. The owner could be master or transaction data and its attachments are therefore considered master or transaction data. Owned attachments are not candidates for migration using CMA. Common attachments on the other hand are considered administrative data and may be candidates for migration using CMA. For these use cases, an implementation may follow the suggested strategy of only creating the administrative data in one region so that IDs for common attachments are not reused. However, it is reasonable and expected that owned attachments are being created in the target region and may receive a system generated key that matches the key of a common attachment from the source region.

To try to minimize this issue, the system includes special logic to be used by any MO that may contain administrative data mixed in with master or transaction data. This special logic

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generates the key of an administrative record with a zero (0) in the middle of the key and ensures that the keys for master and transaction data do not include a zero in this spot. For maintenance objects in the framework that use this method, refer to Framework Provided Migration Configuration. For your specific edge application, refer to the CMA addendum for information about additional maintenance objects that may be in this category.

Importing Data that References a User

Although the tool supports copying users from one environment to another, the assumption is that it will be more common for implementations to define their valid users for each environment separately. In fact, the default CMA configuration for copying security configuration assumes that users are not being copied.

There may be times were a record is being copied from one environment to another where a user is referenced on the record but that user is not valid in the target environment. For example, if a batch control is configured as Timed with a user referenced, if this batch control is copied to another environment, what should happen if that user is not found? You may not want that user defined in the target environment. To handle this, the product provides support for a Default User that you can define in the migration assistant configuration. If this default user is configured then any time the CMA import process recognizes that a record references a User and the user does not exist in the target environment, it updates the record to instead refer to the default user.

> **Note**
>
> Please note that if you are trying to copy entities that includes valid users, you should ensure that all the users are copied to the target environment first. Otherwise, the entity will be updated to refer to the default user, which may not be your intention.

> **Note**
>
> If you copy records that reference a User within an XML field or CLOB, the CMA input tool is not able to detect that. A pre-compare algorithm is recommended if this use case exists in your implementation.

Importing Environment-Specific Data

Configuration entities that include references to environment-specific values should be imported with extreme care. Unintentionally overriding these values with data sourced from another environment may disrupt the proper function of the application. Note that these records may be initially imported from another environment but are typically adjusted manually to reflect current environment settings and should not be updated again by an import.

The sole purpose of some maintenance objects, like Message Sender, is to define environment-specific settings. As such, they are easily identifiable and included in a designated integration related migration request (F1-IntegrationConfig) that can be used carefully and as needed.

However, general purpose maintenance objects, like Extendable Lookup and Master Configuration, are designed to define various types of configurations where some may contain environment-specific information. For example, while most extendable lookup records do not contain environment-specific settings, the File Storage Configuration (F1-FileStorage) extendable lookup includes object storage definitions that are environment dependent.

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The following mechanism may be used to prevent an unintentional update of such records by a CMA import. It identifies the records containing environment-specific data and allows for them to be added but not updated as follows:

- Use the **Environment Specific** option to mark business objects that define environment specific information. For example, the business object for the File Storage Configuration extendable lookup is marked with this option.

> **Note**
>
> This option is available for Extendable Lookup and Master Configuration business objects but may be configured to be valid for other maintenance objects as needed.

- The product supports a generic migration plan **pre-compare algorithm** that prevents an update of an entity that its business object is marked as containing environment-specific data using the designated option.

> **Note**
>
> The algorithm is added to the Extendable Lookup and Master Configuration default migration plans and can be added to other migration plans as needed.

In addition, the following changes were made to keep such entities in environment-specific related migration requests:

- The wholesale **General System Options** migration request excludes extendable lookup and master configuration records that their business object indicates they contain environment-specific information.
- The wholesale **Framework Integration Configuration** migration request include only those extendable lookup and master configuration records that their business object indicates they contain environment-specific information.

Configuration Data Deletion

The import process does not handle deletion of entire entities in the target environment. When importing data from a source environment to a target environment, the import process for the migrated records is able to identify objects to add and objects to change. There is no mechanism for comparing the target environment to detect entities that were previously imported and no longer exist in the source system. In the same way, there is also no mechanism for indicating that records in the target environment should be deleted. The absence of those records in the import is not enough because the migration may be only importing a subset to add or update.

Note that CMA does orchestrate the deletion of child rows of an object as a result of a comparison. This is only applicable to child records that are owned by the implementation.

If data on the target system must be deleted, users must delete the records in the target accordingly.

This section describes available tools to assist with this task.

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Delete Entities Online

You may review and delete previously imported configuration entities using the Configuration Deletion portal.

Delete Entities In Batch

You may submit a request to delete configuration entities in batch. The process involves uploading a list of configuration entities from a CSV file onto a request record that is processed in batch by the request monitor process.

To do so create a request record using the **Delete Configuration Entities** (F1-DeleteConfigEntitiesType) request type. This option allows you to upload a list of entities to delete from a CSV file onto the request record and submit the request for batch processing when ready. When processed in batch, the request deletes all the entities in the list as a single transaction.

The file with the entities to delete should be prepared with the following header columns: maintenance object, key1, key2, key3, key4, key5. Add rows after the header row for each configuration entity to delete.

	A	B	C	D	E	F
1	Maintenar	key1	key2	key3	key4	key5
2						
3						
4						
5						

> **Note**
>
> The file should be of a reasonable size to allow the list to properly upload online. If the upload step times out use smaller files.

The deletion process abides to the application's standard referential integrity rules and therefore the order in the list should reflect data model relationship dependency.

The process stops at the first error, i.e. it does not accumulate exceptions. The user needs to review the exception, correct the issue, and resubmit the request as needed.

Additional Considerations

The following sections describe some additional considerations for CMA.

File Transfer Considerations

When moving the export file between systems, use the binary transfer option of whatever tool you use to move the file so that line-end characters are not converted from Linux-style to Windows-style or vice versa.

It is recommended to avoid using 'txt' for the export file's extension (defined in the master configuration). That file extension by default implies a non-binary file and tools that perform file transfer may treat this as a non-binary file unless explicitly stated. The recommendation is to define 'cma' as the extension. This is not a recognized file extension and most file transfer tools will transfer the file as is.

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Note that if the file gets converted, there are two likely outcomes - either a numeric conversion error, or a buffer under-run error may be received when attempting to import the file.

Multi-Language Environment Considerations

If your implementation uses a language other than English, it means that migrated administration objects may have multiple language rows (because English is always enabled). There are some important points with respect to multiple languages and CMA:

- As described in User Language, there are steps to follow when supporting an additional language. The steps outlined in that topic highlight that for system data, translation of the strings may be provided via a language pack provided by the product or may be the responsibility of your implementation. In either case, this effort is non-trivial and will have its own established plan. The expectation is that the translation of the system data is applied for each region at your implementation site. CMA should not be used to create a new language in a target region.
- For administrative / control data that your implementation develops as part of your project, the expectation is that descriptions for your supported language are entered in the region that is considered the source region used to promote changes to regions in the "chain". For example, control data is entered in a development region and promoted to a test with the supported language enabled in both regions.
- What if you export data from a region with more languages enabled than your target? This scenario is perhaps a case where the source region is a type of test or playpen region where the additional language is enabled for other purposes. In this case, if the language code doesn't exist at all in the target region, the import will produce an error given that the code is invalid. If the language code exists but is not enabled, this will cause the extra language rows to be inserted in the target region, but will not cause any issues. They are simply ignored.
- What if you export data from a region with fewer languages enabled than your target? In this situation, the import process will only create language rows for the languages that were copied from the source. It will not automatically create language rows in the target as part of the import. For this situation, the recommendation is to run the **New Language** batch program (`F1-LANG`) that creates any missing language entries.

Versions and CMA

This topic addresses two separate version related topics with respect to using CMA between two environments.

- Different versions of the application
- Different CMA file format versions

Different Versions of the Product

CMA was developed with the main requirement of copying data between two environments that are on the same version of the product. For example, copying configuration data from a development environment to a test environment on the same product version. It is highly recommended that you limit your use of CMA to this scenario. If it is impossible for you to ensure that both environments have the same product version, then this section highlights the possible challenges you may face when trying bring data in from a different product version.

In general, there isn't anything about how CMA functions that would limit your ability to copy data between two different versions of the product. However, there are several ways that your product may have enhanced or changed functionality for certain objects such that the data captured in a different version may not be compatible with the changes.

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Our products follow strict standards for upgrading clients to ensure backward compatibility. Upgrade scripts in the blueprint process know what was changed from one release to another and update the data accordingly, where applicable. When using CMA to move data from one version of the product to another, you are bypassing these upgrade scripts. It means your data is not being adjusted as expected. It's not recommended unless you are certain that the data of an object from one version is compatible in the other version.

The following points highlight this in more detail.

- For objects whose structure and rules have not changed between the two versions, there should be no issues.
- For objects that have changed between the two versions, there are scenarios that may cause additional steps.
  - If the target environment is a later version and includes a new optional column on an object that was not present in the source, the import should go through without any issues.
  - If the target environment is a later version and includes a new required column on an object that was not present in the source, a 'pre-compare' algorithm could be used to populate the new required value. Your implementation can provide this algorithm to populate the data according to your business rules.
  - If the target environment is an earlier version than the source, we cannot guarantee that there won't be specific issues encountered with specific objects.

> ⚠ **Caution**
>
> When importing data from a different environment and bypassing upgrade scripts, it may be that nothing about this product change causes an error in CMA. But because the data has not been updated as expected, it's possible that something will not work properly in the application that is not easy to detect.

Another issue you may encounter is that if system owned data is part of your import file, it's possible that the product has made changes to that data as part of an upgrade and your version of the data is different. Because CMA tries to make the target data look like the source data, when it sees a difference in product owned data, it won't proceed with importing that data. Some examples:

- Your import has included all portals, including system owned portals. In the target version, one of the zones on the portal is no longer supported by the product and is no longer linked. In your import, the zone is still linked and the system attempts to add that zone back to the portal. Because the data is system owned, it marks it as "Cannot Apply". In this case, you don't need to do anything. You can just skip this record.
- If in the previous use case you had added a custom zone to the portal and are trying to copy in that configuration, you will not be able to do it because of the system data differences. In this case you will need to manually add the custom zone to the portal in the target environment.

File Format Version

If your implementation has decided that you are going to use CMA across product versions, given all the cautions described in the previous section, this section provides information on the rare case where CMA has a change in how it writes the export file.

When creating the export file, the format of the file is specific and the CMA import step knows how to read the file. It is rare, but there are times when the product makes an enhancement to

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CMA that requires a change in the structure of the export file at which point the 'version' of the CMA file is incremented.

The CMA file format version has no impact to migrations that are exported and then imported into the same version of Oracle Utilities Application Framework. However, if your implementation has different environments on different versions of the product where the CMA file format is also different, then the system has functionality to cater for these differences.

- If you are exporting data from a lower file format version to a higher file format version, there is nothing special that you need to do. The export step captures the file format version and the import step reads this information and processes the file accordingly.
- If you are exporting data from a higher file format version and the product currently supports exporting to a lower file format version, at export time you are prompted for the earlier file format version. You may indicate the you want the earlier file format version when creating the migration data export.

> **Note**
>
> The product supports exporting to an earlier file format version for a reasonable amount of time, but not in perpetuity. If you don't see any option in the user interface to export to an earlier file format, it means that it is not supported in that release.

CMA Configuration

The following sections describe tasks required for CMA configuration.

- Master Configuration - Migration Assistant
- Migration Plans
- Defining a Migration Request
- Identifying Tables to Exclude From Migrations
- Configuring Custom Objects for Migration

Master Configuration - Migration Assistant

The **Migration Assistant Configuration** master configuration record defines system wide configuration used in both the source environment and the target environment.

As described in Importing Data that References a User, if you have records being imported that may reference a user does not exist (and shouldn't exist) in the target environment, define a Default User here.

In both the source environment and the target environment, the system needs to know the location of the export directory and the import directory along with the expected file suffix. For these fields, implementations may also rely on the system defaults. If no Migration Assistant Configuration record is found, the system assumes that there is an entry defined in the system's substitution variable list for `F1_CMA_FILES`. Further it defaults the values as follows:

- Export directory is the value for this variable plus `"\export"`.
- Import directory is the value of this variable plus `"\import"`.

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- File suffix is set to **cma**

Refer to Referencing URIs for more information about the substitution variable list.

For additional information about specific fields in the master configuration, refer to the embedded help.

> **Note**
>
> This record can be updated at any time to change details. The new configuration takes effect on all subsequent exports and imports.

Migration Plans

A migration plan defines one or more types of objects that are eligible for migration. It is essentially a set of instructions describing how the data to be exported is structured, allowing objects to be migrated together as a logical unit to ensure consistency and completeness.

The migration plan is always related to a given maintenance object, defined using its primary instruction. Multiple migration plans may exist for a given maintenance object if there are different requirements for migrating records in that MO under different circumstances. For each migration plan, you decide if additional data should be included as part of an object using subordinate instructions. For example, when copying a single algorithm type, should the system only copy that algorithm type record, or should it also copy all its algorithms and its related script (if applicable)? Refer to Types of Migrations for more information.

The following topics describe defining a migration plan as well as other topics for a migration plan.

- Defining a Migration Plan
- Understanding the BO Filtering Process
- Migration Plans for Objects with XML-Embedded Links

Defining a Migration Plan

To view or define a migration plan, navigate using **Admin**, and then **Implementation Tools**, and then **Migration Plan.**

Use the **Migration Plan Query** portal to search for an existing migration plan. Once a migration plan is selected, you are brought to the maintenance portal to view and maintain the selected record.

> **Caution**
>
> Important! If you introduce a new migration plan, carefully consider its naming convention. Refer to System Data Naming Convention for more information.

The following points provide information about defining **Instructions** for a migration plan.

The **Instruction Sequence** uniquely identifies the instruction. The recommendation is to use increments of 10 to allow insertion of other instructions in the future.

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Select **Primary** for the first **Instruction Type**. All migration plans must contain one and only one primary instruction. All subsequent instructions require a **Subordinate** instruction type. In this case, the **Parent Instruction Sequence** must be entered. This number, used to maintain the defined relationships in the exported data, must match an instruction sequence number at a higher level in the hierarchy.

The instruction **Description** provides a business description of the instruction.

Select a **Business Object** (BO) to define the type of object from which data will be derived.

> **Note**
>
> Though BOs are specified in each instruction, it's important to understand that each BO is used only for filtering purposes. The migrated data set comprises the complete contents of the *maintenance object* that the business object structure is defined against. For a more detailed explanation of this, see Understanding the BO Filtering Process.

> **Note**
>
> Refer to Identifying Tables to Exclude From Migrations for information about defining child tables to always exclude from a migration.

Traversal Criteria is used to define the relationship between each of the objects in a migration plan. The system provides three options to define how the child object is connected to the parent object so the system knows how to traverse from one object to another. **Traversal Criteria Type** options are **Constraint**, **SQL** and **XPath**. The following points explain each option:

- **Constraint** allows you to select a table constraint that represents a given record's relationship to another record in the system via a foreign key constraint defined in the meta-data. If **Constraint** is selected, the following additional fields are enabled:
  - **Constraint ID** is a unique identifier for the constraint. The search will show the valid table constraints for the MO of the instruction's BO and the MO of the parent instruction's BO.
  - **Constraint Owner** is used to define the owner of the constraint. This is populated automatically when selecting a constraint from the search.
- **SQL** lets you specify SQL join criteria between the parent instruction's object and the child object in the **SQL Traversal Criteria**. The syntax of the the traversal criteria is a WHERE clause (without including the word WHERE). When referring to a field on the parent instruction's object, use the syntax `#PARENT.TABLE_NAME.FIELD_NAME`. When referring to a field on the current instruction's object, use the syntax `#THIS.TABLE_NAME.FIELD_NAME`. For example, the following statement is used on a migration plan for Business Object, where the parent instruction is the BO and the subordinate instruction is used to reference the UI Map that is referred to as a BO option with the option type `"F1DU":#PARENT.F1_BUS_OBJ_OPT.BUS_OBJ_OPT_FLG = 'F1DU' AND @trim(#THIS.F1_MAP.MAP_CD) = @trim(#PARENT.F1_BUS_OBJ_OPT.BUS_OBJ_OPT_VAL)`.
- The **XPath** option lets you apply syntax in an XPath expression referencing elements in the instructions' referenced business objects. This is entered in the **XPath Traversal Criteria**. For example, the display map collection statement in the SQL example noted above would be written as follows in XPath: `#this/mapCd = #parent/businessObjectOption/businessObjectOptionValue AND #parent/`

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`businessObjectOption/businessObjectOptionType = 'F1DU'`. This technique allows foreign key references that are mapped inside an XML column to be referenced.

> **Note**
>
> The #parent expressions may access elements that are stored in an XML column and described using mapXML and mdField. However, the #this expressions must refer to fields available in the business object using the mapField reference.

Defining **Next Migration Plan** provides the ability to indicate that in addition to copying the object defined in the instruction, any additional instructions included in that referenced migration plan will also be included in an export.

The **Algorithms** grid contains algorithms associated with each instruction. You must define the following for each algorithm:

- Specify the **System Event** with which the algorithm is associated (see the table that follows for a description of all possible events).
- Specify the **Sequence** and **Algorithm** for each system event. You can set the **Sequence** to 10 unless you have a **System Event** that has multiple **Algorithms**. In this case, you need to tell the system the Sequence in which they should execute.

System Event	Optional / Required	Description
`Pre-Compare`	Optional	Algorithms of this type may be used to adjust the data after it is moved to the target system. These may only be defined on the primary instruction. Refer to Adjusting Imported Data for more information.
Import	Optional	Algorithms of this type are no longer supported.

Understanding the BO Filtering Process

Migration plan instructions require the definition of a business object to provide CMA with information about the record related to the instruction.

If the business object is the physical business object for the maintenance object, then CMA assumes that the instruction applies to all records that satisfy the traversal criteria. CMA recognizes the physical BO by comparing the BO to the value defined in the maintenance object option. If the business object defined is not the physical BO, then CMA will limit the records in the instruction to those that explicitly reference this BO or reference a child of this BO as its identifying BO value. (In other words, this BO must be in the parentage hierarchy of the records to be included in the instruction.)

> **Note**
>
> Unlike Bundling, CMA does not use the BO schema to drive what data is copied for a given record. The BO is only used as a filtering mechanism for selecting records. Refer to Identifying Tables to Exclude from Migration for information about how to ensure a child table is not included in a migration.

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For example, if you define a migration plan for Master Configuration and use the physical business object for the instruction (`F1-MstCfgPhysicalBO`) then all master configuration records are considered for the instruction. If instead the business object you define is Migration Assistant Configuration (`F1-MigrationAssistantConfig`) then only the record related to this business object is included in the instruction.

Migration Plans for Objects with XML-Embedded Links

When migrating objects where foreign key references are captured in the object's XML based field, subordinate instructions are needed to define the foreign key references in order for CMA to understand the relationships. This is in contrast to direct foreign keys where CMA can determine the relationships using constraints. The instructions provide two purposes. Defining instructions ensures that the related objects are included in the migration, if appropriate. If you know that the related objects are included because of other criteria, the instructions allow CMA to group related objects into transactions. This helps in the apply process at import time to ensure that related objects are grouped together. However, the apply process includes iterative steps to try to overcome dependencies like this so defining the instructions is not critical for this purpose.

The following are options for creating migration plans with XML-embedded links:

- One option is to use the specific logical (business) BO in the primary instruction to define the object you are copying. With this option, the subordinate instructions may use XPath criteria to define the related foreign key. When this approach is used, a separate Migration Plan must be created for each logical BO. (Refer to Understanding the BO Filtering Process for more information.) This option would only be used in isolated cases.
- Another option is to create a migration plan that uses the Physical BO as the primary instruction, and then include a subordinate instruction for the real logical BO, using SQL Traversal to join the object to itself by its primary key. Note that with this technique, the records that reference the logical BO will still only be included in the export file once. At this point further subordinate instructions may use XPath notation to define the foreign key data. Using the physical BO as the primary instruction ensures that all records in the MO are considered. The subordinate instructions with the logical BO and XPath notations will only apply to the records that are applicable to that BO. This option is useful for MOs that have a small number of logical business objects with disparate foreign keys.
- Another option is to use the physical BO in the primary instruction and use raw SQLs in the subordinate instruction's traversal criteria to identify the foreign keys using substring commands. A separate Subordinate Instruction is needed for each SQL corresponding to each element occurrence. Using this technique has the same advantages of the previous in that all records for the MO are included in the migration. However, this technique may be useful for maintenance objects with a larger number of business objects expected where each has one or more foreign keys. It's especially useful if many business objects reference the same foreign key. Then only one instruction is required for that foreign key. Note that a single migration plan may use this technique and the XPath technique for different elements.

A migration request may have multiple migration plans for the same maintenance object. That allows for some flexibility and long term maintainability in that the above techniques may be used in multiple migration plans. Consider the following example:

- A product provides base business objects with foreign keys defined in the XML field and provides the appropriate migration plan with instructions. An implementation extends this business object or perhaps creates their own business object for the same maintenance object and includes different additional foreign keys in the XML. Rather than duplicating the base migration plan and adding additional instructions for the additional foreign keys, the implementation can create a second migration plan for the MO with the additional foreign

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keys defined. A migration request should be defined to include both migration plans. In this case if the implementation has only one custom BO, they can choose to use the custom BO as the primary instruction as described above in the first option.

Defining a Migration Request

Migration Requests are used to define the data to be included in a migration. To view or define a migration request, navigate using **Admin**, and then **Implementation Tools**, and then **Migration Request**.

Use the **Migration Request Query** portal to search for an existing migration request. Once a migration plan is selected, you are brought to the maintenance portal to view and maintain the selected record.

There are three types or classes of migration request. The system provides a base business object for each along with a migration request class, which matches the business object. The subsequent sections provide more information about each class of migration request.

Note that all migration requests support defining a Category, which allows implementers to categorize the migration request.

In addition, all classes of migration request include the following zones:

- **Migration Request** This zone contains display-only information about the selected record. Please see the zone's help text for information about this zone's fields.
- **Referencing Migration Requests** This zone is only visible if the displayed migration request is included in a Group migration request. It lists each group migration request that includes it.

Other zones may appear for specific classes of migration requests. See the following sections for more information.

Criteria-based

This type of migration request defines a set of entities to be logically included together as part of a migration. For each migration instruction, selection criteria is defined to indicate which records for each MO should be included. Selection may be defined using SQL, an algorithm, an entity tag or explicit primary key values.

- For selection using SQL Statement, refer to the embedded help for examples.
- For selection using Algorithm, the algorithms that are eligible to be plugged in here are those valid for the **Migration Request - Select** system event.
- For selection using Entity Tag, reference a tag name. The entities linked to the tag at export time would be included in the export file.
- For selection using Specific Keys, the primary key (1 through 5) must be explicitly specified. Multiple rows are allowed.

Entity List

This type of migration request allows the user to choose explicit MO / prime keys. The MOs that are eligible are those that are configured with a **Default Migration Plan** option. Although the user is managing MO / PKs, the migration instructions are still defined with a migration plan. The system maps the migration instructions in a similar way to a `Criteria-based` migration requests that use a Specific Key selection type. Note however that it will create a separate migration instruction for each MO / PK combination. It does not try to group all PKs for the same MO / migration under one migration instruction.

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For this type of migration request, a user adds a migration request record with its description and other main information. Then, a special zone **Add Entities** is provided to find and select records based on a selected maintenance object and add to the migration request. The user is prompted to provide a reference and comments, if desired. If the category selected is one that requires a reference, then this will be validated. Alternatively, you may also use the Collect Entity zone to add specific entities as you review them on their respective maintenance portals.

When maintaining a migration request with existing entities, they are visible in the zone **Migration Request Entities** . This zone allows a user to remove the entity from the list.

Group

This type of migration request points to other migration requests. This allows you to define separate migration requests that represent logical groupings of migration plan instructions for ease of maintenance, but to combine all the separate migration requests into a single "grouped" migration request for streamlined export / import purposes.

The CMA export process will build an extract that includes the union of all the objects that qualify for the export and group them together based on their relationships.

Identifying Tables to Exclude From Migrations

Some maintenance objects that are eligible to be migrated may include child tables that should not be included in the migration. For example, if an object includes log tables, the entries in the log should reflect the actions on the object in that system, and will be different between the source system and the target system. If you have a custom Maintenance Object that includes tables you don't wish to migrate (such as a log table), use the **Non-Migrated Table** option on the MO to specify this table. All child records for this table will also be ignored during migration.

Another use case to consider is a child "many-to-many" table that connects two administrative objects and exists in the maintenance object of both tables. The child table may be in both MOs for convenience sake, but it may be that one MO is considered more of a "driver" object and the other more of a subordinate. If you are doing a migration where you want to copy a subset of objects, you may want to only copy the driver object and its children and their data but not their children. For example, a To Do Type includes a collection of valid To Do Roles and in turn the To Do Role refers to its To Do Types. If an implementation wants to copy a single To Do and include all its related information, including its To Do Roles, it does not want the migration of each To Do Role to in turn copy all its To Do Types (and their data).

> **Note**
>
> The MO option must be set in both the Source and Target systems for a given MO.

Configuring Custom Objects for Migration

During the implementation and extension of the product, new custom administrative maintenance objects may be introduced. If your implementation would like to migrate records in those maintenance objects using the Content Migration Assistant, additional steps must be performed, which are highlighted in the following sections.

Physical Business Object

As described in Understanding the BO Filtering Process, the migration plan requires a business object for its instruction. The business object is used to identify the records eligible for inclusion in the migration. Assuming your custom tables use one or more "logical" business

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objects for their processing, your implementation must decide if these business objects are appropriate for use by the migration plans, or if a physical BO is warranted. If so, create an appropriate physical BO.

Review MO Option Configuration

The following points highlight maintenance object (MO) configuration that should be reviewed or updated to support CMA:

- If a physical BO was created (above), link it to the MO as an option using the appropriate option type.
- Be sure that your MO defines an appropriate FK Reference and includes an Option on the MO that identifies the FK Reference. This is used by various portals and zones for CMA when showing detail about records being imported into the target region. Also be sure that this FK reference defines an Information program.
- As described in Identifying Tables to Exclude From Migrations, an MO option is used to identify child tables for an MO that should never be included in a migration. If your custom maintenance object includes a standard Log table, than the recommendation is to list that table as an excluded table. Depending on the specific design of the maintenance object, there may be other child tables to define.

Characteristic Type Configuration

The CMA import process will attempt to create a log record for any administrative object that includes a log table. If your implementation has introduced any custom administrative tables that you plan to include in a migration request and it includes a log table, you must, to ensure that the log creation is successful, add your log table as a valid characteristic entity to the characteristic type `F1-MGO` (Migration Object).

Navigate to Characteristic Type and select the characteristic type `F1-MGO`. Navigate to the **Characteristic Entity** tab and add a row to include the characteristic entity for your custom maintenance object's log table.

Standard CMA Configuration

Create one or more migration plans for the new object, depending on the type of data in the maintenance object and the types of migrations you envision:

- If you have implemented only one "logical" business object used to define the data in the MO, then a single migration plan that references the this BO (or the maybe the MO's physical BO) is appropriate.
- If you have implemented more than one "logical" business object, would the data for multiple business objects get copied together? Then perhaps a single migration plan that references the MO's physical BO is appropriate.
- Are there additional foreign keys defined using mapXML in the business object(s) for the MO? If so, then it is recommended to include sub-instructions to define the links. At this point, if multiple "logical" BOs exist, your implementation may choose to define all the additional elements in the same migration plan or choose to define separate migration plans for each logical BO.
- Your implementation may decide to define more than one migration plan for the same type of record based on the types of migrations you plan to include. For example, you may decide to include a migration plan that copies only the records in this maintenance object. You may decide to define another migration plan that copies the records in this MO along with related records in another MO (for a special type of migration). Having said that, be sure to design the migration plan with reuse in mind to minimize maintenance efforts.

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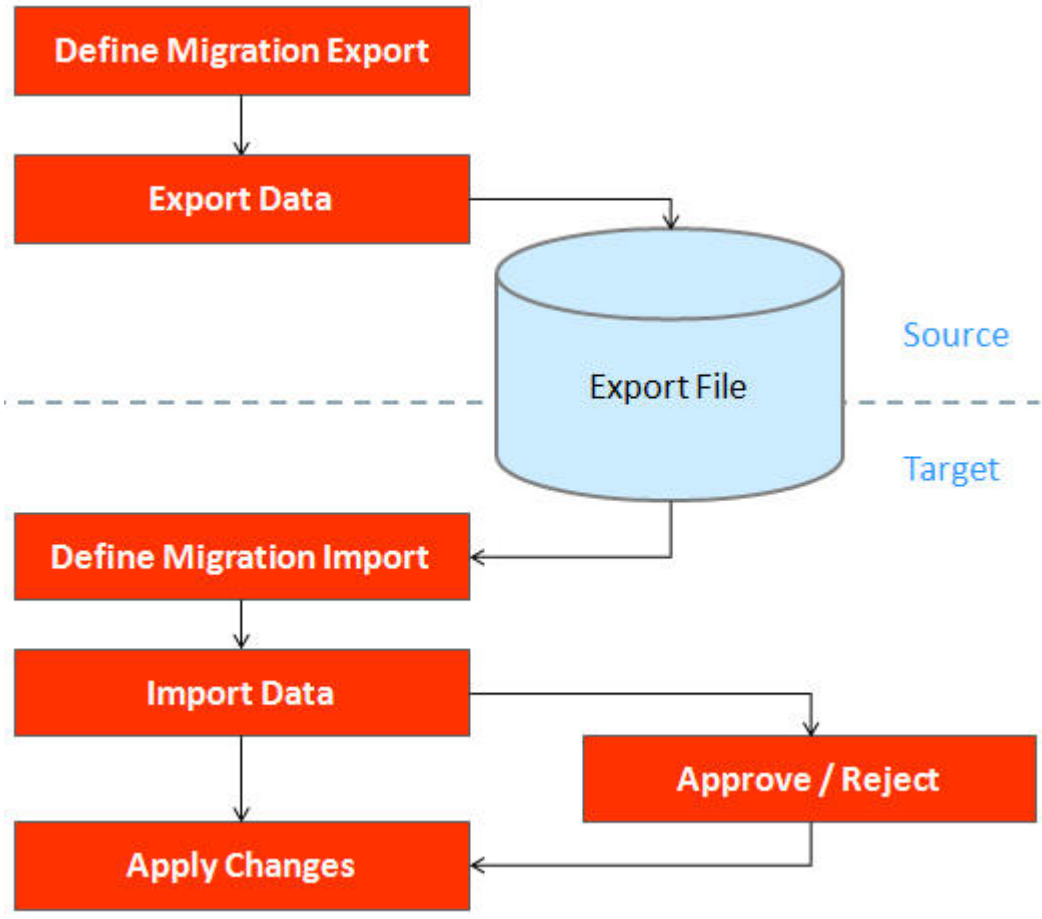
In order to support **Entity List** migration request, a default migration plan must be defined as an option on the maintenance object. This should be a single migration plan that supports all types of business objects for the MO.

If your implementation has a template migration request to use for migrations, include the new migration plan(s) as appropriate.

> ⚠ **Caution**
>
> Important! New migration plans and migration requests should follow naming conventions. Refer to System Data Naming Convention for more information.

The CMA Execution Process

The following diagram illustrates a high-level view of the Content Migration Assistant execution process. The subprocesses illustrated here are described in more detail in the following sections.



- Exporting a Migration
- Importing and Applying a Migration

Exporting a Migration

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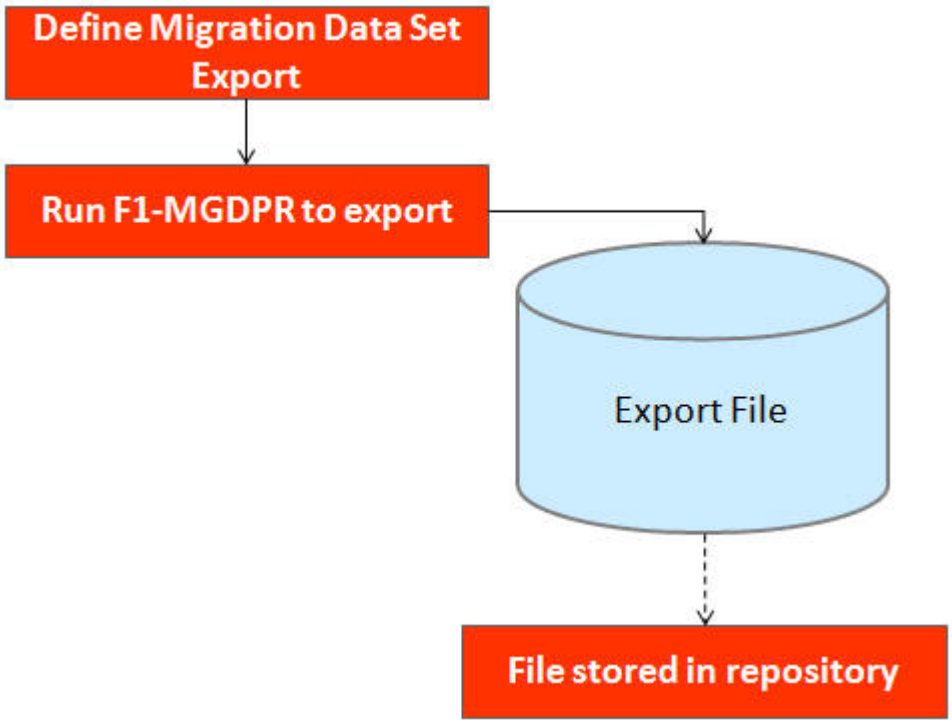
The migration export process begins in the source environment by defining a **Migration Data Set Export**, which specifies a defined **Migration Request** and provides a file name and description for the export file. After the data set is defined and saved, the **Migration Data Set Export Monitor** batch job can be submitted generate the export file. The lifecycle of the Migration Data Set Export business object includes algorithms that select the appropriate records according to the migration request, determine dependencies between records to build groupings of related objects and create the export file.



The following topics provide more detail about this process.

- Migration Data Set Export
- Export Lifecycle

Migration Data Set Export

To migrate data from one region to another, define a **Migration Data Set Export**. This establishes the export file name and identifies the migration request.

To view an existing migration data set export, navigate using **Admin**, and then **Implementation Tools**, and then **Migration Data Set Export**. Use the query criteria to locate the desired data set.

Note that you can also initiate the creation of an export data set from the Migration Request portal using the **Export** button.

The export requires the name of an existing **Migration Request**.

Enter a unique **File Name** for the export. Do not use spaces in the name, and do not enter the file extension or a path. The output location and file extension of the intended export file, which should appear in the **Export Directory** and **File Suffix** labels, are defined as described in the topic Migration Assistant Configuration.

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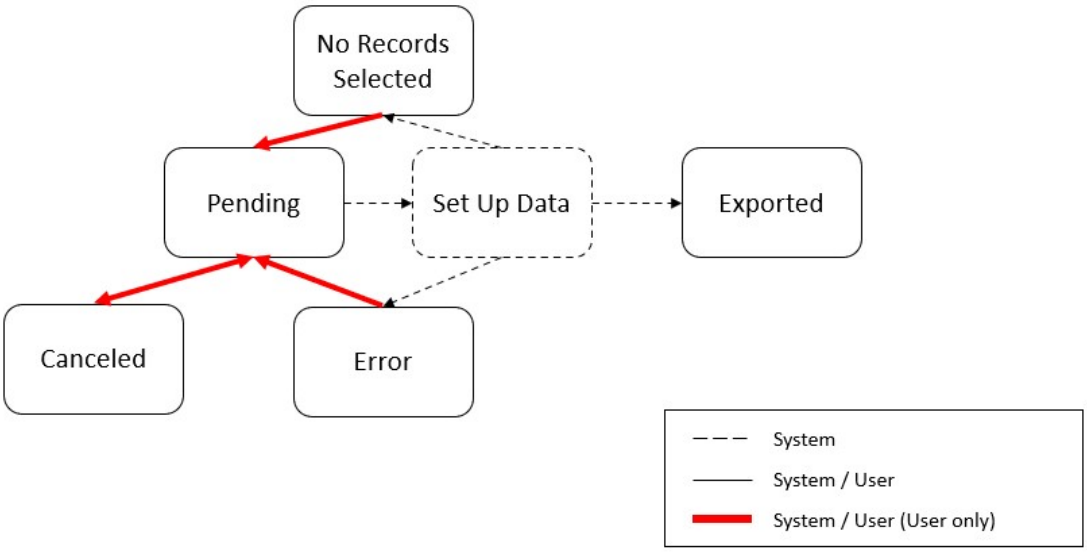
Enter an **Export Description** to provide information about the purpose of the export. Note that this field is not language enabled.

The **Source Environment Reference** is for information purposes. It should be populated with text that provides a meaningful description of the source environment. The default value is the URL of the source environment.

The **Migration File Version** is only visible if the product currently supports creating a file in an earlier file format version. If this element is visible and you are planning to import the file in a target environment that uses an older migration file format version, indicate the lower file format version that you wish the export to use.

Export Lifecycle

The following diagram describes the lifecycle of a Migration Data Set Export (data set).



The following points describe the lifecycle.

- The data set is created in **Pending** status.
- A user may choose to temporarily **Cancel** a pending data set to prevent it from being processed. The user can later return it to the Pending state when desired.
- The record remains in Pending until its monitor batch job is submitted. The **Migration Data Set Export Monitor** (F1–MGDPR) selects pending records and transitions them to **Set up data**. Refer to Running Batch Jobs for more information.

> **Note**
>
> This batch control is delivered with the batch strategy configured as 'JOBS'. This ensures a more even distribution of work when there are multiple data sets to export.

- Set up data is a transitory state that includes the algorithm that does the work of determining the objects to include in the export and group related objects together into a transaction. If everything is successful, the export file is written to the appropriate file location and the record transitions to **Exported**. If the algorithm detects that no records are

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selected per the migration request instructions, the record transitions to **No Records Selected**. If an error is detected, the process stops and the record transitions to **Error**.

- If a record is in error and it is possible to correct the error, the record may be transitioned back to Pending to try again.
- If no records were selected and you want to adjust the migration request instructions to ensure that records are selected, the record may be transitioned back to Pending to try again.

When the process is marked as **Exported**, the export file can be imported into the target system.

> **Note**
>
> The export process creates a file, providing the benefits of having a standalone file. It can be stored in a version control system for audit purposes or provided to others for import purposes.

> **Caution**
>
> Under no circumstances should exported data files be edited manually. Doing so could cause data corruption when the file content is applied to the target environment.

> **Note**
>
> The export functionality is supported using the business object **Migration Data Set Export** (F1-MigrDataSetExport). The expectation is that implementations will use the delivered base business object and its logic and will have no reason to implement a custom business object for the CMA export process.

Importing and Applying a Migration

The import process is broken down into four general steps: Import, Compare, Approve, Apply. The following points provide an overview of the steps.

- **Import**. The first step covers importing the file and creating appropriate Migration Import records in the target environment to facilitate the subsequent steps.
- **Compare**. The compare step reviews each object that is in the import file and compares the object in the import against the equivalent record in the target environment. The comparison step results in noting which objects are unchanged, which are new (and the appropriate SQL to insert them) and which objects are changed (and the appropriate SQL to update them). Based on user configuration at import time, the objects that qualify for the import may be in a state that requires review or may be pre-approved.
- **Approve**. Once the comparison is complete, the user should review the results. There may be records marked for review. All of these records must be approved or rejected before the import can proceed. Users may choose to suppress individual SQL statements for a given object that is approved. When the user is satisfied with the results of the comparison and has completed the review, the import is marked to proceed to the Apply step. Optionally, a migration import may be configured to automatically apply.

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- **Apply**. This is the final step and is the step where the records in the target environment are added or updated. Because of potential high volumes of data and because of possible dependencies between records, this step supports two levels of attempting to apply the records. There is an apply step at the object level and an apply step at the transaction level. This will be described in more detail below.

- Import Step
- Compare Step
- Approval Step
- Apply Step
- Adjusting Data Prior to Comparing
- Import Process Summary
- Cancelling a Data Set
- Additional Note Regarding Imports
- Caching Considerations
- Maintaining Import Data

Import Step

The import process starts with verifying the import directory configured as described in the following topic Master Configuration - Migration Assistant and ensuring that the exported file is located in that directory. Then, in the target environment, a **Migration Data Set Import** record should be created. The user indicates the file name.

In addition, the user decides what the default status should be for resulting objects.

- The **Default Status for Add** sets the default status for objects that are determined to be ***new*** during the import comparison process. The default is to automatically set new objects to **Approved** status. Other options are to set any new objects to **Rejected** or **Needs Review** status.
- The **Default Status for Change** sets the default status for objects that are determined to be ***changed*** during the import comparison process. As with new objects, the default for changed objects is **Approved**, with **Rejected** or **Needs Review**options available.

The user may also configure the **Automatically Apply** flag to **Yes**. This allows for use cases where the migration is repetitive and has been tested and the user feels that there is no need for manual approval. Note that when configuring this setting, neither of the Default Status values may be set to **Needs Review** and at least one must be set to **Approved**.

The file to import contains a list of all the objects included in the export. Any objects that the export step determined to be related have been grouped into “transactions”. Once the Migration Data Set Import is created, the next step is for the system to read in the file and create Migration Transactions and Migration Objects.

By default, the import step creates a Migration Object for each entity in the file. When importing a high volume data set of business entities, the user may request to import entities in bulk mode for performance reasons. In this mode, a single Migration Object record may contain multiple entities from the file. If at least one of the entities included in the migration object record is new and the remaining ones are either new or unchanged then the **Default Status for Add** setting applies to it. If at least one included entity is determined to be changed then the **Default Status for Change** applies to the record. Refer to bulk import mode for more information.

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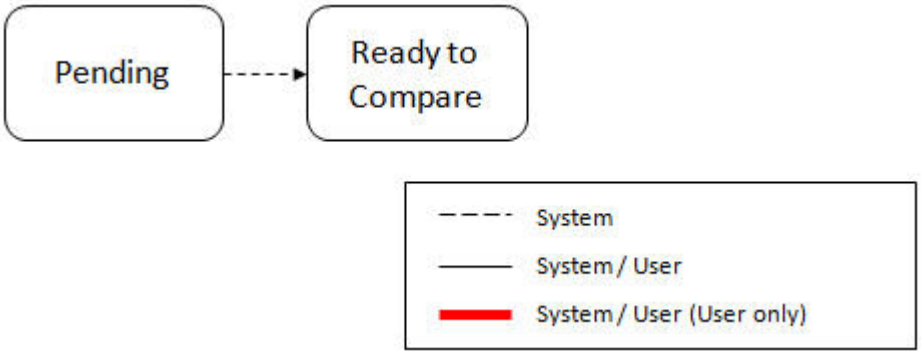
The following is a portion of the Migration Data Set Import lifecycle as it pertains to the import step.



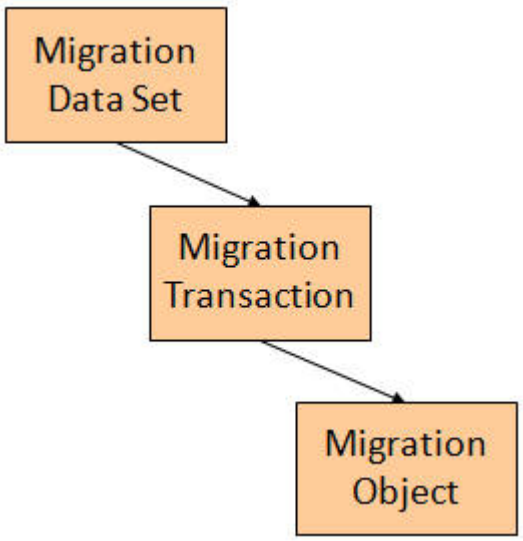
The following points describe the lifecycle.

- The data set is created in **Pending** status.
- The record remains in Pending until its monitor batch job is submitted. The **Migration Data Set Import Monitor** (F1–MGDIM) selects pending records and transitions them to **Ready to Compare**. Refer to Import Process Summary and Running Batch Jobs for more information.

  The Ready to Compare state has an algorithm that is responsible for reading the related import file and creating the migration transactions and migration objects. The data set remains in this state until the comparison step is complete.

> **Note**
>
> A user may choose to **Cancel** a data set. Refer to Cancelling a Data Set for more information.

The following diagram highlights the relationships of the resulting migration import records.



The migration transaction and migration object each have their own lifecycle that will help manage the subsequent compare and apply steps. At the end of the import step, the status values of the three types of records are as follows:

- Migration Data Set Import is in the **Ready to Compare** state.

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- Migration Transaction is in the **Pending** state.
- Migration Object is in the **Pending** state.

> **Note**
>
> The import functionality is supported using business objects supplied by the base product. The expectation is that implementations will use the delivered base business objects and their logic and will have no reason to implement a custom business objects for the CMA import process. The base business objects are **Migration Data Set Import** (F1-MigrObjectImport), **Migration Transaction** (F1-MigrTransactionImport) and **Migration Object** (F1-MigrObjectImport).

Compare Step

The import step results in the creation of one or more migration objects. Typically, one migration record is created for each record selected in the export based on the export's migration request and its configuration. Related objects are grouped together in migration transactions.

When importing a high volume data set of business entities, the user may request to import entities in bulk mode for performance reasons. In this mode, a single Migration Object record may contain multiple entities from the file. Refer to bulk import mode for more information.

The next step in the import process is the Comparison step. In this step, the data captured by the import file for each object is compared to the view of that object in the target environment.

To cater for a possible large volume of objects, the comparison is done via a batch monitor. To aide in performance of the process, the monitor is performed on the migration objects so that it can be run multi-threaded. Once the objects are finished with the comparison, the migration transactions and the migration data set should be updated with an appropriate overall status before continuing to the next step. As a result, the comparison actually requires three steps: Migration Object Comparison, Migration Transaction Status Update and Migration Data Set Export Status Update. The steps are explained in detail in the following sections.

> **Note**
>
> Refer to Running Batch Jobs for more information about streamlining the various steps in the process.

Migration Object Compare

This is the main step of the comparison. The **Migration Object Monitor** (F1–MGOPR) selects pending migration object records and transitions them to **Comparing**. This is a transitory state that includes the algorithm that does the work of comparing. There are various possible outcomes that could occur based on the logic in the algorithm. The following diagram illustrates a portion of the migration object lifecycle that pertains to comparison.

> **Note**
>
> When using separate batch processes for business data the **Migration Object Monitor (Business)** process (F1-MGOPB) works in the same way to compare business migration objects.

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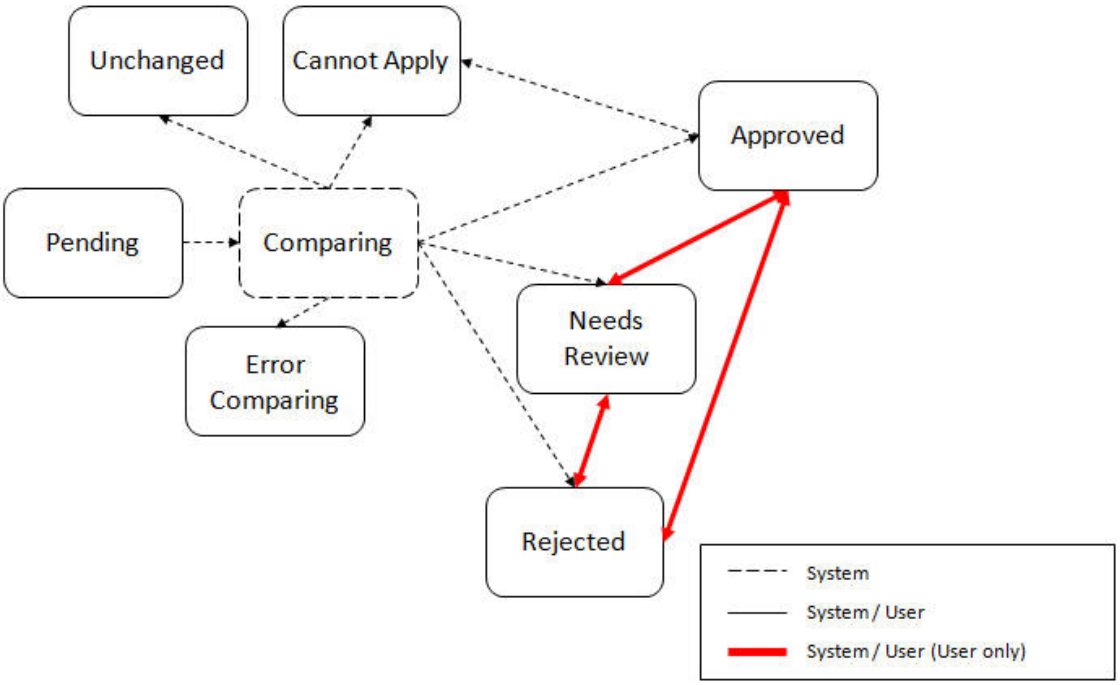

The following points describe the lifecycle.

- When **Pending** records are selected by the monitor batch job, it transitions to **Comparing**. If the migration object refers to one or more pre-compare algorithms, they are executed to adjust the data prior to comparison. Then algorithm will determine the appropriate next state by comparing the source data to the target data.
- Entity related notes:
  - If the record in the migration object is found in the target environment and the data is exactly the same, the record transitions to **Unchanged** (with the object action value also set to **Unchanged**).
  - If the record in the migration object is found in the target environment and the data is different, the algorithm sets the object action value to **Change** and generates the appropriate SQL to be used later in the Apply step to update the record. It then transitions to **Approved**, **Needs Review** or **Rejected** based on the Default Status For Change setting captured on the Data Set.
  - If the record in the migration object is not found in the target environment, the algorithm sets the object action value to **Add** and generates the appropriate SQL to be used later in the Apply step to insert the record. It then transitions to **Approved**, **Needs Review** or **Rejected** based on the Default Status For Add setting captured on the Data Set.
  - When the import is performed in bulk mode each included entity is compared separately but the overall status of the record is set as follows:
    * If all included entities are unchanged then the migration object record transitions to **Unchanged** (with the object action value also set to **Unchanged**).
    * If all included entities are either unchanged or changed then the object action value is set to **Change**), corresponding SQLs are generated for the changed entities only and the migration object transitions based on the Default Status For Change setting captured on the Data Set.
    * If all included entities are either unchanged or new then the object action value is set to **Add**), corresponding SQLs are generated for the new entities only and the

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migration object transitions based on the Default Status For Add setting captured on the Data Set.

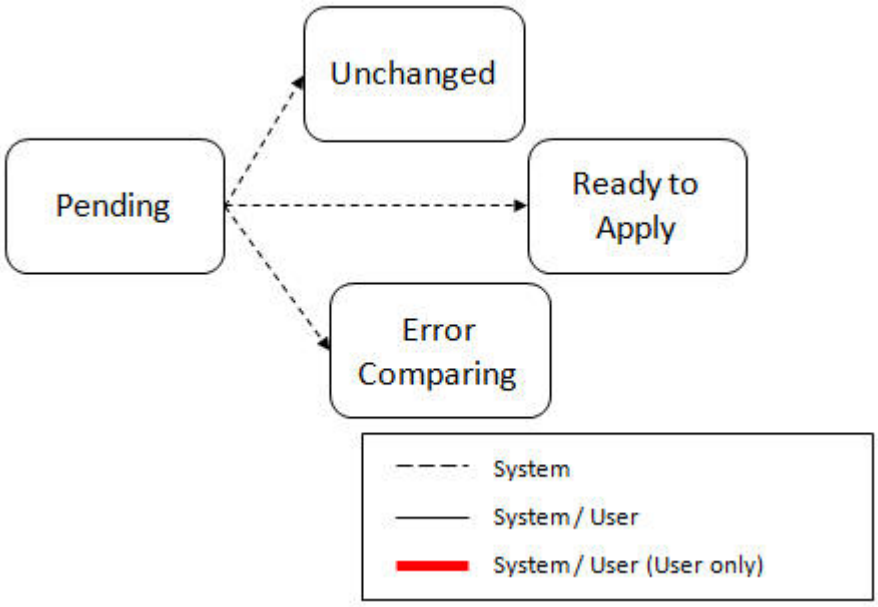
* If some of the included entities are new and some changed then the object action value is set to **Mixed Actions**), corresponding SQLs are generated for the each entity and the migration object transitions based on the Default Status For Change setting captured on the Data Set.

- If there is any issue with attempting to parse the object data from the import, the record transitions to **Error Comparing**.
- If there is any reason that the imported object is not valid for import, the record transitions to **Cannot Apply**. The log will be updated with the error that caused the record to transition to this state. An example is that perhaps the record was exported in a different version of the product and has additional elements that are not recognized in this version.

> **Note**
>
> Refer to Cancelling a Data Set for information about cancelling a data set and its impact on its related objects.

Migration Transaction Status Update

After the import step, the migration transaction remains in the Pending state until all its objects have completed the comparison step. At that point, the status of the transactions should be updated based on the results of their objects. The **Migration Transaction Monitor** (F1–MGTPR) selects pending migration transaction records and runs its monitor algorithms. There are various possible outcomes that could occur based on the logic in the algorithms. The following diagram illustrates a portion of the migration transaction lifecycle that pertains to comparison.



The following points describe the lifecycle possible next states after Pending.

- If any related migration object is in the Error Comparing state, the transaction transitions to **Error Comparing**.
- If all related migration objects are in the Unchanged state, the transaction transitions to **Unchanged**.

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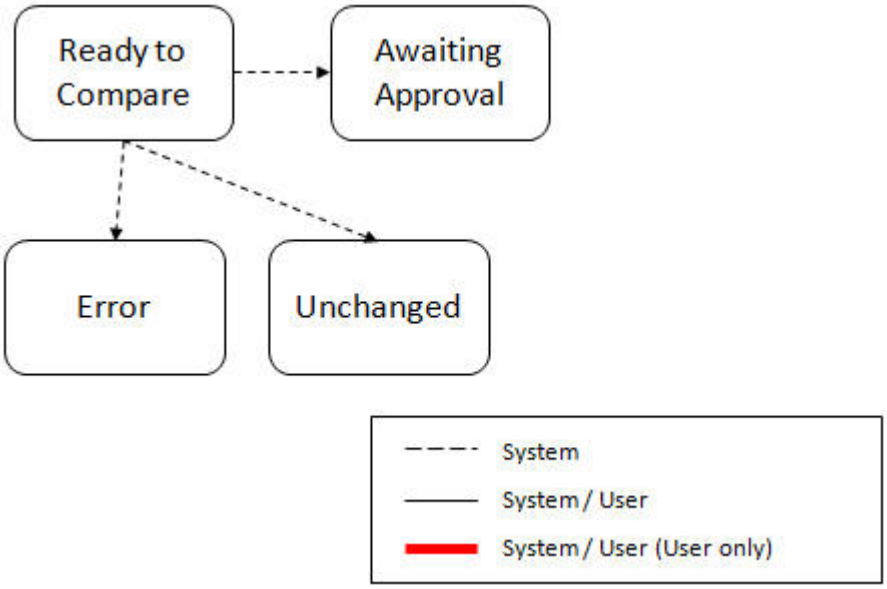
- Otherwise, the transaction transitions to **Ready to Apply**. This means that at least one object is in an “apply-able” state.

The transaction remains in the **Ready to Apply** state until a user has approved the data set to move to the Apply step and the transaction’s related objects have attempted to apply themselves. This is described in more detail below.

> **Note**
>
> Refer to Cancelling a Data Set for information about cancelling a data set and its impact on its related objects.

Migration Data Set Import Status Update

Once all the objects and all transactions have been updated via the previous two steps, the migration data set export must be updated based on the results of their transactions. The **Migration Data Set Import Monitor** (F1-MGDIM) selects Ready to Compare data sets and runs its monitor algorithms. Note that this is the same monitor process that is used to select Pending data sets. There are various possible outcomes that could occur based on the logic in the algorithms. The following diagram illustrates the portion of the migration transaction lifecycle that pertains to comparison.



The following points describe the lifecycle possible next states after Ready to Compare.

- If any related migration transactions is in the Error Comparing state, the data set transitions to **Error**.
- If all related migration transactions are in the Unchanged state, the data set transitions to **Unchanged**.
- Otherwise, the transaction transitions to **Awaiting Approval**. This means that there are no errors and at least one object is in an “apply-able” state.

The data set remains in the **Awaiting Approval** state until a user decides that the data set and all its records are ready to progress to the Apply step.

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> **Note**
>
> A user can choose to cancel a data set at any time while it is in progress. Refer to Cancelling a Data Set for more information.

Approval Step

Once the comparison is complete and the data set transitions to the Awaiting Approval state, a user needs to progress the data set to **Apply Objects** to trigger the Apply step. The following points describe steps a user may take during the approval step.

- If the data set configuration for the Default State for Add and Change was set to **Approved**, then any migration object that is determined to be eligible for the Apply step will be in the Approved state. In this situation, a user may want to review the data set and its transactions and objects to see verify that the results make sense. At that time, the user is able to move an object to Needs Review or Rejected as appropriate.
- If the data set configuration for the Default State for Add and Change was set to **Needs Review** for either option, then each migration object in the Needs Review state must be reviewed and the user must either Reject or Approve each object before moving to the Apply step.
- If the data set configuration for the Default State for Add and Change was set to **Rejected** for either option, the assumption is that the rejected records don't need to be reviewed. But if a user finds a rejected record that shouldn't be rejected, it may be transitioned to Approved (or Needs Review) as appropriate.

A user has the option to mark one or more SQLs within a migration object to be suppressed. In this case, if the migration object is approved, then only the SQLs that are not marked as Suppressed will be applied. This option is useful when importing a record that has many child records. It may be that the user wants to only include a subset of the child records. This may be done by suppressing the child records that should not be included.

Once the user is comfortable with the data set's results and no more objects are in the Needs Review state, the user should transition the record to **Apply Objects**. This will initiate the Apply step.

Alternatively, if the Automatically Apply flag was set to **Yes** when creating the import record, the import data set will progress from **Awaiting Approval** to **Apply Objects**. Refer to Import Process Summary for more information.

> **Note**
>
> Refer to Maintaining Import Data for details about the pages provided to help the user review a data set and its transactions and objects to help in the approval step.

> **Note**
>
> A user can choose to cancel a data set at any time while it is in progress.

Apply Step

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The apply step is the step where records in the target environment are added or updated. Like the comparison step, the apply step is actually multiple steps to optimally handle high volume and dependencies between records as smoothly as possible.

> **Note**
>
> Refer to Running Batch Jobs for more information about streamlining the various steps in the process.

Before explaining the apply steps in detail, the following points highlight the type of data that may be included in a given data set.

1. Records that have no foreign keys and therefore no dependencies on other records. Examples: Message, Display Profile.
2. Records that have foreign keys that may already be in the target. Examples: Algorithms for existing algorithm types, To Do Roles for existing To Do Types.
3. Records that have foreign keys that are new records but also part of the migration. CMA detected the relationship at export time and grouped the objects in the same transaction. Example: Script-based Algorithm Type where the script is also in the migration.
4. Records that have foreign keys that are new records but also part of the migration. CMA did not detect the relationship. This may occur if the referenced foreign key is in a XML or parameter column and the migration plan did not include an instruction to explicitly define the relationship. Example, a Zone that references a visibility script.
5. Records that have circular references where both records are new and are part of the migration. CMA detected the relationship at export time and grouped the objects in the same transaction. Example: plug-in Script for a BO plug-in spot. The script references the BO and the BO references an algorithm for the script's algorithm type. Another example is when the same record is maintained by multiple maintenance objects and therefore exists in multiple migration objects.

To handle high volume data, the first step in the apply process is to perform the apply logic at the migration object level via a multi-threaded batch job. This should result in all records in categories 1 and 2 above being applied successfully.

For records in categories 3 and 4 above, if a record with a foreign key is added or updated before its related record, the validation will fail. However, if the related record is added first and then the record referring to it is added, validation will pass. The tool handles these dependencies as follows:

- Dependency between master and transaction entities is typically hierarchical and in most cases straight-forward. The tool leverages that knowledge to orchestrate the processing of objects in an optimal way that follows their dependency order as much as possible. Note that relationship between entities could be complex and this approach does not eliminate all processing order related errors but rather significantly reduce them.
- Dependency between configuration entities is more complex and inter-twined and therefore migration objects are not ordered, i.e. the multi-threaded batch process may not process records in the desired order.
- To overcome the potential issue of processing order related errors, the Apply step has special functionality, described in detail below.

For records in category 5 above, the circular reference will mean that the apply process at the object level will not successfully add or update these records. The apply process at the transaction level will cover these records. This is described in detail below.

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Apply Objects

Once the Data Set is in the state of **Apply Objects**, the **Migration Object Monitor - Apply** process (F1-MGOAP) runs to attempt to apply the objects.

> **Note**
>
> When using separate batch processes for business data the **Migration Object Monitor (Business)- Apply** process (F1-MGOAB) works in the same way to apply business migration objects.

The background process in conjunction with the Apply algorithm have special functionality to ensure records in categories 3 and 4 (above) successfully apply during this step:

- The **Migration Object Monitor - Apply** process is a special one that continually re-selects records in the **Approved** state until there are no more eligible records to process.
- When an error is received in the Apply Object algorithm, the algorithm increments an "iteration count" on the migration object record. If the iteration count does not exceed a maximum count (noted in the algorithm), the object remains in the **Approved** state and is eligible to be picked up for processing again. If the iteration count exceeds the maximum defined in the algorithm, the record transitions to the **Error Applying** state.

> **Note**
>
> When submitting this Apply batch job, be sure to set the number of threads to a number that does not exceed the number of threads supported by the thread pool worker. Doing this will cause the ‘excess’ threads to wait for the supported number of threads to finish.

> **Note**
>
> Each retry iteration to apply an object after an error slows down the Apply batch process. When the quality of the imported data is suspected to result in many errors, you may use the **Maximum Retries** batch parameter. Refer to the batch control's parameter description for more information.

The following diagram is the portion of the migration object lifecycle that pertains to the Apply step.

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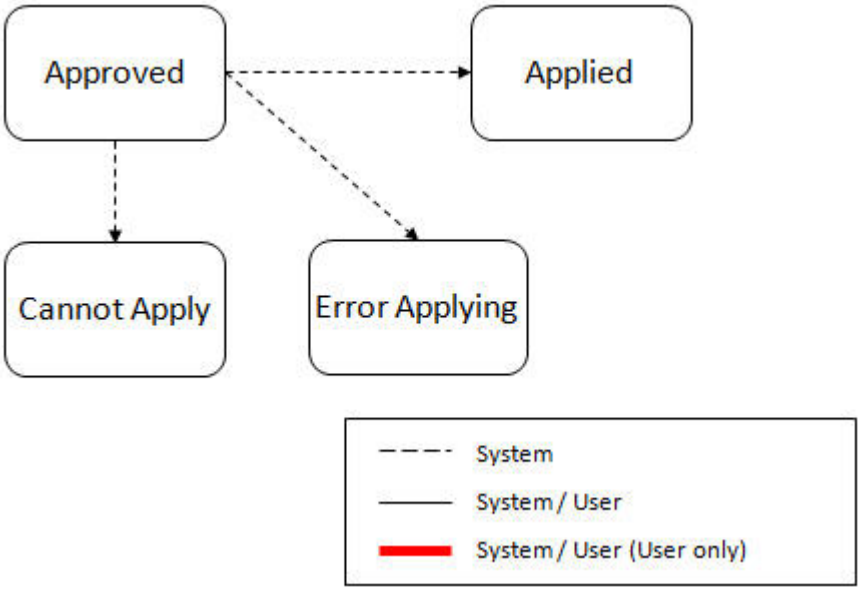

At the completion of the Apply monitor process, typically the objects will be in the **Applied** state or the **Error Applying** state. The records in the Error Applying state are in that state for one of two reasons.

- They are in category 5 described above where the records have a circular reference with another record. For this scenario, the Apply Transactions step described below should successfully apply the records.
- There is some other error that is unrelated to the records in the current migration. In this case, manual intervention may be required. Refer to the Resolving Errors section below for more information.

As shown in the diagram, the Apply Objects algorithm may also detect a reason that the object cannot be applied. This may occur if the object in the target environment has been updated since the comparison step, making the SQL captured at that point no longer applicable. If this occurs, after the current migration is fully applied, the original file may imported again, and new comparisons can be generated and applied.

Apply Transactions

Ideally, after the Apply Objects step, all the objects are **Applied** or are in **Error Applying** due to the "circular reference" situation. The typical next step is to turn over responsibility to the transactions. The migration transactions can then attempt to apply their objects in bulk.

In order to ensure that multiple background processes are not trying to select migration objects to run the Apply step, the Transactions are only eligible to attempt to "apply my objects" if the Data Set is in the **Apply Transactions** state.

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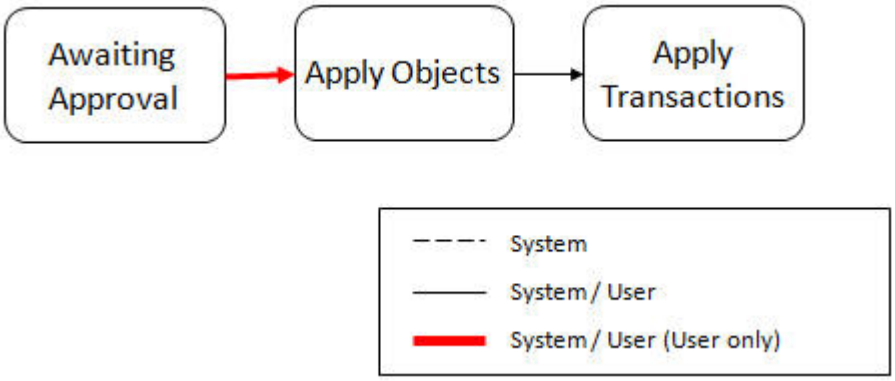

A monitor algorithm (executed by the data set monitor batch process) on the Apply Objects state checks to see if all migration objects are no longer **Approved** or the count of records in **Error Applying** does not exceed a configured limit. If so, it automatically transitions the record to the **Apply Transactions** state.

If the number of objects in **Error Applying** exceeds a configured limit, the monitor algorithm does not automatically transition the record. In that case, a user must determine if the large number of errors can be resolved or manually transition to **Apply Transactions** (despite the large number of errors). The Resolving Errors section below describes alternative steps that the user may take if there are errors.

Once the Data Set is in the state of **Apply Transactions**, the **Migration Transaction Monitor - Apply** process (F1-MGTAP) runs. It attempts to apply the transaction's objects. If no migration objects are in error, the migration transaction simply transitions to **Applied**. If any of the migration objects are in **Error Applying**, the background process and the Apply algorithm have special functionality to try to overcome dependencies in migrated objects:

- The Apply algorithm selects all migration objects in error and performs all their SQL, then validates all the records. If there are objects in the transaction with circular references, they should pass validation at this point.
- Because there may still be some dependencies across transactions, similar error handling described in the Apply Objects step occurs here. When an error is received in the Apply Transaction's Object algorithm for any of the objects in the transaction, the algorithm increments an "iteration count" on the migration transaction record. If the iteration count does not exceed a maximum count (noted in the algorithm), the transaction remains in the **Ready to Apply** state and is eligible to be picked up for processing again. If the iteration count exceeds the maximum, the record transitions to the **Error Applying** state. Note that if any objects in the transaction are in error, none of the objects are applied. They all remain in error.
- The **Migration Transaction Monitor - Apply** process is a special one that continually re-selects records in the **Ready to Apply** state until there are no more eligible records to process.

> **Note**
>
> When submitting this Apply batch job, be sure to set the number of threads to a number that does not exceed the number of threads supported by the thread pool worker. Doing this will cause the 'excess' threads to wait for the supported number of threads to finish, erasing the benefit of the iteration processing.

The following diagram is the portion of the migration transaction lifecycle that pertains to the Apply step illustrating the points above.

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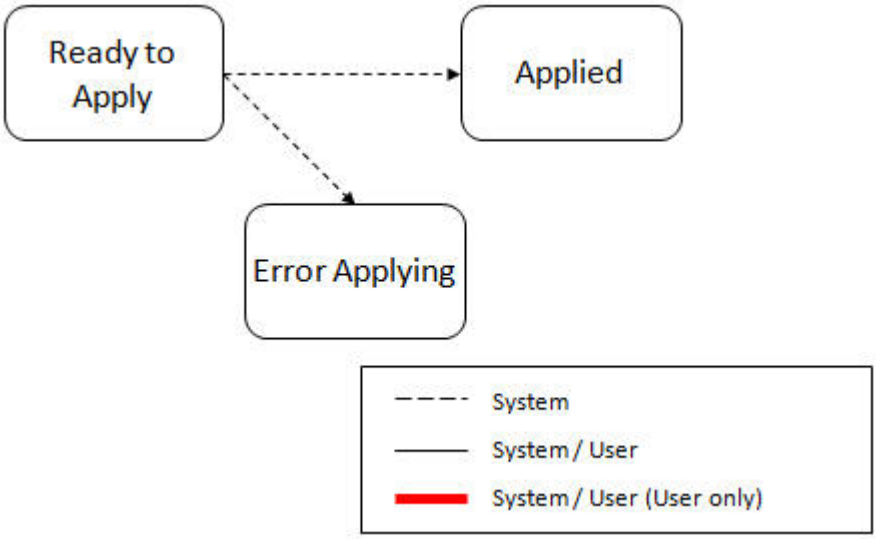

If at the end of the transaction level Apply process there are transactions in error (and therefore there are still objects in error), a user must review the errors and determine how to fix them. Refer to the Resolving Errors section below for more information.

Resolving Errors

As mentioned in the previous sections, errors may be received after the Apply Objects process runs. If the number of records in error is below a certain limit (and the data set monitor batch job is submitted to execute the monitor algorithms) the system will automatically transition the data set to the **Apply Transactions**. If the monitor batch job is not run or if the number of objects in error exceeds a certain limit, a user must make the decision after viewing the errors in the Objects in Error zone on the Migration Data Set Import portal.

- If the errors appear to be dependency related, the user can decide to let the "transactions apply their objects" and transition the data set to **Apply Transactions**, described above.
- If the errors appear to be related to an outside issue that can be manually resolved, the user may choose to fix the issue and redo the Apply Objects step.
- The user may also decide to reject one or more objects to remove them from the migration.

After the Apply Transactions step, if there are still errors, a user must review the records and determine how to proceed. Errors are visible in the **Transactions in Error** zone on the Migration Data Set Import portal.

- The user may decide to reject one or more objects to remove them from the migration.
- The user may manually resolve an issue external to the migration and then decide to do one of the following:
  - Redo the **Apply Objects** step. This is recommended if there are a large number of Objects still in error and not a large number of dependencies expected. The benefits of running the Apply Objects multi-threaded will ensure that the process runs efficiently.
  - Redo the **Apply Transactions** step.

Because the objects and transactions are in Error Applying, in order to "retry" the Apply step after manually fixing an error, the system needs to move the records back to the state that allows them to be picked up by the appropriate Apply process. For migration objects, records need to be moved back to **Approved**. For migration transactions, records need to be moved back to **Ready to Apply**. The following points describe the Retry logic for migration objects.

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- If a user decides to **Retry Objects** (using an action button on the Migration Data Set Import page), the data set transitions to the **Retry Objects** state. At this point the Migration Object monitor must be run.
- The monitor on the **Error Applying** state for the objects detects that the data set is in the state of **Retry Objects** and that triggers the transition back to **Approved**.
- The next step is to transition the data set from **Retry Objects** to **Apply Objects**. This may be done manually or by running the Migration Data Set Import monitor process.
- Now the objects are eligible to be picked up by the object level Apply process.

Analogous logic exists for the migration transactions.

- If a user decides to **Retry Transactions** (using an action button on the Migration Data Set Import page), the data set transitions to the **Retry Transactions** state. At this point the Migration Transaction monitor must be run.
- The monitor on the **Error Applying** state for the transactions detects that the data set is in the state of **Retry Transactions** and that triggers the transition back to **Ready to Apply**.
- The next step is to transition the data set from **Retry Transactions** to **Apply Transactions**. This may be done manually or by running the Migration Data Set Import monitor process.
- Now the transactions are eligible to be picked up by the transaction level Apply process.

The retry logic may also occur when transitioning between the Apply Objects and Apply Transactions depending on whether or not there are errors. The following scenario highlights this point.

- After the **Apply Objects**step there are objects in **Error Applying**. The data set transitions to **Apply Transactions** and the Apply step is done at the transaction level.
- After the **Apply Transactions** step there are transactions in **Error Applying**.
- User chooses to try to apply objects again (by clicking **Retry Objects**). The steps outlined above for retrying objects are followed at this point.
- After the apply objects, user may choose to retry objects again (after fixing errors if applicable).
- At some point the user will transition to**Apply Transactions** again. If there are transactions in **Error Applying**, the system will automatically transition the data set to **Retry Transactions** and the steps outlined above for retry transactions are followed.

Finalize Apply Step

Once all the migration objects for a migration transaction are in a final state (**Applied**, **Rejected** or **Cannot Apply**), the migration transaction transitions to the **Applied** state. Once all the migration transactions are in the **Applied** state, the Migration Data Set record transitions to the **Completed** and the import is complete.

> **Note**
>
> To review the full lifecycle for each record, refer to the Business Object - Summary tab in the application metadata for the base business objects **Migration Data Set Import** (F1-MigrObjectImport), **Migration Transaction** (F1-MigrTransactionImport) and **Migration Object** (F1-MigrObjectImport).

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Adjusting Data Prior to Comparing

There are reasons that the data you are importing requires some adjustment before applying it in the target environment. In such cases, an algorithm plugged into the migration plan primary instruction may be used to adjust the data when importing. This algorithm is executed by the comparison algorithm before any comparison is performed. Algorithms of this system event receive the view of the source record (being imported) and the view of the existing record in the target region, if it exists. The data is provided using the physical BO of the migration plan's maintenance object. The algorithm may make changes and pass a new view of the record that should be used for the comparison. This system event supports multiple algorithms that are executed in sequence. Each algorithm receives the original record's data, the target record's data (if applicable) and the 'new' view of the data (as populated by previous algorithms, if any). The final 'new' view of the data is used for the object comparison. The system includes the algorithms linked to the primary instruction of the migration plan from the source environment. If the system finds any additional pre-compare algorithms linked to the migration plan's primary instruction in the target system, those algorithms are also executed.

> **NOT_SUPPORTED**
>
> Refer to Base Business Objects for more information about physical BOs.

Some examples of records that may require import algorithms.

- Batch Control references its next batch sequence number along with snapshot information like the last run date / time. This information is only relevant with respect to its environment. The instruction for a batch control can include an algorithm to not overwrite the batch sequence number when copying a batch control.
- Some products include administrative objects that reference a master data object. Master data objects are not copied as part of CMA. An import algorithm may be used to adjust the referenced master data foreign key when importing, for example to reset it (or not overwrite when updating). If the algorithm knows how to find the appropriate master data record to link, that may also be included.
- If you are importing data that from a source environment on a lower version, if the object you are importing has been enhanced in the latest release with a new required field, you may need to provide an algorithm to populate data in that field.

Note that it is possible to use the algorithm to "reset" the source data as a way of indicating that the record should not be imported. For these situations, the migration object comparison step will transition the record to **Unchanged** and will use an object action value of **Canceled**. (Note that object action is a simple lookup value. The record is not transitioned to the **Canceled** BO state as to reserve that status for user initiated cancellations of the object or one of its parent records). This technique not expected to be used often because ideally using appropriate selection criteria at export time should ensure that the only records exported are those that should be imported.

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> **Note**
>
> **Legacy 'Import' system event.** The system originally provided an Import system event / plug-in spot. The purpose of algorithms for this plug-in spot were similar in that they were meant to adjust imported data prior to adding or updating. The algorithms were executed in the Apply step. The logic does not allow for easily interacting with the record using a BO. This makes it difficult to use a plug-in script as the plug-in type. In addition, it is difficult to update elements in an XML column. The support for the plug-in spot will be removed in a future release. Algorithms to adjust the data should be using the pre-compare system event.

Import Process Summary

The following table summarizes the steps required to complete the import process from start to finish. Note that this section **only a summary** and assumes that you are familiar with the details described in the previous sections. It highlights what steps are manual and what steps are performed by a batch monitor process. For each step, the table highlights the Next Action sequence that would occur. For the Apply steps, there are two parts where multiple next actions are possible based on whether there are errors and the user's decision on how to resolve the error. Refer to Resolving Errors for more information. The possible next actions have the same sequence with a letter following the sequence highlighting the action to take based on the results of the previous step.

> **Note**
>
> When running the Apply batch jobs, be sure to set the number of threads to a number that does not exceed the number of threads supported by the thread pool worker.

Also note that a sequence and action marked in bold is considered the "normal path".

When using separate batch processes for business data any reference to a migration object monitor batch process applies also to the business data related batch controls.

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
Import	**10**	**Create Import record**	Manual	Mig Iggration Data Set Import - Adding	11

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
	11	**Import file**	Batch	FM 1-MGD Li-Mn Mig-ra Sta-it Imp-ro Pro-tra S-Re Ia-ny ct-ro	20

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Step	Seq	Manual / Batch Action	Next Action Sequence
			Perform Control-Amount Tracking Stated - Resulting Status
			Complete Migration Transaction - Pe

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Step	Seq	Manual / Batch Action	Next Action Sequence
			Pre-Contract Cd-Amortization Ended - Resulting Status
			nding Migration Object - Pending

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Step	Seq	Manual / Batch Action	Next Action Sequence
Compare	20	Batch Migration Object Compare	21

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
				Receive Wrong Resigned Unchanged Error Data	

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Step	Seq	Action	Manual / Batch	Process Contract LCM-Amount Transactions Completed - Resulting Status	Next Action Sequence
				to a Process Errors sing submitals so F1-MGOPB(	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Actioned - Resulting Status	Next Action Sequence
				Migration Object Monitor (Business	

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Step	Seq	Manual / Batch Action	Next Action Sequence
			Process to Ad-Hoc Amortization Cost Ended - Resulting Status s))]

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Step	Seq	Action	Next Action Sequence - Resulting Status
	21	Batch Migration Transaction status update	22

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked	Next Action Sequence
			te	priority, Unchanged or Error Comparing	

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
	22	Migration Data Set Import status up	Batch	FM 1-g MGA DI M-n Mi g ra a Se it d m Dp a tr a S- e A tw Ia i m p t d m	30

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Step	Seq	Action	Manual / Batch	Process to Control-Amount Tracked	Next Action Sequence
		date		Mgmt to overall, Apply Objects (if config	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Actioned - Resulting Status	Next Action Sequence
				ured for Automatic Apply), Unchang	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracking Stated - Resulting Status	Next Action Sequence
				ed or Error	

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
Approval	**30**	**Review comparison results, approv**	Manual	Mid-Amount Approved, Reject Line	40

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Step	Seq	Action	Manual / Batch	Process Control Amount Accounted - Resulting Status	Next Action Sequence
		e/rejectasneeded (This step is skip		to the Tranes action is only Obj beeitnaesendesc	

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Step	Seq	Action	Manual / Batch	Portal-Action	Batch Control	Record Impacted-Resulting Status	Next Action Sequence
		pped if the dataset is configured for		essary)		eview) · Migration Data Set Import - A	

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Step	Seq	Manual / Batch Action	Next Action Sequence
		Automatic Apply)	Apply Objects

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Step	Seq	Manual / Batch Action	Next Action Sequence
Apply	40	Batch Apply Objects	41 Appropriate next action is based on error review, if applicable.

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Step	Seq	Action	Manual / Batch	Process to Load-Amount Transaction	Next Action Sequence
				Apply [When using separate business	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
				essdataprocessessubmitalsoF1-M	

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Step	Seq	Action	Manual / Batch	Process to Control-Amortization	Next Action Sequence
				GOAB (Migration Object Monitor (Bu	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Transaction Needed - Resulting Status	Next Action Sequence
				siness) - Apply)]	

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Step	Seq	Action	Manual / Batch	Procedure Action Code	Next Action Sequence
	41a	Migration Data Set Imports status up	Batch	FM-Migration Data Set Import Status Update	42

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Step	Seq	Action	Manual / Batch	Process Contract Code	Next Action Sequence
		date-auto transition to Apply Tran		Manual Contract Code	Resulting Status
				Manual Contract Code	Manual Contract Code

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
			sactions. Only applicable if the nu		

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Step	Seq	Action	Manual / Batch	Procedure Control - Amount Tracked - Resulting Status	Next Action Sequence
		mber of migration objects in Error A			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked	Next Action Sequence
			pplying is below a threshold		

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Step	Seq	Action	Manual / Batch	Process to Control-Amount Tracked	Next Action Sequence
	41b	**Migration Data Set Import status up**	Manual	Migration Data Set Import-click Ap	

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Step	Seq	Manual / Batch	Next Action Sequence
		Action	**Perform Control Amount Accounted - Resulting Status**
		date-manual transition to Apply Tr	ply Transactions

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked	Next Action Sequence
		ansactions. Occurs if user reviews			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Actioned - Resulting Status	Next Action Sequence
		errors and determines that they may			

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Step	Seq	Action	Manual / Batch	Procedure Control - Amount Tracked - Resulting Status	Next Action Sequence
			be resolved in the Apply Transactio		

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Step	Seq	Action	Manual / Batch	Parent to Child-Amount Traced Done - Resulting Status	Next Action Sequence
			n s t e p .		

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Step	Seq	Manual / Batch Action	Next Action Sequence
		System detects that all the transac	42 Migration Data Set Import - Apply Tr

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Step	Seq	Action	Manual / Batch	Process to Load-Amount Tracking Stated - Resulting Status	Next Action Sequence
		tions are in the Ready to Apply state		ansactions	

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Step	Seq	Action	Manual / Batch	Procedure Control Amount - Resulting Status	Next Action Sequence
		and proceeds to the Apply Transacti			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
			onsstate.		

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Step	Seq	Action	Manual / Batch	Portal - Action	Batch Completed	Record - Resulting Status	Next Action Sequence
		System detects that there are trans		Migration Data Set Import - Retry Tr	4	5	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
		actions in the Error Applying state		ansactions	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked	Next Action Sequence
		and transitions instead to the Retr			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
		y Transactions state.			

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Step	Seq	Manual / Batch Action	Next Action Sequence
	41c	Manual Migration Data Set Import status up	44 Migration Data Set Import - Reticky Web

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Step	Seq	Manual / Batch Action	Next Action Sequence
		date-manual transition to Retry Ob	Correct or Cancel-Amount Tracked - Resulting Status Retry Objects

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
		jects. Occurs if user review error			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracking Stated - Resulting Status	Next Action Sequence
		sand decides to fix an external error			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked	Next Action Sequence
		and wants to try the batch level Appl			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
		yagainattheobjectlevel.			

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Step	Seq	Action	Next Action Sequence
	42	Apply Transactions	Appropriate next action is based on error review, if applicable.

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Step	Seq	Manual / Batch Action	Next Action Sequence
			Error to or Applying Migration Object - A

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Step	Seq	Action	Manual / Batch	Process to Load-Amortization	Next Action Sequence
				Reported - Resulting Status	
				pplied or Error Applying	

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Step	Seq	Action	Next Action Sequence - Resulting Status
	43a	Batch Migration Data Set Import status up	N/A

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
		date-autotransitionto Completed		Monitor	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
		Applicable if all transactions are			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
		Applied			

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
	43b	Migration Data Set Import status up	Manual	Migration Data Set Import - Clerk Web	44

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked	Next Action Sequence
		date-manual transition to Retry Ob		tryc Objects	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
		jects. Occurs if user review error			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracking Stated - Resulting Status	Next Action Sequence
		sand decides to fix an external error			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracking Method - Resulting Status	Next Action Sequence
		and wants to try the batch level Appl			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked	Next Action Sequence
		yagainatthe Objectlevel.			

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
	43c	Migration Data Set Import status up	Manual	Migration Data Set Import - Clerk Reactor Amount Reduced - Resulting Status	45

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
			date-manual transition to Retry Tr	tary Transactions	

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Step	Seq	Action	Manual / Batch	Procedure Control - Amount Tracked - Resulting Status	Next Action Sequence
		ansactions. Occurs if user reviews			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracking Stated - Resulting Status	Next Action Sequence
		errors and decides to fix an external			

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Step	Seq	Action	Manual / Batch	Process to Control-Amount Tracking Stated - Resulting Status	Next Action Sequence
		error and wants to try the batch leve			

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Step	Seq	Action	Manual / Batch	Process to Control - Amount Tracked - Resulting Status	Next Action Sequence
		l Apply again at the Transaction lev			

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Step	Seq	Action	Manual / Batch	Perform Action Control - Amount Tracked - Resulting Status	Next Action Sequence
		el.			

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
	44	Migration Objects status update fr	Batch	Fi-Mig Ca Oil Pro-Mo Mig reactio-Ap Op jo ev ce td Mo n i t	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Accounted - Resulting Status	Next Action Sequence
			omErrorApplyingbacktoApproved.	or [Whenusingseparatebusinessda	

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Step	Seq	Action	Manual / Batch	Process to Control-Amount Tracked	Next Action Sequence
		Occurs if user chose to Retry Object		Batch Processes submitals of F1-MGOPB(	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Actioned - Resulting Status	Next Action Sequence
			s.	Migration Object Monitor (Business	

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Step	Seq	Manual / Batch Action	Next Action Sequence
			[Process to Control - Amortization Ended - Resulting Status s))]

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
		Migration Data Set Import status up	Batch	FM-401 Mig-Mig Data Set Import Mig-Mig Data Set Import Process Action Sequence	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked	Next Action Sequence
		date from Retry Objects to Apply Obj		Mortis tor	

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
			ects		

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
	45	Migration Transaction Status Upd	Batch	FM-42 1-Mig Ga Tr Pro-Mirgam Ma Ta Ic Ot Tom a-Rse a Ad Ty it Oo Ap	

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Step	Seq	Action	Manual / Batch	Process to Control - Amount Tracked - Resulting Status	Next Action Sequence
			ate from Error Applying back to Read		only to r

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Step	Seq	Action	Manual / Batch	Process to Apply-Occurs if user chose to Re	Next Action Sequence

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Step	Seq	Action	Manual / Batch	Procedure Control - Amount Tracked - Resulting Status	Next Action Sequence
		try Transaction so rif the user tran			

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Step	Seq	Action	Manual / Batch	Process to Apply Transactions and Update Resulting Status	Next Action Sequence

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Step	Seq	Action	Manual / Batch	Process to Control-Amount Tracked	Next Action Sequence
		hesystemdetectsthattherearerTra			

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Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
		nsactionsintheErrorApplyingsta			

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Step	Seq	Action	Manual / Batch	Procedure Control Amount Tracked - Resulting Status	Next Action Sequence
			te.		

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Step	Seq	Action	Manual / Batch	Process Action Sequence	Next Action Sequence
		Migration Data Set Import status up	Batch	F-42 1-Mig Data Import Mig-Data Set Import Data Set Import Status Up	

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Step	Seq	Action	Manual / Batch	Portal-Action	Record Compacted - Resulting Status	Next Action Sequence
		datefromRetryObjectstoApplyObj		tMonitor	ansactions	

Step	Seq	Action	Manual / Batch	Process to Control Amount Tracked - Resulting Status	Next Action Sequence
		ects			

The following table summarizes the batch monitor jobs that are used in the import process. You can see that there are special monitor processes for the Apply step for both the Object and Transaction. However, for all other states that have monitor logic, the standard monitor process for that MO is used.

Batch Control	Description	Comments
F1-MGDIM	Migration Data Set Import Monitor	Processes data set records in the following states: • Pending • Ready to Compare • Apply Objects • Retry Objects • Apply Transactions • Retry Transactions
F1-MGTPR	Migration Transaction Monitor (Deferred)	Processes transaction records in the following states: • Pending • Error Applying

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Batch Control	Description	Comments
F1-MGTAP	Migration Transaction Monitor - Apply	Processes transaction records in the Ready to Apply state where the data set is in the Apply Transactions or Canceled state. **Note** Be sure to set the number of threads to a number that does not exceed the number of threads supported by the thread pool worker.
F1-MGOPR	Migration Object Monitor	Processes object records in the following states: • Pending • Needs Review (check for Data Set cancellation) • Error Applying
F1-MGOPB	Migration Object Monitor (Business) Applicable only when separate business data processing is enabled.	Similar to F1-MGOPR (Migration Object Monitor) but restricted to business data migration objects.

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Batch Control	Description	Comments
F1-MGOAP	Migration Object Monitor - Apply	Processes object records in the Approved state where the data set is in the Apply Objects or Canceled state. **Note** Be sure to set the number of threads to a number that does not exceed the number of threads supported by the thread pool worker.
F1-MGOAB	Migration Object Monitor (Business) - Apply Applicable only when separate business data processing is enabled.	Similar to F1-MGOAP (Migration Object Monitor - Apply) but restricted to business data migration objects.

Refer to Running Batch Jobs for more information about managing the batch jobs, including ways to automate the above steps.

Cancelling a Data Set

A user may choose to **Cancel** a data set to prevent it from being processed at any point during the process.

The request sets the data set in **Pending Cancel** status. If related migration objects have not yet been created, the data set transitions immediately to the **Cancelled** status and the cancellation request is complete.

If related migration transactions or migration objects have already been created, they will not be canceled as part of the data set getting canceled (due to possible high volumes of related records). They will be canceled the next time an appropriate monitor batch process runs. The child records checks to see if the data set has been canceled prior to any state transition.

Once all the migration transactions and objects are in a final state, the next batch monitor processing of the data set transitions it to the **Cancelled** status to complete the cancellation request.

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Additional Note Regarding Imports

The following points describe miscellaneous comments related to Migration Import.

- CMA relies on the fact that database referential integrity constraints are not in place, and that the SQL statements can be run in any order within the transaction. Any archiving solution that requires referential integrity constraints (such as Information Lifecycle Management) would not be possible on this data. Given that CMA migrations comprise administrative data and not transactional data, this should be a reasonable exception.
- The validation that is performed is only via the **Page Validate** service. BO validation algorithms are not executed. Page validation does not include validation of the business object against the schema (for example, for required fields, field sizes, etc.).
- If multiple migration requests are exported at the same time, on the import side, you should consider importing, reviewing, and applying an entire file/data set before moving on to the next one. The reason is that if objects are included in more than one file, two sets of "inserts" will be generated, but only the first will succeed. The second will cause the object to transition to "Cannot Apply". If instead you wait until the first file is completed before importing the second, the second data set will not generate any SQL for the object, since it has already been inserted. It's a matter of efficiency: If you first import all files and then try to apply all, you'll have to identify the duplicated object as an error and then mark the object as rejected before applying the transaction. This may also be avoided by using a Group migration request to include all objects in one file rather than multiple files.
- The system provides an algorithm to purge "unchanged" migration objects for a given migration data set. This may be plugged in as a BO exit algorithm on the **Ready to Compare** state for the Migration Data Set Import business object (`F1-MigrDataSetImport`).

The following points describe miscellaneous comments related to importing a business data set in bulk mode.

- The number of entities included in each migration object is captured on the migration object record.
- The comparison step only generates SQLs for new or changed entities. SQLs are not generated for unchanged entities.
- Searching for migration objects based on their included entities is only supported for entities that were determined as new or changed. In other words, this type of search by included entities is only possible after the comparison step is performed.

Caching Considerations

There are two important caching considerations when using CMA to migrate administrative data.

- The "apply" batch processes update data. As described in Batch Cache, if any batch job is updating data marked as "cached for batch" it must be run in a special thread pool. Contact your system administrator and ask for the name of a thread pool that has turned off caching. This thread pool name must be entered in the batch controls used for CMA processing in the **Thread Pool Name** parameter.
- After a successful migration, the target region now has new administrative data which needs to be part of various caches. It is recommended to flush the server cache (which will trigger a 'global' flush of the cache). If the thread pool workers in the target region are configured to refresh their caches when a global flush is requested, then this is the only

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step required. If not, then the F1-FLUSH batch job should also be submitted to refresh the caches used in batch processing.

NOT_SUPPORTED

Refer to Caching Overview for more information.

NOT_SUPPORTED

Refer to Running Batch Jobs for more information about running CMA batch jobs.

Maintaining Import Data

This section describes the portals provided to add, view and maintain migration import data.

- Migration Data Set Import
- Migration Transaction Portal
- Migration Object Portal
- Configuration Deletion

Migration Data Set Import

Use the Migration Data Set Import portal to view and maintain migration data set import records. Refer to Importing and Applying a Migration for an overview of the import process.

Navigate using **Admin**, and then **Implementation Tools**, and then **Migration Data Set Import.** You are brought to a query portal with options for searching for import data sets. In addition, the query provides an option to specifically search for data sets that have either objects in error or transactions in error. Once a data set has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones are visible on the **Main** tab:

- **Migration Data Set Import.** This zone contains display-only information about the selected record. Please see the zone's help text for information about this zone's fields.
- **Entity Summary.** This zone provides a summary count of all migration objects included in the current data set across the various statuses.

The following zones are visible on the **Transactions** tab:

- **Migration Data Set Transactions in Error.** This zone is only visible if there are transactions for this data set in a non-final state that have errors. It indicates the error for each transaction. A user may use this zone to review errors after the monitor batch job to apply transactions completes. The errors received when attempting to apply objects at the transaction level may differ from those received when attempting to apply objects at the object level. A transaction log is created for each object error received and these exceptions are shown in this zone.

Note

Refer to Apply Step for more information about resolving errors.

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- **Migration Data Set Transactions.** This zone is visible once the Import Step has occurred and lists all the transactions that are related to the data set. To see more information about a specific migration transaction, click the hypertext for its ID. This brings you to the Migration Transaction portal.

The following zones are visible on the **Objects** tab:

- **Migration Data Set Objects in Error.** This zone is only visible if there are objects for this data set in a non-final status that have errors. It indicates the error for each object. A user may use this zone to review errors after the monitor batch job to apply objects completes. Using the error information shown, the user can choose to drill into the record to transition it to **Error Applying** or choose to manually fix the cause of the errors and click **Retry Objects**. The user may also choose to select one or more records to **Reject**.

> **Note**
>
> Refer to Apply Step for more information about resolving errors.

- **Migration Data Set Impacted Object Summary.** This zone is visible once the Import Step has occurred and lists the objects that are related to the data set. To see more information about a specific migration object, click the hypertext for its ID. This brings you to the Migration Object portal. A user may choose to update the status of one or more records by checking the records and clicking **Approve**, **Reject** or **Needs Review** accordingly.

The following zones are visible on the **Errors** tab:

- **Errors Summary.** This zone summarizes migration objects in error by maintenance object, error message category and number. Broadcasting a row provides a more detailed list of distinct error messages.
- **Errors.** This zone lists distinct errors for a selected maintenance object along with a count of migration objects in error with the same exact error message. This information may be used to highlight common configuration issues across objects. A sample migration object is also provided for review. The zone is visible when a selection is made on the summary zone.

The following zones are visible on the **Log** tab, in addition to the standard log entries:

- **Object Retries Summary.** This zone provides a summary of retry processing performed while applying objects. Retrying objects too many times slows down the apply step. Incomplete or invalid export data may result in many objects being retried too many times until they are eventually set to 'Error Applying' status.

Migration Transaction Portal

This page appears after drilling into a specific migration transaction from the migration data set portal or from the migration object portal.

Refer to Importing and Applying a Migration for an overview of the import process.

The following zones are visible on the main tab:

- **Migration Transaction.** This zone contains display-only information about the selected record. Please see the zone help text for information about this zone's fields.
- **Migration Transaction Objects.** This zone lists the objects that are related to the data set. To see more information about a specific migration object, click the hypertext for its ID. This brings you to the Migration Object portal. A user may choose to update the status of

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one or more records by checking the records and clicking **Approve**, **Reject** or **Needs Review** accordingly.

- **Entity Summary.** This zone provides a summary count of all migration objects included in the current transaction across the various statuses.

Migration Object Portal

This page appears after drilling into a specific migration object from the migration data set portal or from the migration transaction portal.

Refer to Importing and Applying a Migration for an overview of the import process.

The **Migration Object** zone contains display-only information about the selected record. Please see the zone help text for information about this zone's fields.

The **Migration Object - List of SQL Statements** zone lists the SQL statements that have been generated as a result of the comparison step. A check mark in the Suppressed checkbox indicates that the SQL for that row will not be applied during the apply step.

The **Migration Object - Algorithms** zone displays any pre-compare algorithms that are associated with the migration plan for this migration object.

Configuration Deletion

Use the Configuration Deletion portal to review and delete configuration entities that were previously imported and are no longer needed. Refer to Importing and Applying a Migration for an overview of the import process.

Navigate using **Admin**, and then **Implementation Tools**, and then **Configuration Deletion.** You are brought to a portal where you can define a set of import data sets as representing a complete imported configuration and delete entities that were previously imported but not included in the reference set.

The following zones are visible on the **Main** tab:

- **Configuration Summary.** This zone summarizes the number of imported entities by maintenance object that are included in a selected set of import data asets that represent a complete imported configuration. Selecting a maintenance object lists potential entities for deletion.
- **Entities to Delete.** This zone lists potential entities for deletion, i.e. entities of the selected maintenance object that were previously imported but not included in the reference data set. You may select and delete entities from this list.

Running Batch Jobs

There are several batch jobs that are part of the CMA process, especially the import step (which are highlighted in Import Process Summary). And in some cases, a single batch jobs may process multiple states in the same business object lifecycle. Implementations must decide the best way to manage the batch job submission depending on how they plan to work.

- **Batch scheduler**. If an implementation wishes to put these batch jobs in the batch scheduler, a given job may need to be included several times to manage progressing the records to completion.
- **Timed Batches**. The batch controls can be configured as timed batches so that they run every N minutes based on the setting. This allows for the batch jobs to run periodically and

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process whatever is ready. A user doesn't have to manually submit a batch request. Navigate to the Batch Control page and select the appropriate batch controls. For each one, change the Batch Control Type to **Timed**. Fill in the additional information that appears for timed batches.

- **Event Driven**. The system provides BO enter plug-in algorithms and batch control post processing plug-in algorithms that automatically submit the appropriate next batch job for that step in the process. This allows for as much automation as possible for the steps that don't require user input. Note that configuration is required because the BOs / batch controls are not configured for this scenario by default. The following table highlights the BO and status where an algorithm may be plugged in and the name of the algorithm to use.

Business Object	Status	Algorithm
Migration Data Set Export	**Pending**	`F1-MGDPR-SJ` (Submit Migration Data Set Export Monitor).
Migration Data Set Import	**Pending**	`F1-MGDIM-SJ` (Submit Migration Data Set Import Monitor).
	Ready To Compare, **Retry Objects**	`F1-MGOPR-SJ` (Submit Migration Object Monitor). When using separate batch processes for business data add also this algorithm: `F1-MGOPRB-SJ` (Submit Migration Object Monitor for Business Data).
	Apply Objects	`F1-MGOAP-SJ` (Submit Migration Object Apply Monitor). When using separate batch processes for business data add also this algorithm: `F1-MGOAPB-SJ` (Submit Migration Object Apply Monitor for Business Data).
	Apply Transactions	`F1-MGTAP-SJ` (Submit Migration Transaction Apply Monitor).
	Retry Transactions	`F1-MGTPR-SJ` (Submit Migration Transaction Monitor).

The following table highlights the batch controls where an algorithm may be plugged in and the name of the algorithm to use.

Batch Control	Algorithm
F1-MGTPR (Migration Transaction Monitor)	`F1-MGDIM-NJ` (Submit Migration Data Set Import Monitor).
F1-MGTAP (Migration Transaction Monitor - Apply)	`F1-MGDIM-NJ` (Submit Migration Data Set Import Monitor).
F1-MGOAP (Migration Object Monitor - Apply) When using separate batch processes for business data update also this batch control: F1-MGOAB (Migration Object Monitor (Business) - Apply)	`F1-MGDIM-NJ` (Submit Migration Data Set Import Monitor).

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Batch Control	Algorithm
F1-MGOPR (Migration Object Monitor) When using separate batch processes for business data update also this batch control: F1-MGOPB (Migration Object Monitor (Business))	`F1-MGTPR-NJ` (Submit Migration Transaction Monitor).

- **Manual submission**. The user managing the CMA import process submits the appropriate batch jobs on demand when a particular step is ready. Navigate to Batch Job Submission, select the appropriate batch control and fill in the parameters as needed.

Note that for the CMA batch processes used to migrate administrative data, there are multiple important caching considerations. Refer to Caching Considerations for more information.

> ⚠ **Caution**
>
> Be sure that the Thread Count set when submitting the batch job does not exceed the number supported by the thread pool. Otherwise the extra threads will wait until the supported number of threads are finished, possibly resulting in a large number of errors in the Apply steps.

Refer to the parameter descriptions in the batch control metadata for more information about filling in the parameters.

For additional details on submission controls, refer to the topic Batch Job Submission Portal in the Batch Jobs section.

CMA Reference

This section provides additional reference information.

- Framework-Provided Migration Configuration

Framework-Provided Migration Configuration

This topic describes special information relating to migration objects provided for use by CMA in the product. Additional objects may be provided by your specific product. Any special information for objects is provided separately in each product's documentation.

The following points highlight some information about Framework-provided migration requests. Navigate to the migration request page in the application to view the details of all provided objects.

- Several base migration requests are supplied to logically group system and administrative tables. For example, there is a migration request for Framework System Configuration **F1-SystemConfig** where most system configuration objects are included. There is another one provided for CMA related configuration objects.
- The system supplies a group migration request `F1-FrameworkConfig` (Framework Configuration), which includes several other migration requests. The expectation is that this migration request includes all the typical objects that are included in a wholesale migration. Your specific product may include this migration request into its own group migration request to support a wholesale migration of all the framework and product administrative tables. An implementation may choose to build a custom group migration

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request. In this case, review the various migration requests provided by base to see if any may be included as components for the custom migration request. Then any new migration plans added to the base migration request in future releases are automatically included in future migrations.

- There are several different security related migration requests that include different combinations of migration plans to support multiple possible business requirements related to security migration. Note that the security migration request included in the above mentioned group migration request is the one that does not include users. If your implementation wants to copy users to a target environment, refer to Importing Data that References a User for some considerations.

> **Note**
>
> Refer to your specific product's CMA documentation for its recommendation on which migration requests to use for a full migration of framework and product administrative tables.

The following points highlight some information about the Framework-provided migration plans. Navigate to the migration plan page in the application to view the details of all provided objects.

- Fields and characteristic types are not migrated with an object (like a business object or a data area) unless specifically indicated.
- The **Application Service** used by an object is migrated only if it is CM-owned.
- The **Batch Control** object optionally references a User (for 'timed' batches). Refer to Importing Data that References a User for some considerations about copying the user. Also note that when running a batch job, snapshot information is captured on the batch control. Updates like this increment the version number. If a batch control record is part of the migration and the comparison step has detected a change to the batch control, the Apply step will error out for this batch control if a batch job is submitted between the compare and apply step.

> **Note**
>
> CMA batch controls that are part of the import step are executing and as such, the system does not include these records in a migration. If your implementation changes default parameters for any of the batch controls, the recommendation is to manually make those changes to the target region.

- The base migration plans for MO and BO include instructions to copy option types that use foreign key references to refer to other objects. Note that the data stored in the options are not validated, so defining these instructions is not required when doing wholesale migrations. However, including subordinate instructions for foreign key references is useful for targeted migrations to ensure that the related data is included in the migration. If you add additional MO or BO option types that use foreign keys and you want to support targeted migrations, you must create custom migration plans and requests for MO and BO, respectively to include these referenced objects in the migration plan. Note that you do not need to duplicate the instructions in the base migration plans. You may define the additional migration plans to only have the additional custom option types. When submitting a migration request for MO or BO you must include both the base migration plans and the custom migration plans in the request.
- For scripts, schema-based objects and zones, the migration plans provided by the product migrate, through constraints, some of the typical associated data with them. However, data

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specified through alternate formats (such as through **Edit Data** steps in scripts, referenced in schemas for schema-based objects, or data from mnemonics in zone parameters, etc.) are not identified and combined in the same transaction. The iterative processing functionality of the import step should resolve any timing issues that may result in validation errors for these types of objects.

- There are two migration plans for **Scripts**. The migration plan **F1-ScriptOnly** migrates just the script and its **Application Service** (provided the Application Service is CM-owned). The migration plan **F1-Script** includes most related objects, but does not migrate any objects referenced in the edit data area steps. It does not move the **Function** maintenance object. It may be included in any appropriate custom targeted migration request where scripts and related data should be migrated.
- If your implementation includes a **Feature Configuration** setting for the `F1_DBCONINFO` entry that will be included in a migration request, be sure that the import user on the target region has the appropriate security rights to this entry (**Administrator** access mode for the Feature Configuration application service (**CILTWSDP**).
- The common attachments in the Attachment maintenance object may be considered administrative data to include in a migration. Because this MO has a system generated key, as described in Administrative Data with System Generated Primary Keys, it uses a logical key of the file name and the creation date to determine if the record exists in the target environment. In addition, this MO contains administrative data (common attachments) and non-administrative data (owned attachments). To try to minimize the possibility of key "collision", new common attachments receive a generated key that includes a zero in the middle whereas owned attachments receive a generated key that does not have a zero in the middle.
- The Menu maintenance object has a user defined key, however, its menu lines and menu items have system generated keys. To avoid the possibility of overriding a menu line or menu item incorrectly, the menu MO will check the menu line's menu name in the source and target to be sure they match and will check the menu item's menu line in the source and target to be sure they match otherwise an error will be issued in the comparison step.
- For the system messages, the product provides three different migration plans.
  - Message Category and its Messages (F1-MessageCategory). This migration plan is included in the **F1-SystemConfig** migration request.
  - Message Category (F1-MessageCategoryOnly). This migration plan is provided to support a targeted migration where an implementation has created a custom message category and wants to move it but doesn’t want to move all its messages.
  - Message (F1-Message). This migration plan is provided to support a targeted migration where only specific messages within a message category should be migrated.
- For lookup values, the product provides two different migration plans.
  - Lookup Field and its Values (F1-Lookup). This migration plan is included in the **F1-SystemConfig** migration request.
  - Lookup Value (F1-LookupValue). This migration plan is provided to support a targeted migration where only specific lookup values within a lookup field should be migrated.
- There are some system data objects where no information in a base delivered record may be modified by an implementation. For these records, the base delivered migration requests include selection criteria to only select CM-owned records (because the base records will always exist in the target region assuming both regions have the same release). An example is Algorithm Type. The **F1-SystemConfig** migration request only includes CM-owned algorithm types. However, many system data objects support custom changes to one or more fields, for example the Zone object allows an implementation to

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override the zone text or certain parameters. Other system data objects support custom additions to a collection. For example, the Maintenance Object allows an implementation to add algorithms or options. For the migration plans related to these system data objects, all records are included in the base delivered migration requests to allow for any customized configuration to be migrated. It means that during the Import / Compare step many base delivered objects that are not customized will be marked **Unchanged**.

- Many of the integration related maintenance objects that include references to environment-specific data, such as Message Senders. This data should be migrated with extreme care. When appropriate, consider taking advantage of URI substitution. Refer to Referencing URIs for more information.

Facts

Fact is an optional configuration tool for simple workflow-type business messages or tasks. The base package does not provide a dedicated Fact user interface because fact is generic by design. Implementations configure their own user interface to visualize the desired custom business process. The topics in this section describe the generic Fact entity and how it can be customized.

- Fact Is A Generic Entity
- Fact's Business Object Controls Everything
- Fact Supports A Log

Fact Is A Generic Entity

The Fact maintenance object is a generic entity that can be configured to represent custom entities and support automated workflows for a variety of applications. Each fact references a business object to describe the type of entity it is. A status column on the fact may be used to capture its current state in the processing lifecycle controlled by its business object.

The maintenance object also supports a standard characteristic collection as well as a CLOB element to capture additional information.

Fact's Business Object Controls Everything

A fact's business object controls its contents, lifecycle and various other business rules:

- Its schema defines where each piece of information resides on the physical Fact maintenance object.
- If may define a lifecycle for all fact instances of this type to follow. Each fact must exist in a valid state as per its business object's lifecycle definition.
- It may define validation and other business rules to control the behavior of facts of this type.

NOT_SUPPORTED

For more information about business objects, refer to The Big Picture of Business Objects.

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Fact Supports A Log

The Fact maintenance object supports a log. Any significant event related to a Fact may be recorded on its log. The system automatically records a log record when the fact is created and when it transitions into a new state. In addition, any custom process or manual user activity can add log entries.

NOT_SUPPORTED

Refer to State Transitions Are Audited for more information on logging.

Conversion

This section describes the overall conversion process and the tools provided to support it.

- Understanding The Conversion Process
- Conversion Entity Dashboard

Understanding The Conversion Process

When you're ready to convert data from your legacy system, you will have analyzed your processing requirements according to your business and organizational needs and set up the control tables accordingly. After the control tables are set up, you are ready to load data into the system from your legacy system.

There are two table owners in the system database. We refer to the first owner as **staging** and the second owner as **production**. The staging owner is linked to the tables into which you insert your pre-validated data. The production owner is linked to the tables used by your production system.

Note

It's important to notice that **control tables exist only in production**. In staging, they exist as views to the production schema. Refer to Multiple Owners In A Single Database for more information about table ownership.

The conversion effort involves several steps as illustrated in the following diagram:

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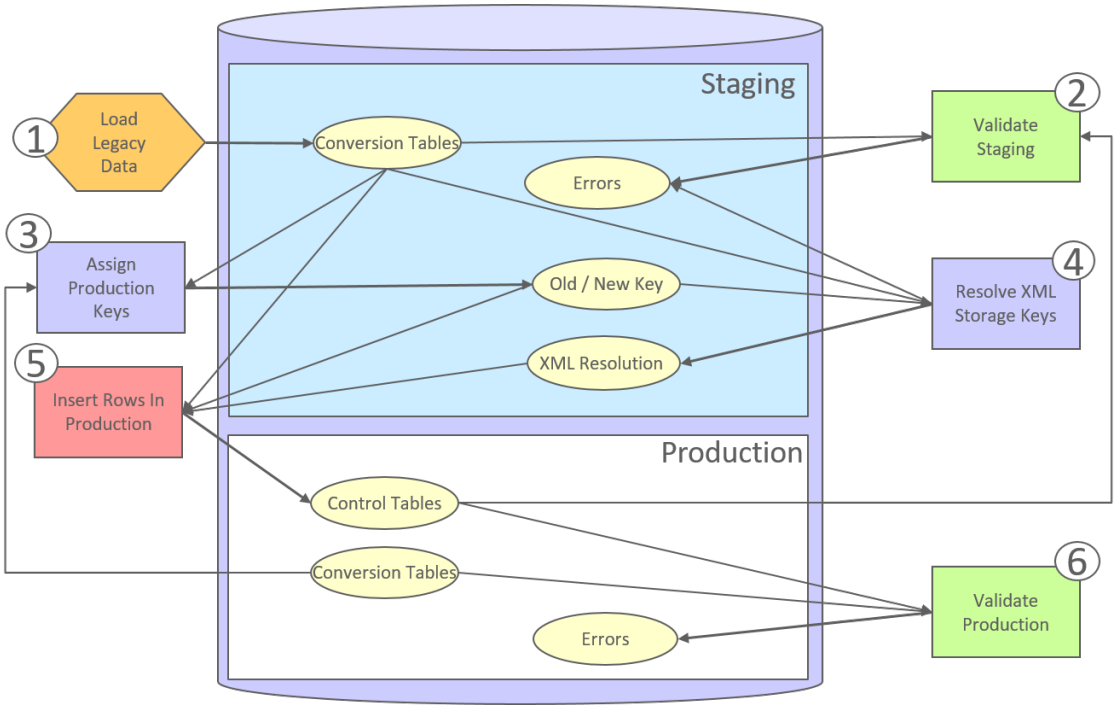

The following points briefly outline each of the above tasks:

- **Load Legacy Data.** During this step, your legacy data is loaded into the system. Notice that you are not migrating this data directly into production. Rather, your rows are loaded into tables that are identical to the production tables; they just have a different owner. Mapping legacy data into the system is probably the most challenging part of the conversion process because the system is a normalized database (and most legacy applications are not).
- **Validate Staging.** During this step, the system validates the data you loaded into the staging tables. Note that validation rules validate your staging data using the control tables that have been set up in production.
- **Assign Production Keys.** During this step, the system allocates random, clustered keys to the rows in the staging database.
- **XML Resolution.** During this step, the system resolves legacy keys that may be mapped to an XML storage field with new values that were assigned in the key assignment step.
- **Insert Rows Into Production.** During this step, the system populates your production tables with rows from the staging. When the rows are inserted, their prime keys and foreign keys are reassigned using the data populated in the key assignment and XML resolution steps.
- **Validate Production.** During this step, you rerun the object validation processes, but this time against production. We recommend performing this step to confirm that the insertion programs have executed successfully.

> **Note**
>
> Additional steps may be needed to support specific data conversion requirements. Refer to your product documentation for additional conversion related information.

This section further discusses concepts and guidelines related to the conversion process.

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- Conversion Entities
- Conversion Steps
- A Note About Keys
- Multiple Owners In A Single Database

Conversion Entities

Conversion is enabled for selected master and transaction maintenance objects. In the same way, only a subset of a maintenance object's tables are enabled for conversion.

The following is provided for each maintenance object that supports conversion:

- An entity validation batch control. This batch process validates data in staging and can also be run to validate data in production.
- A key assignment batch control for each **table** that is eligible for conversion and has a system-generated key.
- An XML resolution batch control if the maintenance object has at least one table that includes an XML storage field.
- An insertion to production batch control for every **table** of the maintenance object that is eligible for conversion.

You may review the conversion configuration provided for an entity and more using the Conversion Entity Dashboard portal.

Conversion Steps

The following sections provide more details about the steps in the conversion process.

> **Note**
>
> Additional steps may be needed to support specific data conversion requirements. Refer to your product's documentation for additional conversion related information.

- Load Legacy Data Into Staging Tables
- Validate Information In The Staging Tables
- Allocate Production Keys
- XML Resolution
- Insert Production Data
- Validate Production

Load Legacy Data Into Staging Tables

This section provides some high level discussion about mapping and loading legacy data to the system's staging tables.

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Mass Load Utility

Unless in a Cloud installation, you can use any method you prefer to load data from your legacy application. However, we recommend that you investigate your database's mass load utility (as opposed to using insert statements) as the mechanism to load the staging tables. In addition, we strongly recommend that you disable the indexes on these tables before populating these tables and then enable the indexes after populating these tables.

> **Note**
>
> In a Cloud installation, refer to **Data Conversion Support for Cloud Implementations** for more information about the various tools provided to support database related conversion tasks.

Populating Keys

Some tables in the staging database have keys that are system-assigned random numbers. Special consideration should be given when populating these keys. Refer to A Note About Keys for more information on how to properly populate these tables. Those tables that don't have system-assigned random numbers have keys that are a concatenation of the parent's prime-key plus one or more additional fields.

Populating Characteristic Tables

There are many maintenance objects that include a characteristic table used to capture miscellaneous information about the object. Most of these tables include an indexed column used when searching by characteristic value called Search Characteristic Value. During conversion and depending on the type of characteristic, this column must be populated as follows:

- **Predefined.** Populate search characteristic value with the contents of the characteristic value column converted to upper case.
- **Ad hoc.** Populate search characteristic value with the first 50 bytes of the ad hoc characteristic value column converted to upper case.
- **Foreign key.** Populate search characteristic value by concatenating the values of each foreign key characteristic value column to a maximum of 50 bytes.

Validate Information In The Staging Tables

During the first validation step, the system validates the data you loaded into the staging tables. This section provides some high level discussion about the validation process.

A Batch Process Per Maintenance Object

Each of the maintenance objects that are eligible for conversion must be validated using its respective entity validation conversion batch process. These are classic background processes that can also be run against production data.

These processes are multi-threaded and have no dependency on other processes.

Validation Mode

By default, each entity is fully validated for schema as well as entity validation rules, at the maintenance object and business object level. The batch process performs the same business

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rules that are used to validate data added by users in your production system. You may restrict the batch process to perform schema validation only or entity validation rules only using a batch parameter. This may be useful in identifying common data issues in preliminary runs.

The batch process sets an indication available to validation rules, that they are being called as part of a conversion process. A custom validation algorithm may use this indication to skip unnecessary rules that are not applicable as part of conversion.

> **Note**
>
> The indication is accessible via the scripting $$isConvGenericValidation context variable.

Random Sample Mode

By default all records are selected for validation. The "Process Every Nth" batch parameter allows you execute this process in a random-sample mode to highlight pervasive errors. In this mode, you are actually telling the batch process to validate every N records.

We strongly recommend validating each entity in the following steps:

- Execute the validation batch process in random-sample mode.
- Review and correct the errors. Note, you can use the base package's transactions to correct an error if the error isn't so egregious that it prevents the object from being displayed on the browser.
- After all pervasive errors have been corrected; re-execute each object's validation batch process in all-instances mode to highlight elusive, one-off errors.

Reported Errors

Errors encountered during validation are logged onto the conversion Validation Error (CI_VAL_ERR) table. Note that at the start of this job, all rows in the conversion error table for the process maintenance object are deleted.

You can view errors highlighted by the validation process using the Conversion Entity Dashboard portal.

Uneven Thread Distribution Using Legacy Keys

By default, the 'Object Validation' batch process distributes thread processing load using the **Thread Level SQL Select** (THDS) batch strategy. This method relies on the entity's prime key to be evenly distributed.

In the staging schema, entities still reference their legacy prime keys which may not be evenly distributed. When the distribution skew is significant, the performance of this batch process may be impacted. In this situation, you may want to use the **Key Ranges** (KEYS) batch strategy instead. Refer to Parallel Background Processesfor more information.

To do so, add the **Batch Strategy** common batch parameter to the corresponding 'Object Validation' batch control record and set it to the 'KEYS' value.

Recommendations To Speed Up Validation

The following points describe ways to accelerate the execution of the validation process:

- Ensure that statistics are recalculated after data has been inserted into the staging tables.

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- Execute the process multi threaded.
- Execute shorter running validation processes (e.g., less records) first so that the error data can be analyzed while other processes are busy running.
- Remember that validation can be run in random-sample mode. We recommend running these batch processes using a large sample value for this parameter until the pervasive problems have been rectified.

> **Note**
>
> In a Cloud installation, refer to **Data Conversion Support for Cloud Implementations** for more information about the various tools provided to support database related conversion tasks.

Another use for these programs

In addition to validating your objects after conversion or an upgrade, the validation programs have another use. Say for example, you want to experiment with changing the validation of a business entity and you want to determine the impact of this new validation on your existing records. You could change the validation and then run that entity's validation batch process- it will produce errors for each record that fails the new validation.

Allocate Production Keys

During the key assignment step, the system assigns a new key for each legacy key for a table that its prime-key requires a system-generated random key. The conversion process allocates new prime keys to take advantage of the system's parallel processing and data-clustering techniques in the production system (these techniques are dependent on randomly assigned, clustered keys).

The topics in this section provides some high level discussion about the key assignment process and describe the background processes used to assign production keys to the staging data.

The Old Key / New Key Table

It's important to understand that the system does not overwrite the prime-keys on the rows in the staging database, as this is a very expensive IO transaction. Rather, a series of tables exist that hold each row's old key and the new key that will be assigned to it when the row is transferred into the production database. We refer to these tables as the "old key / new key" tables.

The convention "<1st letter of owner flag>K_<table_name>" is used to denote the old key / new key table name. For example, the old key / new key table for CI_ACCT is called CK_ACCT.

The insertion batch process that transfers the rows into the production database use the new key for the main record of the key along with any other record where this key is a foreign key. In the same way, the XML resolution process resolves conversion foreign keys residing in XML storage fields and replaces them with their corresponding new keys from these table.

A Batch Process Per Table

A key assignment batch process is provided for each table that has a system-generated key and belongs to a maintenance objects that is eligible for conversion. The batch process is responsible for populating the corresponding old key / new key table (in other words, you don't

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have to populate these tables). These processes are single threaded. Refer to a table's corresponding key assignment batch process for more information.

Key Assignment Dependencies

Most tables with system-generated keys do not inherit part of their key from another table's key. Their corresponding key assignment batch process have no dependencies and can therefore be executed in any order you please.

Some tables inherit part of their key from another table's key. Key assignment batch processes for such tables must be executed in key inheritance order. In other words, the key assignment process for a table should be run after the process that generates keys for the entity it depend on. The Conversion Entity Dashboard portal displays key inheritance dependency information if any exist for a conversion entity.

> **Note**
>
> You may run multiple key assignment batch process in parallel as long as they are independent with respect to key inheritance.

Iterative Conversions

Rather than perform a "big bang" conversion (one where all records of an entity are populated at once), some implementations have the opportunity to go live on subsets of their entity base. If this describes your implementation, please be aware that the system takes into account the existing prime keys in the production database before it allocates a new key value. This means when you convert the next subset of customers, you can be assured of getting clean and unique keys.

Key assignment logic creates the initial values of keys by a manipulation of the sequential row number, starting from 1. After any conversion run, a subsequent conversion run will start with that row number again at 1, and the possibility of duplicate keys being assigned will be higher. The key assignment batch process allows you to specify a starting value for that row number. The purpose of this parameter is to increase the value of row number by the given value, and minimize the chance of duplicate key assignment. This parameter is only used if you are performing conversions where data already exists in the tables in the production database.

Run Type

Key assignment is performed in two steps:

- **Initial Key Generation.** The system allocates new keys to the rows in the staging tables (i.e., it populates the respective old key / new key table).
- **Duplicate Key Resolution.** The system reassigns keys that are duplicates compared to production.

By default, both steps are performed at the same run but you have the option to run them separately by indicating which step to run via a batch parameter. The proper use of this parameter will greatly speed up the key assignment step as described under **Recommendations To Speed Up Key Generation** section.

Recommendations To Speed Up Key Generation

The following points describe ways to accelerate the execution of the key generation programs.

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- For a non-Cloud installation:
  - Make the size of your rollback segments large. The exact size is dependent on the number of rows involved in your conversion. Our research has shown that processing 7 million rows generates roughly 3GB of rollback information.
    * Setup the rollback segment(s) to about 10GB with auto extend to a maximum size of 20GB to determine the high water mark
    * A next extent value on the order of 100M should be used.
  - Make sure to turn off all small rollback segments (otherwise Oracle will use them rather than the large rollback segments described above).
  - After the key assignment programs execute, you can reclaim the space by:
    * Keep a low value for the "minimum extent" parameter for the rollback.
    * Shrink the rollback segments and the underlying data files at the end of the large batch jobs.
- Compute statistics on the old key / new key tables after every 50% increase in table size. Key generation is performed in tiers or steps because of the inheritance dependency between some tables and their keys. Although key generation for the inheritance dependency tier currently being processed is performed by means of set-based SQL, computation of statistics between tiers will allow the database to compute the optimum access path to the keys being inherited from the previous tier's generation run.
- Optimal use of the **Run Type** batch parameter.
  - Before any key assignments, alter both the "old key" F1_CX_ID index and the "new key" CI_ID index on the old key / new key tables to be unusable.
  - Run all key assignment batch processes in tiers, submitting each job to only perform the **Initial Key Generation** step.
  - Rebuild the indexes on the old key / new key tables. Rebuilding the indexes using both the PARALLEL and NOLOGGING parameters will speed the index creation process. Statistics should be computed for these indexes.
  - Run all key assignment batch processes in the current tier that were previously run in initial key generation mode, to perform the **Duplicate Key Resolution** step. This will reassign all duplicate keys.

> **Note**
>
> In a Cloud installation, refer to **Data Conversion Support for Cloud Implementations** for more information about the various tools provided to support database related conversion tasks.

XML Resolution

Most system-generated foreign keys are stored in physical fields and characteristic tables and as such their legacy value is replaced with its corresponding new key as part of the insertion to production process. Rarely, maintenance objects may store system-generated foreign keys in an XML storage field, in other words, a field defined with the data type of CLOB or XML. This step is only applicable to such maintenance objects.

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During this step, the system resolves convertible system-generated foreign keys that may reside in XML storage fields you may have loaded into the staging tables. This section provides some high level discussion about the XML resolution process.

The XML Resolution Table

It's important to understand that the system does not overwrite the prime-keys on the XML storage fields in the staging database, as this is a very expensive IO transaction. Rather, a corresponding XML resolution table exists for each table that defines an XML resolution field to capture each row's resolved XML storage content, in other words, the content with all the old keys replaced with the new assigned keys.

The convention "<1st letter of owner flag>R_<table_name>" is used to denote the XML resolution table name.

The insertion batch process that transfers the rows into the production database replaces each XML storage field with its resolved value from the corresponding XML resolution table.

A Batch Process Per Maintenance Object

Each of the maintenance objects that are eligible for conversion and support XML storage fields is provided with an XML resolution batch process. These batch processes must be run to resolves foreign keys that may reside in these XML storage fields.

These processes are multi-threaded and must be executed after the key assignment step has completed and before inserting data to production.

XML Resolution Eligibility

Not all maintenance objects that support XML storage fields actually store convertible system-generated foreign keys in their XML storage field. If none of the business objects associated with the maintenance object involve mapping of such foreign keys to an XML storage field then XML resolution is not needed for any row in the maintenance object. The XML resolution batch process detects such situation and completes right away without storing any rows in any of the maintenance object's XML resolution tables.

> **Note**
>
> If the XML resolution batch process detects that the maintenance object is eligible, the maintenance object must reference a physical BO. If a product delivered business object supports system-generated foreign keys in an XML storage field, the product should be supplying a physical BO. If your implementation has system-generated foreign keys in an XML storage field in a custom business object for a maintenance object where the product has not supplied a physical BO, you must create a physical BO and link it to the maintenance object.

Only Resolved Values Are Captured

XML storage fields typically store large amounts of data. To avoid capturing the same XML content redundantly, the system only stores values in the resolved XML storage fields if the resolved value is different than the original value, in other words, if at least one key was resolved.

If for a given record the resolved XML content is the same as the original content then the following rules apply:

- If this is the primary table of the maintenance object a record is inserted into its corresponding XML resolution table for that record with no value in the XML storage field.

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- If this is a child table of the maintenance object then no record is inserted into the corresponding XML resolution for that record.

Reported Errors

Errors encountered during XML resolution are logged onto the conversion Validation Error (CI_VAL_ERR) table. Note that at the start of this job, all rows in the conversion error table for the process maintenance object are deleted.

You can view errors highlighted by the XML resolution process using the **Validation Error Summary** page.

Uneven Thread Distribution Using Legacy Keys

By default, the 'XML resolution' batch process distributes thread processing load using the **Thread Level SQL Select** (THDS) batch strategy. This method relies on the entity's prime key to be evenly distributed.

In the staging schema, entities still reference their legacy prime keys which may not be evenly distributed. When the distribution skew is significant, the performance of this batch process may be impacted. In this situation, you may want to use the **Key Ranges** (KEYS) batch strategy instead. Refer to Parallel Background Processesfor more information.

To do so, add the **Batch Strategy** common batch parameter to the corresponding ' XML resolution' batch control record and set it to the 'KEYS' value.

Insert Production Data

The topics in this section describe the background processes used to populate the production database with the information in the staging database.

A Batch Process Per Table

An insert to production batch process is provided for each table of a maintenance objects that is eligible for conversion.

The batch process is responsible for transferring to production all the rows from the staging table while replacing all references to old keys with their corresponding new keys as follows:

- Keys residing in prime keys, foreign key fields and characteristics are resolved using the corresponding old key / new key tables.

  > **Important**
  >
  > If metadata constraints are missing, then FK references for physical fields may be missed. It is important to review each conversion table that it has all the necessary constraints defined.

- Keys residing in generic foreign key reference tables where each row represents a reference to an entity's maintenance object and prime key values are also resolved using the corresponding old key / new key tables. Note that all entities referenced this way must either be convertible or view of production. A reference to an entity that is explicitly marked as not convertible is not supported as it cannot be resolved.
- Keys residing in XML storage fields are resolved using the corresponding XML resolution tables.

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> **Note**
>
> Foreign keys residing in any other form of storage are not resolved. For example, any references stored in raw elements, log records, or any other field that is not used as an XML storage field.

All insertion batch processes are independent and may run concurrently. Also note, all insertion batch processes can be run in many parallel threads as described in the next section (in order to speed execution).

Recommendations To Speed Up Insertion

The following points describe ways to accelerate the execution of the insertion batch processes:

- Before running the first insertion batch process:
  - Rebuild the index on the prime key on the old key / new key table.
  - Re-analyze the statistics on the old key / new key table.
  - Alter all indexes on the production tables being inserted into to be unusable.
- After the insertion programs have populated production data, rebuild the indexes and compute statistics for these tables.

> **Note**
>
> In a Cloud installation, refer to the **Data Conversion Support for Cloud Implementations** for more information about the various tools provided to support database related conversion tasks.

Validate Production

During this step, you rerun the object validation batch processes, but this time in production. We recommend rerunning these batch processes to confirm that the insertion batch processes have executed successfully. We recommend running these batches in random sample mode (e.g., validate every 1000th object) rather than conducting a full validation in order to save time. However, if you have time, you should run these processes in full validation mode (to validate every object).

A Note About Keys

The prime keys of the tables in the staging database are either system-assigned random numbers or they aren't. Those tables that don't have system-assigned random numbers have keys that are a concatenation of the parent's prime-key plus one or more additional fields. Every table whose prime key is a system-assigned random number has a related table that manages its keys; we refer to these secondary tables as "key tables".

The following points provide more information about the key tables:

- Key tables are used by programs that allocate new keys. For example, before a new key is allocated, the key assignment program checks the corresponding key table to see if it exists.

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- Key tables only have two columns:
  - The key of the object.
  - An environment ID. The environment ID identifies the database in which the object resides.
- Key tables are named the same as their primary table with a suffix of "_K". For example: The key table for CI_ACCT is CI_ACCT_K.
- The key table for a table whose prime key is a system-assigned is defined on its table definition record.
- When you populate rows in tables with system-assigned keys, you must also populate a row in the related key table. For example, if you insert a row into CI_ACCT, you must also insert a row into CI_ACCT_K. The environment ID of these rows must be the same as the environment ID on this database's installation record.
- When you populate rows in tables that reference this record as a foreign key, you must use the appropriate key to ensure the proper data relationships. For example, if you insert a row in CI_SA for the above account, the ACCT_ID column must contain the temporary account key.
- When you insert rows into your staging database, the keys do not have to be random, system-assigned numbers. They just have to be unique. A later process, Allocate Production Keys, will allocate random, system-assigned keys prior to production being populated.

Multiple Owners In A Single Database

The conversion process relies on the following table owner configuration in the system database:

- The production owner is linked to the tables used by your production system. These tables have an owner ID of CISADM.
- The staging owner is linked to the tables into which you insert your pre-validated data. These tables have an owner ID of CISSTG.

The staging owner schema is almost identical to the production schema, with the following exceptions:

- Control tables are not actual tables in staging but rather views to the corresponding tables in production.
- Conversion specific tables designed solely to support the conversion process exist only in the staging schema. For example, tables that manage key assignment and XML resolution.

This section provides some high level concepts related to these table owners.

Validation Always Uses Production Control Data

When the validation batch processes run against your staging data, they validate the staging data against the production control tables (and insert errors into the staging error table). This means that the SQL statements that access / update entities needs to use the staging owner whereas the SQL statements that access control tables need to use the production owner. But notice that when these same validation batch processes run against production, the SQL statements will never access the staging owner. Rather, they all point at the production owner.

This is accomplished as follows:

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- A separate application server must exist for each owner. Each application server points at a specific database user ID.

  > **Note**
  >
  > In a Cloud installation, the application server may only point to a specific database user ID at any point in time. Refer to **Data Conversion Support for Cloud Implementations** for more information about switching owners.

- The database user ID associated with the staging owner uses CISSTG as the owner for the master and transaction tables, but it uses CISADM as the owner of the production control tables.
- The database user ID associated with the production owner uses CISADM as the owner for all tables.

You may wonder why we went to this trouble. There are several reasons:

- We wanted to reuse the validation logic that exists in the programs that validate your production data. In order to achieve this, these programs must sometimes point at the staging owner, and other times they must point at the production owner (and this must be transparent to the programs otherwise two sets of SQL would be necessary).
- We wanted to let you use the application to look at and correct staging data. This can be accomplished by creating an application server that points at your staging database with the ownership characteristics described above.
- We wanted the validation programs to be able to validate your production data (in addition to your staging data). Why would you want to validate production data if only clean data can be added to production? Consider the following scenarios:
  - After an upgrade, you might want to validate your production data to ensure your pre-existing user-exit logic still works.
  - You may want to conduct an experiment of the ramifications of changing your validation logic. To do this, you could make a temporary change to user exit logic (in production) and then run the validation jobs on a random sample basis.
  - You forget to run a validation program before populating production and you want to see the damage. If you follow the instructions in this document, this should never happen. However, accidents happen. And if they do, at least there's a way to determine the ramifications.

Only Validation Can Work In Both Owners

While the redirection of owner ID's is a useful technique for the validation batch processes, it cannot be used by the key assignment and production insert batch processes? Why, because these processes have to access the same tables but with different owners at the same time. They also need to reference conversion specific tables that do not exist in production. For example, the batch process that inserts rows into a table in production must select rows from the staging version of that table, resolve keys from the conversion old key / new key mapping tables and insert the resolved records into the production version of that same table

This is accomplished as follows:

- In staging, a view to production exists for each eligible to conversion table. These views have hard-coded the database owner to point to production. For example, there is a view called CX_PER that points at person table in production.

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- The key assignment and insertion programs use these views whenever then need to access production data.

Conversion Entity Dashboard

This portal provides an overview of a maintenance object's conversion configuration along with information related to its current status and progress within the overall conversion process.

Refer to Understanding Conversion for more information.

You can access the portal from the **Admin Menu**, and then **Implementation Tools**, and then **Conversion Entity Query.** You are brought to a query portal with options for searching for a specific maintenance object that is eligible for conversion. Once a maintenance object has been selected you are brought to the conversion entity dashboard portal to review the information for the selected record.

The following zones may appear as part of the portal's **Main** tab page.

- **Tables.** This zone provides information about tables that belong to the maintenance object and are marked as eligible for conversion.
- **Batch Controls.** This zone lists the conversion batch controls defined for the maintenance object in the order they should be executed within the conversion process along with current execution details if any.
- **Error Summary.** This zone provides a summary of all conversion errors related to the maintenance object.
- **Duplicate Keys.** This zone lists duplicate legacy keys that need to be resolved by the key assignment conversion process.

The **Errors** tab page provides a query zone that allows you to review conversion errors related to the maintenance object by various criteria.

Data Export

This section describes concepts and tools related to the various types of data export methods supported by the product.

- Understanding Data Export
- Defining Data Export Control
- Generalized Export Dashboard

Understanding Data Export

The application supports the following classes of export methods for a maintenance object:

- **Generalized.** This method may be used for maintenance objects that are low to medium in volume and update activity. Most maintenance objects are eligible for this method.
- **Specialized.** This method should be used for maintenance objects that are high in volume or very frequently updated.

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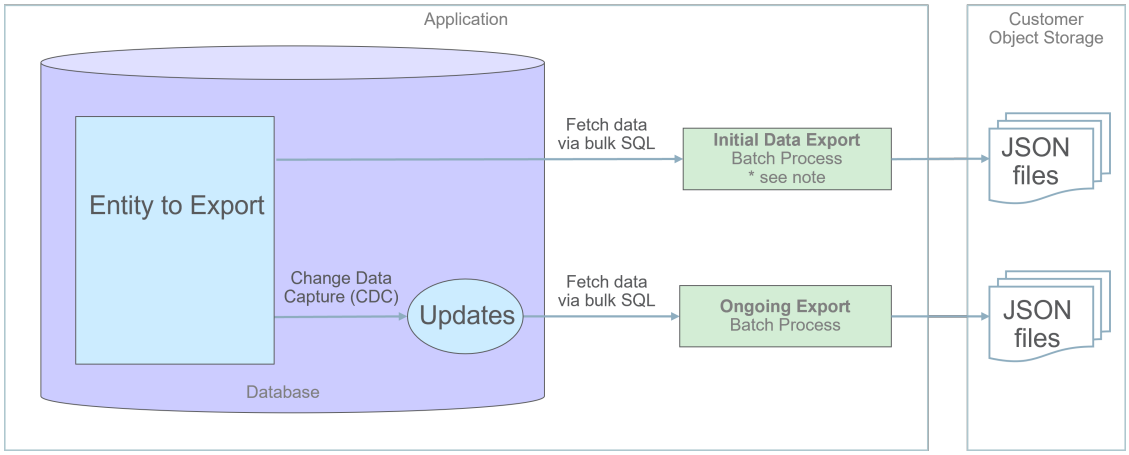
> **Note**
>
> It is your organization's responsibility for designing the process by which these files are imported to one or more target environments.

This section discusses concepts and guidelines related to data export features.

- Generalized Data Export
- Specialized Data Export

Generalized Data Export

The generalized data export method provides a file-based export of data in JSON format. Exporting the data of a maintenance object using this method involves an initial export of the entity's entire data followed by an ongoing export of changes as they are made over time. These processes are illustrated in the following diagram:



The overall process involves the following steps:

- Enable entities for export in the Generalized Export Dashboard portal. You may enable many entities at once. This step also allows you to enable ongoing export of these entities.
- Submit the Generalized Initial Export Initiator (`F1-GEXPI`) batch process to export the current content of all enabled entities. This step submits a separate batch process for each entity you have enabled for export.

  > **Note**
  >
  > A full database export can be used instead. The export file can be imported in the target environment to establish the initial baseline. Cloud customers may contact cloud operations to request such export for on-premise use. This schema export is limited for reporting purposes and is intended for initial extract only.

- Schedule the Generalized Ongoing Export (`F1-GEEXO`) batch process to run periodically.

The following sections further discusses concepts and guidelines related to the generalized data export method.

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Eligibility

While most entities are eligible for generalized data export, not all of them are. Here are a few of the common reasons for that:

- The entity manages extremely high volume of data. Tracking changes to such entity would double the volume of managed data and impact overall performance.
- The entity is updated very frequently. Tracking these events may impact overall performance.
- The entity is used by the product's infrastructure and operational processes. These entities are maintained differently and cannot be subject to the generalized data export methods.

By default a maintenance object is eligible for the generalized data export method unless explicitly marked otherwise by the **Data Export Class** option. The option may be used to mark an entity as either not allowed for any type of export or allowed for a specialized export only. The lack of such explicit option means the maintenance object is eligible for the generalized export.

> ⚠ **Caution**
>
> If an entity is explicitly marked as not eligible for generalized data export there is a good reason for that and its configuration should not be changed.

One Method Fits All

The generalized data export method is designed to accommodate many eligible maintenance objects in a generic way that must also takes performance considerations into account. For this reason this method does not support entity specific filtering options nor custom rules of any kind.

The following rules apply to all entities that may be exported using this method:

- Entire data is exported.
  - All fields on all tables that belong to the maintenance object are exported except for "key" and "log" tables if any.
  - Maintenance object log tables typically do not contain useful business information and as such are omitted from export for performance and data volume reasons. However, there are entities for which log records provide analytical value. When applicable, use the **Export Log Tables** option to explicitly include log tables for a specific maintenance object.
- Same data structure and format is used for all entities. Refer to the **Record Format** section for more information.
- Data is exported to files only. Refer to the **Export To Files Only** section for more information.
- All changes are captured. It is not possible to exclude some changes from being tracked for ongoing export based on custom business rules.
- When data changes, a full snapshot of the data related to that entity is exported to avoid heavy data merging on the target side.
- When the entity is deleted, only the primary key of the entity is exported along with an indication that it is deleted.

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> **Note**
>
> Export is not supported for entities that store fields in a time zone other than the base time zone. This type of definition is not commonly used and includes maintenance objects that at least one of their fields is defined as stored in **Reference Time Zone**.

Export To Files Only

The immediate destination of both initial and ongoing export processes are files in a customer specified location. In a Cloud installation files are created in a customer owned Object Storage.

Based on your business requirements you may further consume these files by downstream applications such as data lakes etc.

Enabling Data Export

To enable data export for an eligible maintenance object a **Data Export Control** record needs to be created. The record keeps an indication of whether the initial export for the maintenance object has been completed or not and whether changes made to the entity should be tracked and exported on an ongoing basis. A designated portal allows you to enable the generalized data export for many maintenance objects at once as well as monitor their current export status at a glance. Refer to Generalized Export Dashboard portal for more information.

> **Caution**
>
> Enabling and disabling entities for export should only be made via the Generalized Export Dashboard or the Data Export Control portals to ensure the configuration is valid and complete.

> **Caution**
>
> When applicable, ongoing data export should be enabled before submitting the initial export batch process for the entity. This ensures that changes made during the initial export are properly tracked.

Ongoing export options are cached in various online and batch caches. In order for these options to take effect and track entity changes made by any online or batch process, the various caches must be properly flushed when these options are changed. Using the designated portals to enable entities for export triggers a 'global' flush of the caches. If the batch thread pool workers are configured to refresh their caches when a global flush is requested, then this is the only step required. If not, then the `F1-FLUSH` batch job should also be submitted to refresh the caches used in batch processing. Refer to Caching Overview for more information.

Initial Data Export

Each maintenance object that is eligible for the generalized data export method is associated with an initial data export batch control that is referenced on the maintenance object using the **Export Batch Control** option. The same common batch program is used by all these batch controls to export the entire data of an entity to files. The process is multi-threaded and produces one file per thread by default. An optional batch parameter allows for multiple smaller files to be generated per thread by setting a limit on the number of records written to each file. Refer to the **File Size** section for more information.

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Instead of manually submitting the generalized initial export batch process for each maintenance object you have enabled for export, submit the F1-GEXPI Generalized Initial Export Initiator batch process to automatically submit them all at once.

The initial export process for each maintenance object updates the corresponding data export control record for the maintenance object to indicate that the process has started and updates it again upon completion. This allows you to view the overall status of the initial export across all enabled entities on the Generalized Export Dashboard portal.

Note that the initiator batch process only submits batch processes for enabled maintenance objects that according to their data export control record their initial export has not started yet. If you need to export one or more entities again, reset the initial export status indication on their data export control records and submit the initiator batch process again.

The initial export file name is constructed as follows:

```
INIT_EXPORT[_file prefix(optional)]_[maintenance object]_[batch
run]_[thread]_[thread count]_[timestamp][_file sequence].json.gz
```

The "file sequence" part of the file name is used only when more than one file is created per thread. The sequence suffix is populated starting from the second file as follows _2.

Refer to any of the individual generalized initial export batch controls and the initiator batch control for more information.

Restricting Initial Export By Date

By default, the Initial Data Export batch process exports the entire data for an entity. In some situations, typically around high volume historical data, there may be a need to restrict the export to more recent data, for example the last few months of data.

The initial export batch process supports an optional batch parameter **Restrict By Date** that can be used to limit the scope of data to export. The parameter references a date field and a requested time frame in terms of number of days prior to business date. Refer to the F1-GEIXP Generalized Initial Export Template batch control for more information.

> ⚠ **Caution**
>
> Excluding records from export should be carefully considered as this may result in data discrepancies when the excluded data is referenced on other exported entities.

> ⓘ **Note**
>
> The option is only applicable to specific entities that have a qualifying reference date and the time frame for export may vary for each customer. Therefore, the new parameter is not added to any base product Initial Export batch control aside of the template batch control for documentation purposes. You may clone the base product batch control for a specific entity and add the parameter as per your business needs.

Ongoing Data Export

Data changes are tracked by the Capture Change for Ongoing Export (F1-MO-REGCHN) Maintenance Object Audit algorithm. The algorithm records the prime key of a changed entity

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in a designated **Data Export Update** table that serves as a queue of changed entities to export. The queue is later on consumed by the ongoing data export batch process.

> **Note**
>
> The Maintenance Object Audit plug-in spot is capable of tracking changes made to the entity by any layer of the application. Making changes using direct SQL would bypass this mechanism and therefore should be avoided.

The audit rule is added to a maintenance object when the ongoing data export option on its corresponding data export control record is enabled. In the same way the audit rule is removed from the maintenance object when the ongoing export option is disabled.

> **Note**
>
> The ongoing export option has to be enabled on the data export control record for the entity before it is initially exported. This ensures changes made while the initial export process is in progress are not missed.

Unlike the initial export batch process that requires a batch control to be defined for each eligible maintenance object, a single batch process is used to export ongoing changes made to all entities.

The following describes the ongoing export batch process at a high level:

- All changes queued in the Data Export Update table are exported to a designated ongoing export file. Refer to the **Managing a Large Backlog** section for more information.
- A full snapshot of the data related to the changed entity is exported to avoid heavy data merging on the target side.
- Once exported, records are deleted from the Data Export Update table.

The process is multi-threaded and a separate file is produced for each thread by default. An optional batch parameter allows for multiple smaller files to be generated per thread by setting a limit on the number of records written to each file. Refer to the **File Size** section for more information.

> **Note**
>
> It is important to schedule the ongoing export batch process to run frequently enough to avoid accumulating a high volume of records in the Data Export Update table. The smaller the table is kept the faster it is for the change data capture mechanism to add records to it.

The ongoing export file name is constructed as follows:

```
INC_EXPORT_[batch run]_[thread]_[thread count]_[timestamp][_file
sequence].json.gz
```

The "file sequence" part of the file name is used only when more than one file is created per thread. The sequence suffix is populated starting from the second file as follows _2.

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Refer to Generalized Ongoing Export (F1-GEEX0) batch control for more information.

File Size

The initial export batch process produces a single file per thread by default. For some high volume entities this may result in files that are too large to manage. To produce multiple and smaller files for a specific entity, limit the number of records written to each file by setting the corresponding parameter on the initial export batch control defined for the entity. The same parameter may be provided when submitting the Initial Export Initiator batch process, in which case the initiator value is used only when a corresponding value has not been defined on the entity's specific batch control record.

In the same way, the ongoing export batch process produces a single file per thread by default. To produce multiple and smaller files, limit the number of records written to each file by setting the corresponding parameter on the batch control.

To avoid the creation of too many files by a single batch run, the system sets a maximum limit of around 500 files per run. When the requested number of records per file is determined to cause the number of generated files to exceed the system limit, the actual value used is adjusted to meet the system limit.

Managing a Large Backlog

When a large backlog of changes accumulates in the ongoing export queue for some reason, the next batch takes longer to export which delays the downstream import step. A better option is for the backlog to be cleared in smaller "chunks", allowing the downstream process to import them as they are made available.

You may limit the number of records the batch process exports using the **Thread Processing Limit** batch parameter. When specified, the number of records exported by each thread is capped by the specified limit, leaving the remaining records to be consumed by subsequent batch runs. Instead of waiting for the next scheduled batch run, a new batch process may be automatically submitted, if explicitly requested to do so using the **Automatic Backlog Clearance** batch parameter.

It is important to ensure that the backlog clears gradually and that the queue resumes its normal size in a timely manner. The processing limit must therefore be set with an appropriate value that would promote proper clearance of the queue. To do so, at least 20% of the queue, and no less than 100,000 records, must be consumed by each batch run across all threads. If the specified limit does not meet the minimum clearance requirement then the processing limit is adjusted accordingly.

Record Format

Data is fetched and exported directly from the database in bulk read operations for performance reasons. For that reason, the structure used does not reflect the logical data model of the entity but rather its physical list of tables. Data for a given instance is organized by tables followed by rows in each table and for each row its list of fields in JSON format.

The following describes the format and structure used:

```
{
"OBJ": "<mo name>",
"TIMESTAMP": "<export time in ISO format for example
2019-07-25T11:06:04.740615Z>",
"PK1": "<mo pk1 value>",
"PK2": "<mo pk2 value if any>",  ← PK2-5 should only be included when
applicable
"PK3": "<mo pk3 value if any>",
```


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```
"PK4": "<mo pk4 value if any>",
"PK5": "<mo pk5 value if any>",
"DELETED": true,  ← should only be included when the entity is deleted
"DATA":
{
"<MO table name 1>":
[
{<name value pairs of all fields in row 1 in that table>},
{<name value pairs of all fields in row 2 in that table>},...
{<name value pairs of all fields in row n in that table>},...
],
"<MO table name 2>":
[
{<name value pairs of all fields in row 1 in that table>},
{<name value pairs of all fields in row 2 in that table>},...
{<name value pairs of all fields in row n in that table>}
],...
 "<MO table name n>":
[
 {<name value pairs of all fields in row 1 in that table>},
{<name value pairs of all fields in row 2 in that table>},...
{<name value pairs of all fields in row n in that table>}
]
}
```

Notes about field values and formats:

- All fields for a row are included even when the field is empty or null.
- All string values are trimmed of excess trailing spaces but if a field is empty it exported as a single space and not null.
- An empty array is used for a table node when no records exists for the entity in the table.
- Date/time information is converted to UTC time zone and exported in ISO format for example 2019-07-25T11:06:04.740615Z.
- Deletes have an explicit indicator in the header.

Order of Consuming Files

It is important to apply all the initial export files for a maintenance object before applying ongoing change files to ensure data consistency.

The following is a recommended procedure for consuming generalized data export files:

- Apply all initial data export files before ongoing export files.
- Apply initial files for a maintenance object in run number order.
- Apply ongoing export files in run number order.
- If a new initial export is available the file consumption procedure should be changed temporarily as follows:
  - Stop consumption of ongoing export files.
  - Apply the new initial export files.
  - Resume consumption of ongoing export files.

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Recover from a Lost Ongoing Export File

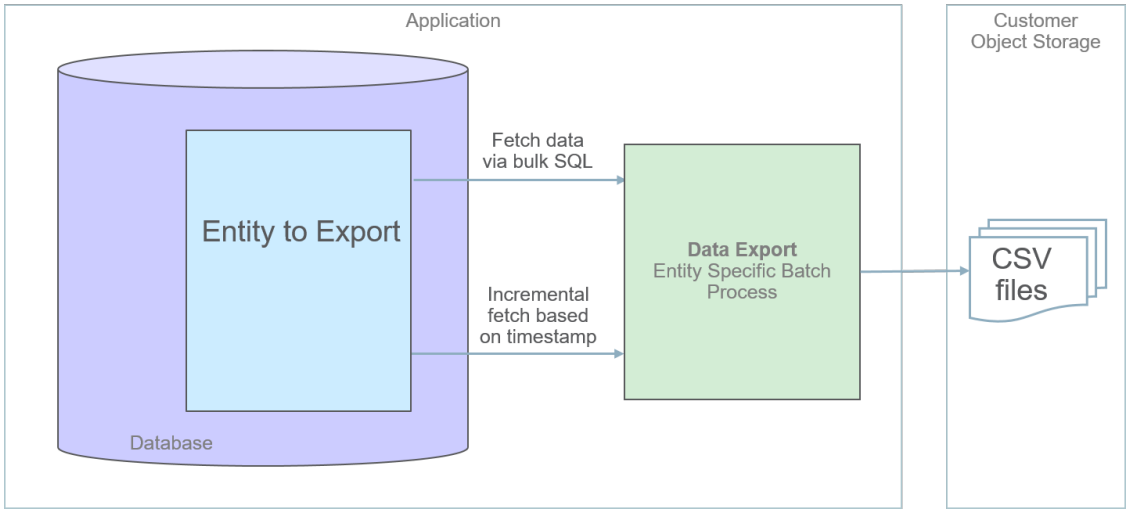
The ongoing export batch process keeps a backup of all entity keys, that were exported on a specific batch run, in a designated backup table. In rare situations where an ongoing export file is deleted or becomes corrupted before it gets processed, the backup table may be used to identify the missing changes and export them again.

Use the Restore Generalized Export Keys (`F1-GERST`) batch process to recover from this situation. The process identifies the entities that were exported during a specified batch run and adds them back to the ongoing changes queue from the backup table. The entities would then be exported again wen the next ongoing export runs. This method does not restore the exact content of the original file that was lost as it cannot be reproduced. Instead, the process ensures that the entities that were included in the lost file would be exported again.

> **Note**
>
> Backup records follow a weekly retention policy for performance reasons. They are meant to support near future situations of file recovery and are not an historical change data capture log.

Specialized Data Export

Several performance considerations are called for when exporting the data of a high volume entity or an entity that is updated in extremely high frequency. The generalized method does not fit such entities and a specific batch process is designed for each, aiming to achieve an optimal export method for the entity. The initial run of the process exports the entity's existing data while subsequent runs of the same process exports data incrementally, i.e. it exports records that were added or updated since the previous run based a timestamp field. The overall process is illustrated in the following diagram:



The following sections further discusses concepts and guidelines related to the specialized data export method.

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A Specific Process For Each Entity

A maintenance object that is designed to be exported using the specialized method is explicitly marked as such by the **Data Export Class** option and its specific batch process is defined using the **Export Batch Control** option.

All specialized batch processes are designed to export the data in a CSV format as it produces smaller files in size compared to more verbose formats. Refer to each batch process for more information about specific export considerations and parameters.

Enabling Data Export

To enable data export for a maintenance object a specialized type of Data Export Control record needs to be created. The record serves as an indication that such entity should be exported and keeps track of the date and time through which data has been exported so far, allowing subsequent export run to only export incremental changes.

Incremental Data Export

The specialized export method tracks changes incrementally from prior export run and does not use a change data capture mechanism. It therefore relies on a timestamp field on the primary table of the maintenance object to indicate when data was added or changed. Only entities that were added or changed since the previous export run are exported with each subsequent run. The date and time through which data has been exported is recorded for each maintenance object on its corresponding Data Export Control record.

Order of Consuming Files

Specialized data export files should be consumed in run number order to ensure a consistent and chronological uptake of data.

Defining Data Export Control

This portal is used to maintain Data Export Control records. These records capture your organization's export settings and current export state for a selected maintenance object. For a generalized export it keeps an indication as to whether the initial export for the maintenance object has been completed or not and whether changes made to the maintenance object should be tracked and exported on an ongoing basis. For a specialized data export it keeps the date/time through which data was exported.

Refer to Understanding Data Export for more information.

You can access the portal from the**Admin Menu**, and then **Implementation Tools**, and then **Data Export Control.** You are brought to a query portal with options for searching for a specific record. Once a data export control record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The **Data Export Control** zone provides information about the selected record.

Generalized Export Dashboard

The number of maintenance objects that are eligible for generalized export is large. This portal allows you to easily select and enable export for many eligible entities at once as well as review the current export state of those already enabled at a glance.

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Refer to Generalized Data Export for more information about the generalized data export method.

You can access the portal from the **Admin Menu**, and then **Implementation Tools**, and then **Generalized Export Dashboard.**

The following zones may appear as part of the portal's **Main** tab page.

- **Export Entities.** This zone lists entities for which generalized data export control settings have already been set.
- **Eligible Entities.** This zone lists entities that are eligible for the generalized data export method and for which such settings have not yet been set.

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Part IV

Work and Asset Management Administrative User Guide

Welcome to the Oracle Utilities Work and Asset Management / Operational Device Management Administrative User Guide. This document is used with the following products:

- Oracle Utilities Work and Asset Management
- Oracle Utilities Operational Device Management
- Oracle Utilities Customer Program Management
- Oracle Utilities Work and Asset Cloud Service
- Oracle Utilities Customer Program Management Cloud Service

This guide describes administration and configuration features and functionality, including:

- General Options
- Configuration Options
- Table Setup Sequence
- Documents
- Organizations
- Compliance
- Service History
- Assets
- Operational Device Management
- Inventory
- Purchasing
- Work Options
- Preventive Maintenance
- Scheduling
- Approvals
- Financials
- Integrations
- Defining Oracle Utilities Customer Program Management Cloud Service / Customer Program Management Options

General Options

- Defining Installation Options

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- Access Control
- E-Mail Configuration
- Three Decimals Places for Currency
- Defining Colors

Defining Installation Options

This section provides additional setup information related to your installation options record.

Refer to Installation Options - Main for more information.

- Formatted Address
- Address Geocoding

Formatted Address

Throughout the system address information is formatted for display based on standard address constituents.

> **Note**
>
> Logic to format an address resides in an "Address Information" algorithm on the installation options.

Address Geocoding

The scheduler has to be provided with the geocode of any location that may be included on a crew's route. These include locations of assets, service centers, substations, and so on.

Unless a geocode is provided, algorithms on the various business entities that capture an address attempt to geocode the address when the entity is added or when the address changes.

The minimum match quality level for address geocoding is configurable. By default, the base system requires an exact match, which is the maximum quality level. You can control the quality level of geocoding for any entity that has an address by overriding the match quality parameter of the algorithms on each entity with a different minimum quality level, based on your business needs.

> **Note**
>
> Logic to geocode an address resides in an "Address Geocoding" algorithm on the installations options.

Geocoding, when used in conjunction with GIS, provides location-based mapping and analysis of assets and activities residing within your infrastructure.

- Map layers display the operational details for services provided by your company.

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- Exact location of activities, work orders, and other objects are easily viewed and managed directly from the map.
- New assets created from the map are already plotted with Geocode coordinates.

Access Control

Access control provides a way for your organization to limit or classify record information by “plant,” varying work locations, or work functions. For example, you may have asset types that are only used at your northern location, so you would designate those asset types as restricted to that location. In the same way, you can leverage access control to prevent users in the southern location from accessing work orders related to the northern location (and vice versa). This is referred to as “row level security” in the application framework.

Each location represents an access group and objects in the application may be owned by a specific access group. Access groups are defined in the **Access Group** portal and are assigned to records as an **Owning Organization**.

Refer to Row Security in the **Oracle Utilities Application Framework** documentation for more information on data access roles and how they work with access groups.

> **Note**
>
> This functionality is optional and not enabled by default. If your implementation needs to restrict access by owning organization, you will need to explicitly enable it as described below.

The following points describe the functionality at a high level:

- Some entities are directly secured by being assigned an owning organization value on the entity itself. For example, the work order entity is directly secured and therefore its owning organization field is populated.
- Some entities are indirectly secured by association to another related entity that is directly secured. Entities secured this way are not assigned an owning organization. For example, work activities are secured indirectly by association to their work order. If a user is allowed to view a work order they are also allowed to view all its work activities. There is no owning organization data security for individual activities.
- All other entities do not support this type of security. For example, operation and technical entities are not used by business users and as such should not be subject to data restrictions. A system administrator needs to be able to review all the data in these entities, unfiltered by owning organization, to properly address issues and exceptions.

The following sections further describe concepts related to data security by owning organization.

Which Entities Are Secured?

Not all entities support this type of data security. The following business entities directly support security by owning organization:

- Asset
- Compatible Unit
- Crew

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- Location (This includes all classes of locations stored in the "Node" maintenance object, for example, asset locations, storerooms, and so on.(
- Purchase Order Header
- Purchase Requisition Header
- Template Work Order
- Work Design
- Work Location
- Work Order
- Work Request

The following business entities indirectly support security by owning organization via association:

- Work Activity. Secured via association to work order
- Activity Reconciliation. Secured via association to work order
- Design Element. Secured via association to work design.
- Expedite Purchase Order. Secured via association to Purchase Order Header.
- Invoice Header. Secured via association to Purchase Order Header.
- Material Request Header. Secured via association to Storeroom (Node).
- Material Return Header. Secured via association to Storeroom (Node).
- Measurement. Secured via association to Asset.
- Physical Inventory Header. Secured via association to Storeroom (Node).
- Warranty. Secured via association to Asset.

The following administrative entities directly support security by owning organization:

- Activity Type
- Approval Profile
- Asset Type
- Business Unit
- Checklist Type
- Cost Adjustment Type
- Cost Center
- Distribution Code
- Expense Code
- Labor Earning Type
- Location Type. (This includes all classes of location types stored in the "Node Type" maintenance object, for example, asset location types, inventory location types, and so on.)
- Planner
- Service Category
- Service Class
- Service Code

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- Service History Question
- Service History Type
- Specification
- Work Category
- Work Class

Shared Access

Security by owning organization is optional but when it is enabled the application assumes every record on a directly secured entity is assigned with an owning organization value.

When records are missing a value, the application cannot enforce data restriction and therefore lets these records be accessible to all. While the application treats these records as unrestricted, it assumes they are only temporarily unrestricted until a user or some default rule assigns them with a value.

The correct approach for intentionally sharing records across owning organizations is to designate one or more shared access groups and assign those to appropriate users. For example, if some entities are to be shared between the north and south owning organizations you may want to designate a “north-and-south” owning organization, assign shared entities to this owning organization, and allows users from both locations to have access to it.

Default Owning Organization Assignment Rules

When owning organization security is enabled, entities that are directly secured need to have their owning organization field populated either by the user or process that created them or in absence of an explicit value by a default rule. The application leverages an **Audit** algorithm configured on the entity’s business object to assign it with a default value. While a common default rule for administrative entities is to default the owning organization from the user’s default access group, more complex rules are called for when assigning values for master and transactional entities. To find the rule used for a directly secured entity, find the corresponding audit algorithm configured on its business object.

When creating a new administrative entity that is directly secured by owning organization, the user’s default access group is presented on the user interface prior to saving the record, allowing the user to change the value if needed before creating the record. Note that if the user deliberately clears the defaulted value the application still enforces the default rule and the record would be saved with the user’s default access group.

Default rules for master and transactional objects are more complex and as such need to support a way for your organization to customize them to meet your business requirements. Therefore, the user’s default access group is intentionally not defaulted on the user interface before creating such an entity, allowing the business object audit rule to populate the value as needed.

By default, product provided algorithms for defaulting an entity’s owning organization only resort to using the user’s default access group when a record is created. However, they all support an algorithm parameter that you may configure to enforce defaulting from the user’s default access group also when existing records with no owning organization value populated are updated.

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> **Note**
>
> If after applying the default rules of any object an assignment has not been made, i.e. the record still has an empty owning organization field, the application is not able to restrict access to this record and therefore leaves it allowed to all. This should not be confused with a configuration that intentionally associates entities with a shared owning organization.

Explicit Owning Organization Assignment Rules

There are times when the appropriate owning organization value can not be determined by the entity's default rule. In these unique situations, the process that creates the secured entity pre-populates it with the appropriate owning organization value when adding it. The following are examples of such processes:

- When generating preventive maintenance work orders, the application inherits their owning organization from the asset they are created for. The asset is referenced on the activity and therefore a default rule for the work order would not have access to the asset at creation time.
- When generating or interfacing other direct charges, the application inherits their owning organization from their activity's work order. Here too, the activity is only referenced at the detail record and not available when the charge header record is created..
- When generating follow-up work orders based on service history type configuration, the application inherits their owning organization from the service history's activity's work order.

Refer to the relevant algorithms associated with such processes for more information.

Creating Entities via Integration or in Batch

Typically, the user used to process web service calls or execute batch processes is a common user record that is not affiliated with any owning organization. As such , entities created by this common user should not rely on the user record's default access group for a proper owning organization assignment. For that reason, these common users should not have any default access group defined for them, yet they should be allowed access to all access roles.

Directly secured objects created via web services or in batch are designed to have their value explicitly provided and not rely on the user's default value. For example, a user creates an asset online they can either explicitly populate the asset owning organization or let the application default it to the user's default access group. However, when assets are interfaced from an external system their owning organization should be explicitly populated.

Filtering By Owning Organization

Secured entities, either directly or indirectly, may support an owning organization filter on their respective query portals. The filter allows the user to review data that belongs to a specific owning organization, yet this should not be confused with data restriction. When security by owning organization is enabled, the application restricts the data the user can access to regardless of whether they have used the filter or not. If the user has access to more than one owning organization then a filter may be useful to narrow down the results to a selected group. However, when security by owning organization is not enabled, data is unrestricted and the user may access any record.

Enabling Data Security By Owning Organization

The following points highlight the overall steps needed to enable data security by owning organization customers:

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- Design and configure access groups and access roles to meet your business requirements. If some entities should be shared across all owning organization, define a customer shared access group that is linked to all access roles.
- Associate users with access groups and roles:
  - All user records for individuals accessing the application must be assigned with a default access group and may belong to one or more access roles. This access group is used as the default value assigned to some secured objects by various business rules.
  - All user records used for integration and batch processes should not be associated with a default access group but must have access to all access roles. This way data created by these shared user records are not stamped with an arbitrary owning organization yet all data is accessible to these processes.
- For upgrading customers, make sure existing records in the primary tables of directly secured entities have the correct value in the owning organization field. Depending on the volume of each table and the number of records that may need correction in each table you may choose to make these updates online or via a custom plug-in driven batch process.
- Run the **Apply Access Group VPD Policy** (W1APLVPD) batch process to enforce row level security on master and transactional objects that are directly secured by owning organization. Refer to the batch control definition for more information about this batch process.

E-Mail Configuration

This section provides information about requirements to configure settings for emails sent from within the system regarding objects such as approvals, purchase orders, timekeeping, and so on.

> **Note**
>
> The “System Email From” Option Type used with email notifications is not supported for Oracle Utilities Cloud Services, including Oracle Utilities Work and Asset Cloud Service and Oracle Utilities Customer Program Management Cloud Service. Email configuration for "Cloud" customers is defined in "Service" properties.

To configure the system for sending emails complete the following:

1. Create or update a **Feature Configuration** for email configuration (EMAILCONFIG).

   The **Feature Type** should be set as **External Messages**

2. Add the **System Email From Option Type** with a valid from address in the **Value** field. This identifies the sender to use for system emails.

   Example:

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3. Create a Message Sender with the following:
   - **Invocation Type**: Real-time
   - **Message Class**: RTEMAILSNDR
4. Select the **Context** tab on the Message Sender and add the SMTP information.

   This includes the following:
   - **SMTP Host Name**: Example: inernal-mail-router.yourcompany.com
   - **SMTP Password**: Your SMTP password
   - **SMTP Username**: Example: admin@oracle.com

Refer to the Real-Time Message Configuration and the Message Sender - Context section in the **Oracle Utilities Application Framework** documentation for more information.

Three Decimals Places for Currency

The overall system uses the base currency defined in **Installation Options**, and all financial transactions use the base currency. However, the purchasing system supports other currencies which can be defined in the **Currency** portal. The currency code will appear as an option wherever a currency code is required on purchasing records, such as on a blanket contract or purchase order. Any currency codes used in the purchasing system which are different from the base currency are converted into the base when the system creates financial transactions.

Oracle Utilities Work and Asset Management supports up to three digits after the decimal for currency.

To configure the system for three decimal currency, set the number of decimal positions when defining currency codes.

Refer to the Defining Currency Codes section in the **Oracle Utilities Application Framework** documentation for more information.

Defining Colors

Colors can be used to represent transactions and other entities in various portals. For example, colors can be used to distinguish cost categories as they are represented in graphs and pie charts.

The **Color** portal is used to view and maintain colors.

You can access this portal from **Admin**, select **WAM General**, then select **Color**.

The following zones may appear as part of the portal's **Main** tab page:

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- **Color List**: This zone lists all the colors. Broadcast a record to display the details of a selected record.
- **Color**: This zone provides information about the selected color.

Configuration Options

- Content Migration Assistant (CMA)
- Global Configuration Setup
- Analytics Configuration
- Contextual Insights Configuration
- Asset 360 Configuration
- Project 360 Configuration
- Home Page Configuration
- Understanding Home Page Configuration
- Understanding Online / Batch Loaders

Content Migration Assistant (CMA)

The Content Migration Assistant (CMA) provides customers with a flexible, extensible facility for migrating their configuration data from one environment to another, for example, from a development environment to a production environment.

- Data that Cannot be Migrated Using CMA

Data that Cannot be Migrated Using CMA

Content Migration Assistant does not currently support migration of objects with system generated IDs. The following maintenance object is an example if an object that is not supported by CMA:

- Shift Templates that are not common templates, such as crew-specific templates or subscriptions to common templates.

> **Note**
>
> Above list is strictly an example and is not intended as a complete list of all objects not supported by CMA.

Global Configuration Setup

Many aspects of the application rely on setting up the **Global Configuration** master configuration record.

Refer to Defining Master Configurations for more information.

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Analytics Configuration

This portal provides a bird's eye view of the configuration information for Oracle Utilities Analytics. It provides links and guidelines for the areas that need configuration to successfully run the extract transfer and load processes from Oracle Utilities Analytics.

Refer to the Oracle Utilities Analytics Administration Guide for more information.

You can access the portal from the **Admin**, select **Analytics Configuration**, and then select **Asset Analytics Configuration**.

The following zones may appear as part of the portal's **Main** tab page

- **Analytics Extract Parameters**: This zone displays the extract data to set up.
- **Bucket Configuration List**: This zone displays bucket configuration to set up.

The following zones may appear as part of the portal's **ODM** tab page

- **BI-Oriented Extendable Lookup**: This zone displays extendable lookups to set up.
- **BI-Oriented Master Configuration**: This zone displays master configuration to set up.
- **Bucket Configuration Tree**: This zone displays tree view of analytics data.

Contextual Insights Configuration

Contextual Insights is a feature to allow for the configuration of widgets that highlight information that you want to bring to the attention of the user. The following information describes the configuration of **BADGE** insights for **Asset Condition Score** and **Location Criticality** information in the **Asset** portal.

To enable these two insights, you will need to take the following steps:

1. Configure Asset Condition Score Bucket if you haven't done so already.

- Navigate to **Admin**, select **Analytics Configuration**, select **Bucket Configuration**, and then select **Add**.
- Select *Asset Condition Score Bucket Configuration (W1–AssetConditionScoreBuckets)* as the Bucket Configuration Business Object and enter the desired values.

Example:

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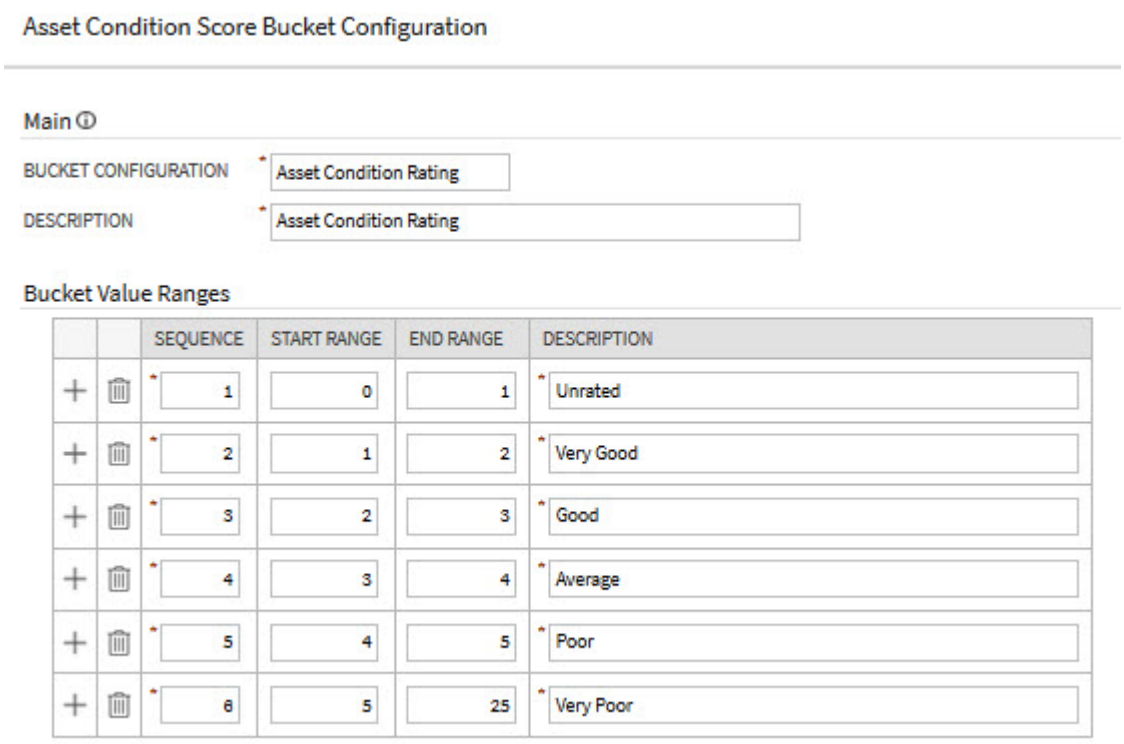
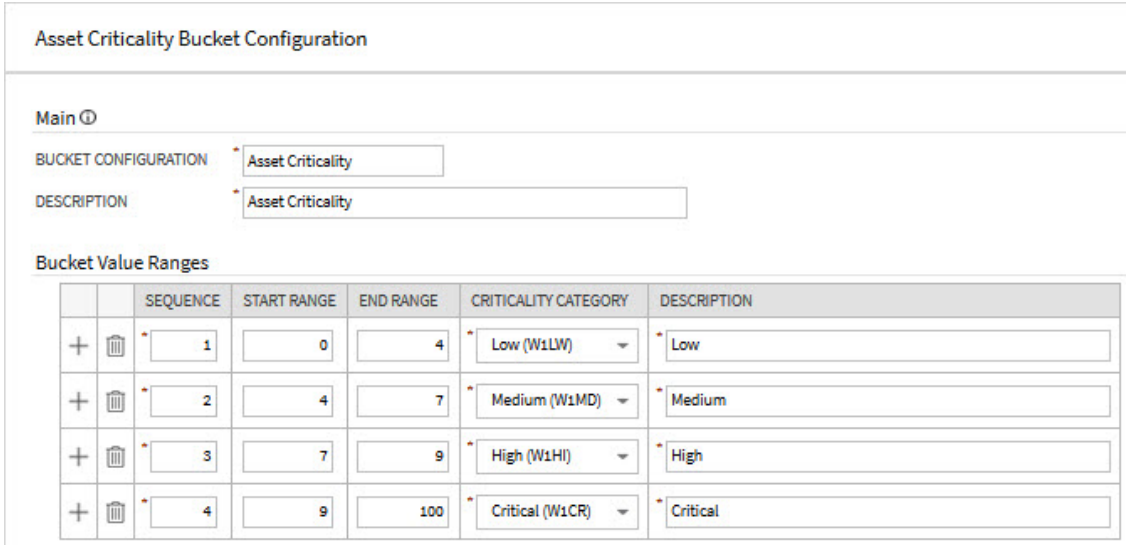


2. Configure Asset Location Criticality Bucket if you haven't done so already.

- Navigate to **Admin**, select **Analytics Configuration**, select **Bucket Configuration**, and then select **Add**.
- Select *Asset Criticality Bucket Configuration (W1–AssetCriticalityBuckets)* as the Bucket Configuration Business Object and enter the desired values.

Example:



3. Configure the corresponding Insight Types and Insight Algorithms.

- Configure an insight type for asset condition and another for asset criticality by navigating to **Admin**, select **General**, select **Insight Type**, and then select **Add**.
  - Select a **Default Insight Color Option** that displays the text and background in a color.

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  - Enter severity values and insight color options in the **Override Visual Settings** field if the insight algorithm is designed to return different severity values based on conditions.
- Configure an insight algorithm for asset condition and another for asset criticality using the W1ASCNLOCCRT algorithm type.
  - Select the appropriate algorithm for each insight type, either asset condition or asset criticality.
  - Algorithm **Parameter** and **Sequence** values must match the **Severity Values** defined on the appropriate insight type in order to have the badge information display on the **Asset** portal.

4. Set up one Insight Group for asset condition as follows:

- Navigate to **Admin**, select **General**, select **Insight Group**, and then select **Add**.
- Select *Asset Condition(W1AC)* as the **Insight Class**.
- Select *Badge Insight* as the **Valid Visual Structure** and click **Save**.
- Click *Edit* in the **Related Insight Types** zone and add the asset condition insight type you just created to the **Insight Type** list on the insight group.

5. Set up one Insight Group for asset location criticality as follows:

- Navigate to **Admin**, select **General**, select **Insight Group**, and then select **Add**.
- Select *Asset Location Criticality (W1LC)* as the **Insight Class**.
- Select *Badge Insight* as the **Valid Visual Structure** and click **Save**.
- Click *Edit* in the **Related Insight Types** zone and add the asset location criticality insight type you just created to the **Insight Type** list on the insight group.

Asset 360 Configuration

Asset 360 is delivered with the following zones:

- Asset
- Insights
- Current Activities
- Attachments
- Asset Cost Breakdown by Service Class
- Asset Type Cost Breakdown by Service Class
- History

Setup is required to get the full Asset 360 experience.

- Configuring Asset Zone
- Configuring Insights Zone
- Configuring Current Activities Zone
- Configuring Attachments Zone
- Configuring Asset Cost Breakdown by Service Class Zone
- Configuring Asset Type Cost Breakdown by Service Class Zone

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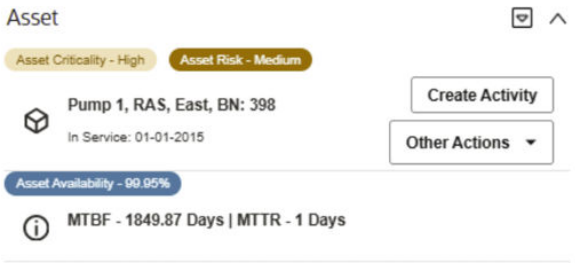
- Configuring History Zone
- Setting the Asset Portal Default Tab

Configuring Asset Zone

Asset Zone

The **Asset** zone displays the common actions that can be taken for the asset, asset and location information, and insights for Asset Criticality, Asset Risk, and Asset Availability.

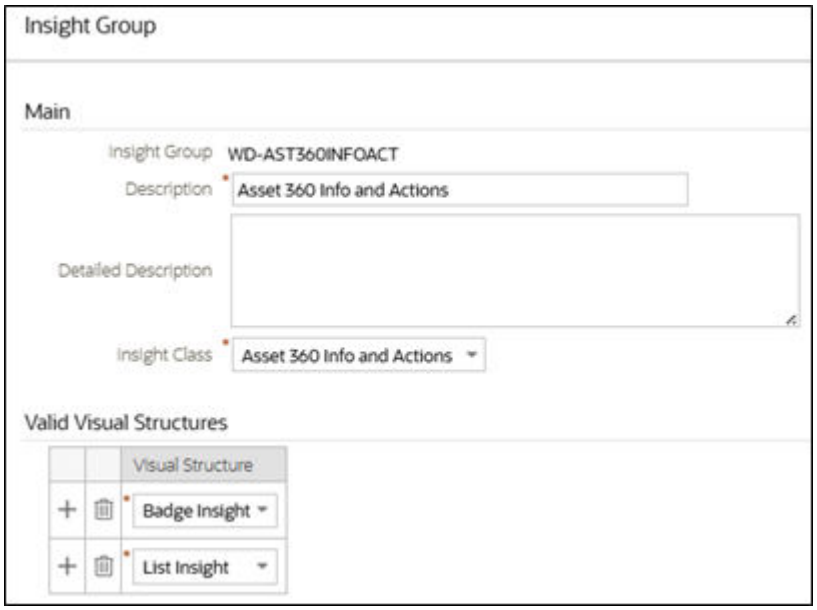


Insight Group

An insight group is required to display **Asset Info and Actions**, an **Asset Criticality** badge, an **Asset Risk** badge and an **Asset Availability** insight, including the **Mean Time Between Failure (MTBF)** and **Mean Time To Restore (MTTR)** information.

Create a new insight group for the **Asset 360 Info and Actions**:

- **Insight Class**: Asset 360 Info and Actions
- **Valid Visual Structures**:
  - Badge Insight
  - List Insight



Next, add your insight types by clicking **Edit** in the **Related Insight Types** zone:

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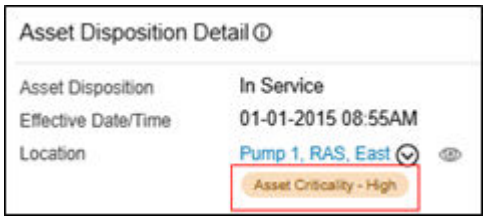
Table Insight Type Example

Sequence	Insight Type
10	Asset Location Criticality Insight
20	Asset 360 Risk
30	Asset 360 Info and Actions
40	Asset 360 Availability
50	Asset 360 Availability List

> **Note**
>
> Refer to each insight type below for additional setup requirements.

Asset Location Criticality Insight Type



This insight type has been delivered in a previous release. If you have previously set up an **Asset Location Criticality** badge, add the same insight type to the insight group. Otherwise, refer to Contextual Insights Configuration in the **Administration Guide** to set up the **Asset Location Criticality Insight Type**.

Asset Risk Insight

The **Asset Risk** badge is available using the **Asset 360 Risk** insight type. It displays either the calculated Asset Risk value or description (as defined in the bucket configuration). By default, the **Asset Risk** badge shows the calculated asset risk using the **Default Insight Color Option**

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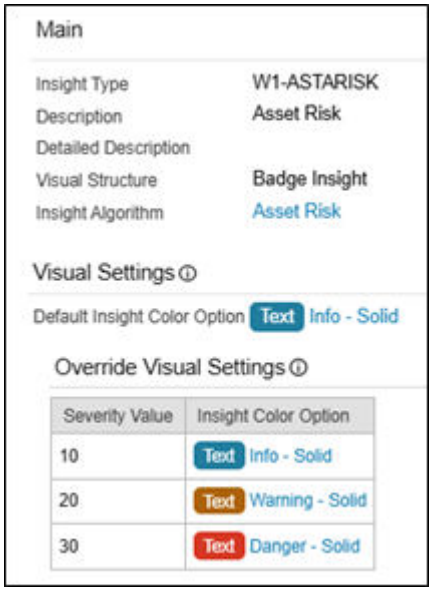
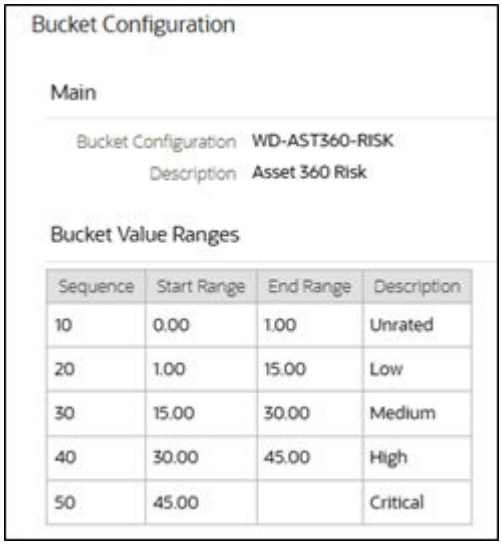


Lastly, follow the steps for **Bucket Configuration** and **Algorithm Parameters** to display the **Asset Risk** badge using the **Override Visual Setting** and **Bucket Configuration** description.

Bucket Configuration

Create a new **Asset Risk** bucket configuration using the **Asset Bucket Configuration** BO. Refer to the screenshot below for suggested **Bucket Value Ranges**:



Algorithm Parameters

Once the **Asset Risk** bucket configuration is set up, edit the Asset 360 Risk (W1ASTRISK) algorithm to add the new algorithm parameter values:

- **Bucket Configuration**: The bucket configuration you created above
- **Severity Number 1-10**: The Override Severity Value for it's corresponding Bucket Sequence Number. Leave blank to use the default visual setting.
- **Bucket Sequence Number 1-10**: Sequence numbers defined in the **Bucket Value Ranges**

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For example, to display a red badge (override value = 30) for a Critical (bucket value sequence number) Asset Risk:

- **Severity Number**: 30
- **Bucket Sequence Number**: 50

Parameters

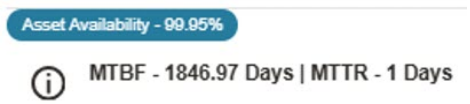
Sequence	Parameter	Value
10	Bucket Configuration	WD-AST360-RISK
20	Severity Number1	
30	Bucket Sequence Number1	10
40	Severity Number2	10
50	Bucket Sequence Number2	20
60	Severity Number3	20
70	Bucket Sequence Number3	30
80	Severity Number4	30
90	Bucket Sequence Number4	40
100	Severity Number5	30
110	Bucket Sequence Number5	50

Asset Info and Actions Insight

The common action buttons are available using the **Asset 360 Info and Actions** insight type. No additional setup is required to display this insight. Available buttons and actions are as follows:

- Create Activity
- Create WO from Template
- Create Work Order
- Create Work Request
- View in Map - this action is available only for GIS sync'd assets and locations

Asset Availability Insight



The **Asset Availability** insight is a pair of insight types to display both a badge and a list. It displays the percentage the asset has been operational (up and running) during the Inservice/ Installed life of the asset. It also displays the **Mean Time Between Failure** and **Mean Time To Restore** information.

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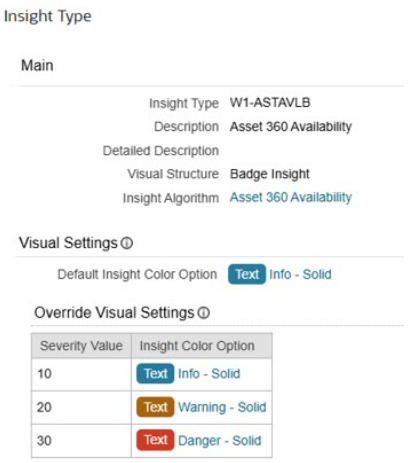

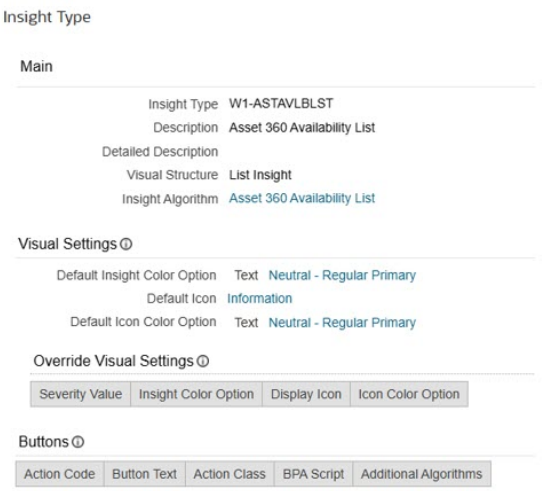

By default:

- If the asset availability is 75% and over, a blue badge (defined as the default insight color) is displayed.
- If the asset availability is between 51% and 74%, an orange badge (override severity value = 20) is displayed.
- If the asset availability is 50% and below, a red badge (override severity value = 30) is displayed.

Update the **Asset 360 Availability (W1ASTAVLB)** algorithm to override the default behavior above.

Sequence	Parameter	Value
10	% value to display warning insight	75
20	% value to display critical insight	50

Calculations

Asset Availability, **Mean Time Between Failures (MTBF)**, and **Mean Time To Repair (MTTR)** are calculated using both downtime and failure service history data. For these calculations, both the downtime and failure service histories must be associated with the same activity and activity must be in either a *Completed* or *Closed* status.

- MTBF Days = Total Uptime Days - Failures Lifetime
  - Total Uptime Days = ((Difference in Seconds between IN_SERVICE_DT and CURRENT_TIMESTAMP))/60/60/24)
  - Failures Lifetime = ((Total Downtime in Seconds)/60/60/24)/Failure Count
- MTTR Days = (Total Downtime in Seconds/60/60/24)/Failures Lifetime
  - Asset Availability = MTBF / (MTBF + MTTR)

Configuring Insights Zone

Insights Zone

The **Insights** zone displays visual insights for Condition Rating, Confidence Rating, Maintenance Trigger, Asset List Maintenance Trigger, and Warranty. Each insight includes a badge, and all except Condition Rating show a list of common actions.

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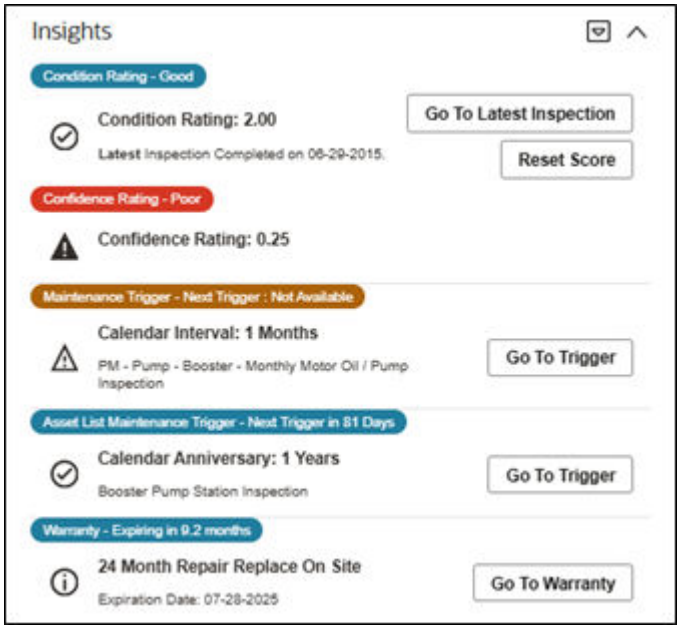
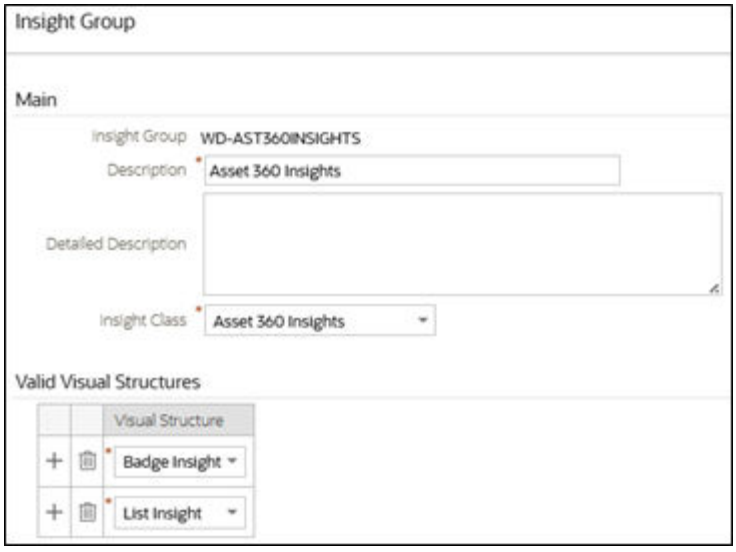


Insight Group

An insight group is required to display the Insights for this zone.

Create a new insight group for the Asset 360 Insights:

- **Insight Class**: Asset 360 Insights
- **Valid Visual Structures**:
  - Badge Insight
  - List Insight



Next, add your insight types by clicking **Edit** in the **Related Insight Types** zone:

Table Insight Type Example

Sequence	Insight Type
10	Asset 360 Condition Rating Badge

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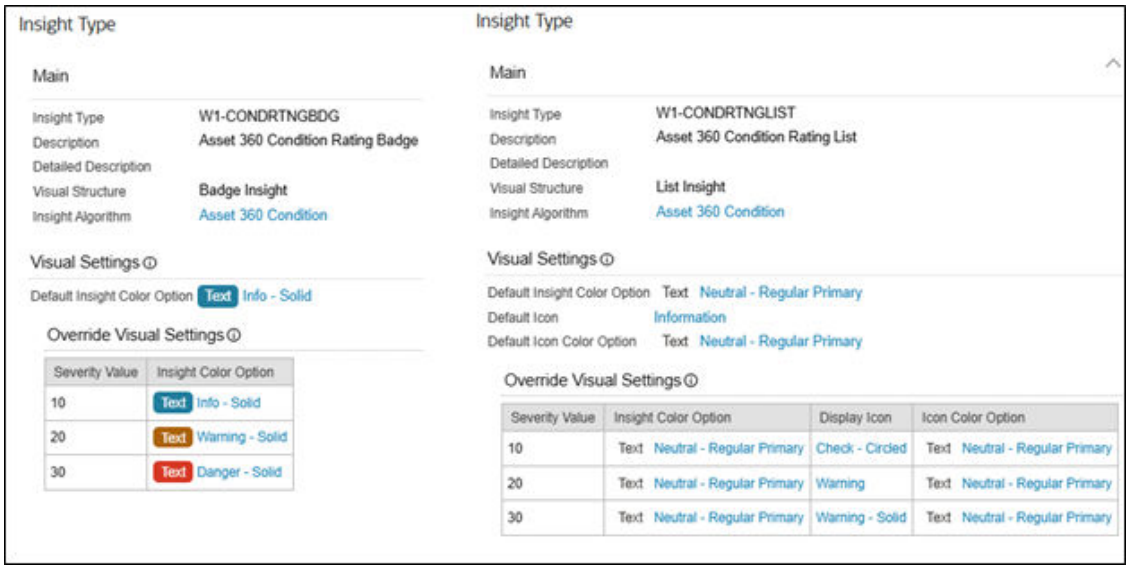
Table (Cont.) Insight Type Example

Sequence	Insight Type
20	Asset 360 Condition Rating List
30	Asset 360 Confidence Rating Badge
40	Asset 360 Confidence Rating List
50	Asset 360 Maintenance Trigger Badge
60	Asset 360 Maintenance Trigger List
70	Asset 360 Asset List Maintenance Trigger Badge
80	Asset 360 Asset List Maintenance Trigger List
90	Asset 360 Warranty Badge
100	Asset 360 Warranty List

> **Note**
>
> Refer to each insight type below for additional setup requirements.

Condition Rating Insight

The **Condition Rating** insight includes two types; a badge and a list. It displays the **Condition Rating Score**, a description (as defined in the bucket configuration), and the asset's last inspection.



The following actions are also available in the Condition Rating insight:

- Go To Latest Inspection
- Reset Score
- Go To Last Reset

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By default, the **Condition Rating** insight is show using the the Default Insight Options.

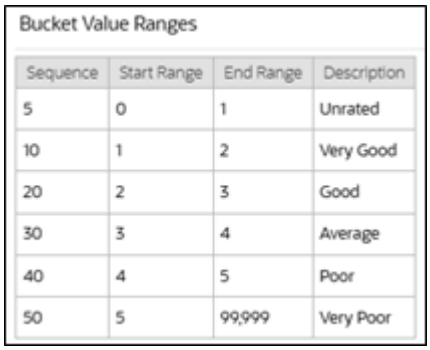
Lastly, follow the steps for **Bucket Configuration** and **Algorithm Parameters** to display the **Condition Rating** insight with the **Override Visual Setting** and **Bucket Configuration** description.

Bucket Configuration

A **Condition Rating** badge (Insight Type) was delivered in a previous release.

If your organization already has a bucket configuration for the **Condition Rating** badge, then use the same **Condition Rating** bucket configuration.

Otherwise, create a new **Conditon Rating** bucket configuration using the **Asset Bucket Configuration** BO. Refer to the screenshot below for suggested **Bucket Value Ranges**:



Bucket Value Ranges

Sequence	Start Range	End Range	Description
5	0	1	Unrated
10	1	2	Very Good
20	2	3	Good
30	3	4	Average
40	4	5	Poor
50	5	99,999	Very Poor

Algorithm Parameters

Once the **Condition Rating** bucket configuration is set up, edit the Asset 360 Condition (W1ASTCOND) algorithm to add the new algorithm parameter values:

- **Bucket Configuration**: The bucket configuration you created above
- **Severity Number 1-10**: The Override Severity Value for it's corresponding Bucket Sequence Number. Leave blank to use the default visual setting.
- **Bucket Sequence Number 1-10**: Sequence numbers defined in the **Bucket Value Ranges**

For example, to display a red badge (override value = 30) for a *Poor* (bucket value sequence number) Condition Rating:

- **Severity Number**: 30
- **Bucket Sequence Number**: 50

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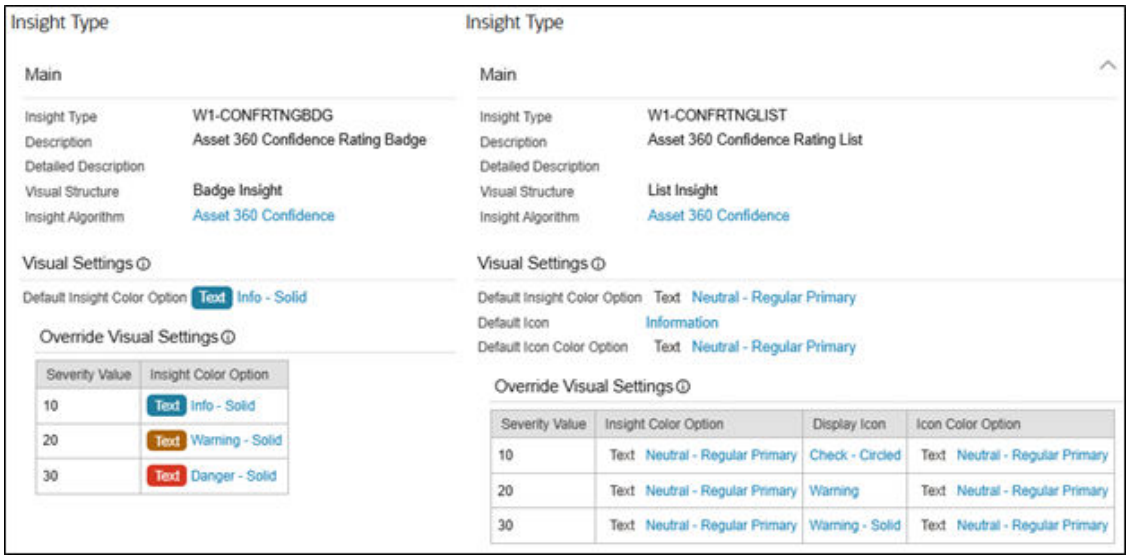
Parameters

Sequence	Parameter	Value
10	Bucket Configuration	WD-CONDSCORE
20	Severity Number1	
30	Bucket Sequence Number1	5
40	Severity Number2	10
50	Bucket Sequence Number2	10
60	Severity Number3	10
70	Bucket Sequence Number3	20
80	Severity Number4	20
90	Bucket Sequence Number4	30
100	Severity Number5	30
110	Bucket Sequence Number5	40
120	Severity Number6	30
130	Bucket Sequence Number6	50

Confidence Rating Insight

The **Confidence Rating** insight includes two types; a badge and a list. It displays the Confidence Rating Score, a description (as defined in the bucket configuration), and the asset's last inspection:



By default, the **Confidence Rating** insight is shown using the Default Insight Options.

Follow the steps for **Bucket Configuration** and **Algorithm Parameters** to display the **Confidence Rating** insight with the **Override Visual Setting** and **Bucket Configuration** description.

Bucket Configuration

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Create a new **Confidence Rating** bucket configuration using the **Asset Bucket Configuration** BO. Refer to the screenshot below for suggested **Bucket Value Ranges**:

Bucket Value Ranges

Sequence	Start Range	End Range	Description
10	0.00	0.01	Unrated
20	0.01	0.20	Very Low
30	0.20	0.40	Low
40	0.40	0.60	Medium
50	0.60	0.80	High
60	0.80	1.00	Very High

Algorithm Parameters

Once the **Confidence Rating** bucket configuration is created, edit the Asset 360 Confidence (W1ASTCONF) algorithm to add the new algorithm parameter values:

- **Bucket Configuration**: The bucket configuration you created above
- **Severity Number 1-10**: The Override Severity Value for it's corresponding Bucket Sequence Number. Leave blank to use the default visual setting.
- **Bucket Sequence Number 1-10**: Sequence numbers defined in the **Bucket Value Ranges**

For example, to display an orange badge and a warning icon (override value = 20) for a *Average* (bucket value sequence number) Confidence Rating:

- **Severity Number**: 20
- **Bucket Sequence Number**: 40

Parameters

Sequence	Parameter	Value
10	Bucket Configuration	WD-AST360-CONF
20	Severity Number1	
30	Bucket Sequence Number1	10
40	Severity Number2	30
50	Bucket Sequence Number2	20
60	Severity Number3	30
70	Bucket Sequence Number3	30
80	Severity Number4	20
90	Bucket Sequence Number4	40
100	Severity Number5	10
110	Bucket Sequence Number5	50
120	Severity Number6	10
130	Bucket Sequence Number6	60

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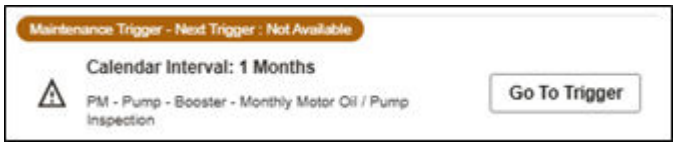
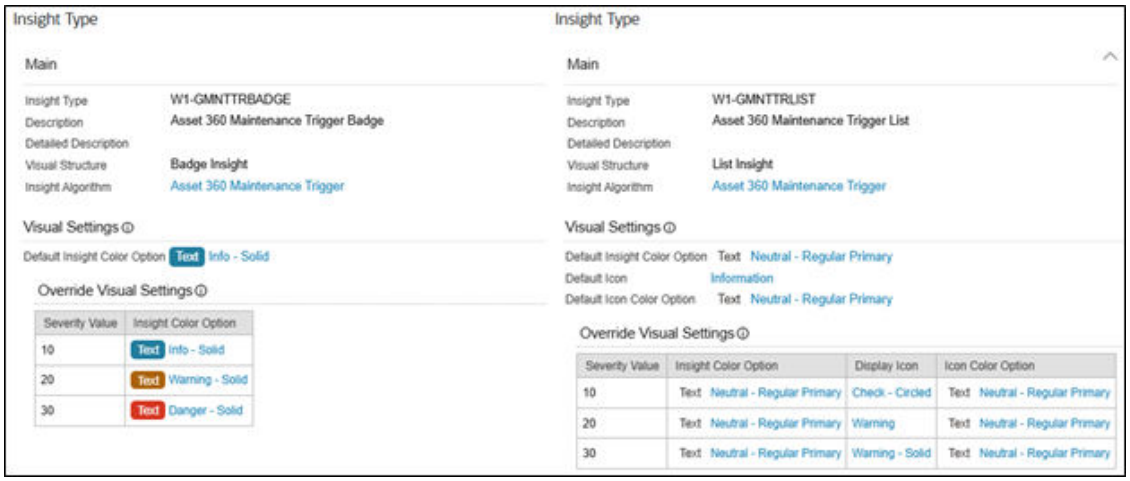
Maintenance Trigger Insight



The **Maintenance Trigger** insight includes two types; a badge and a list. It displays the next trigger information, including trigger days, trigger type, calendar details, and the associated general template work order.



The following actions are also available in the **Mainenance Trigger** insight:

- Cycle Now
- Go To Trigger

By default, the Maintenance Trigger insight is shown using the Default Insight Options.

Follow the steps for **Bucket Configuration** and **Algorithm Parameters** to display the **Maintenance Trigger** insight with the **Override Visual Setting** and **Bucket Configuration** description.

Bucket Configuration

Create a new **Maintenance Trigger Days** bucket configuration using the **Asset Bucket Configuration** BO. Refer to the screenshot below for suggested **Bucket Value Ranges**:

Bucket Value Ranges

Sequence	Start Range	End Range	Description
10		0.00	Delayed
20	0.00	15.00	On Time
30	15.00		On Time

Algorithm Parameters

Once the **Maintenance Trigger Days** bucket configuration is created, edit the Asset 360 Maintenance Trigger (W1ASTMNTR) algorithm to add the new algorithm parameter values:

- **Bucket Configuration**: The bucket configuration you created above

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- **Severity Number 1-10**: The Override Severity Value for it's corresponding Bucket Sequence Number. Leave blank to use the default visual setting.
- **Bucket Sequence Number 1-10**: Sequence numbers defined in the **Bucket Value Ranges**

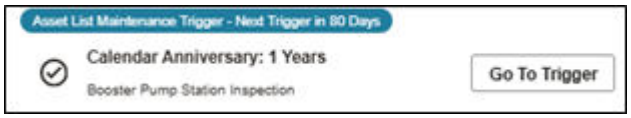
For example, to display an orange badge and a warning icon (override value = 20) for an *On Time* (bucket value sequence number = 20) Trigger Days:

- **Severity Number**: 20
- **Bucket Sequence Number**: 20

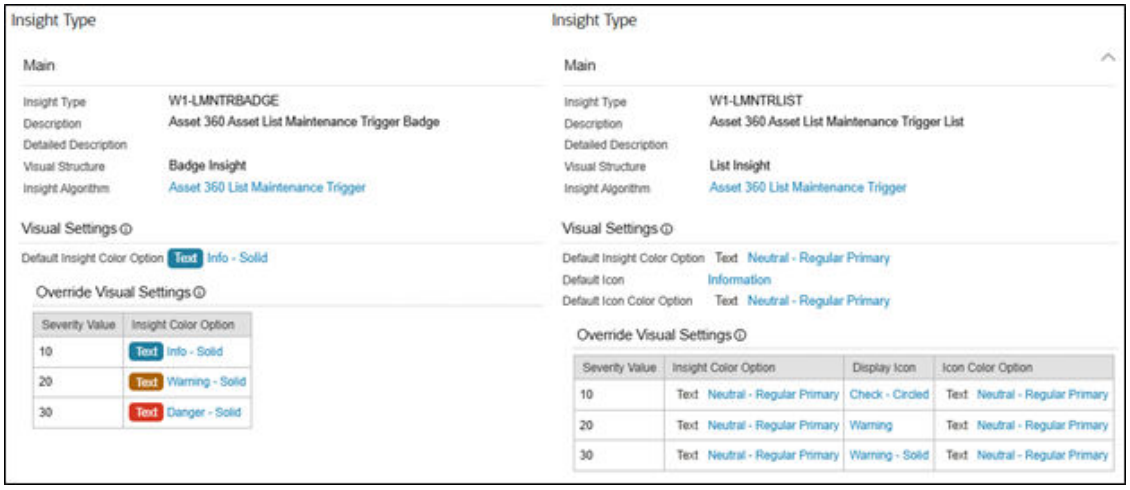
Parameters

Sequence	Parameter	Value
10	Bucket Configuration	WD-AST360-TRIGGER
20	Severity Number1	30
30	Bucket Sequence Number1	10
40	Severity Number2	20
50	Bucket Sequence Number2	20
60	Severity Number3	10
70	Bucket Sequence Number3	30

Asset List Maintenance Trigger Insight



The **Asset List Maintenance Trigger** insight includes two types; a badge and a list. It displays the next trigger information, including trigger days, trigger type, calendar details, and the associated asset location specific template work order.



The following actions are also available in the **Asset List Mainenance Trigger** insight:

- Cycle Now
- Go To Trigger

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By default, the Asset List Maintenance Trigger insight is shown using the Default Insight Options.

Follow the steps for **Bucket Configuration** and **Algorithm Parameters** to display the **Asset List Maintenance Trigger** insight with the **Override Visual Setting** and **Bucket Configuration** description.

Bucket Configuration

Use the same bucket configuration used in the Maintenance Trigger insight.

Algorithm Parameters

Once the **Maintenance Trigger Days** bucket configuration is available, edit the Asset 360 Asset List Maintenance Trigger (W1ASTLMNTR) algorithm to add the new algorithm parameter values:

- **Bucket Configuration**: The bucket configuration you created above
- **Severity Number 1-10**: The Override Severity Value for it's corresponding Bucket Sequence Number. Leave blank to use the default visual setting.
- **Bucket Sequence Number 1-10**: Sequence numbers defined in the **Bucket Value Ranges**

For example, to display a red badge and a warning solid icon (override value = 30) for a *Delayed* (bucket value sequence number = 10) Trigger Days:

- **Severity Number**: 30
- **Bucket Sequence Number**: 10

Parameters

Sequence	Parameter	Value
10	Bucket Configuration	WD-AST360-TRIGGER
20	Severity Number1	30
30	Bucket Sequence Number1	10
40	Severity Number2	20
50	Bucket Sequence Number2	20
60	Severity Number3	10
70	Bucket Sequence Number3	30

Warranty Insight

The **Warranty** insight includes two types; a badge and a list. It displays the active warranty along with the type and expiration date details.

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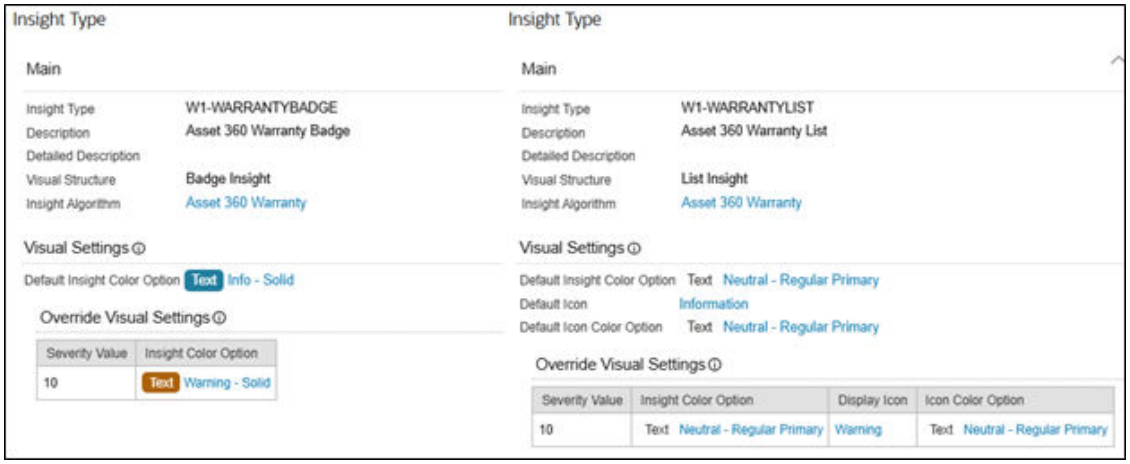

The following actions are also available in the **Warranty** insight:

- Go To Warranty

By default, if the warranty is expiring in eight months or less, it is displayed using the Override Visual Settings.

Algorithm Parameters

Update the Asset 360 Warranty (W1ASTWRTY) algorithm to change the eight-month configuration:

Configuring Current Activities Zone

Asset Zone

The **Current Activities** zone displays the number of current (non-final) activities for the asset, along with up to five of these activities ordered by Total Risk Priority (highest first) and Required By or Activitation Date (oldest first).

Insight Group

An insight group is required to display the badge and activity list.

Create a new insight group for the Asset 360 Current Activities:

- **Insight Class**: Asset 360 Current Activities
- **Valid Visual Structures**:

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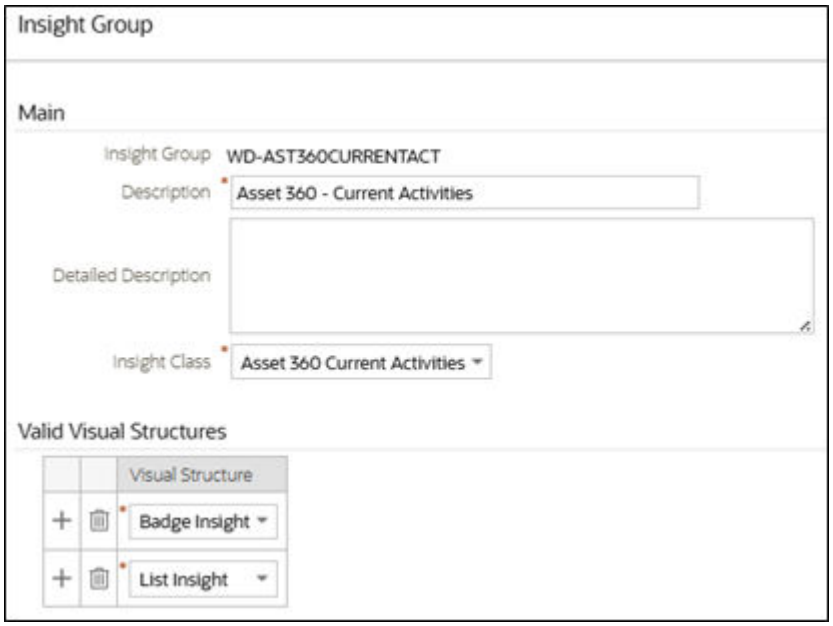
- Badge Insight
- List Insight



Next, add your insight types by clicking **Edit** in the **Related Insight Types** zone:

Table Insight Type Example

Sequence	Insight Type
10	Asset 360 Current Activities Badge
20	sset 360 Current Activities List

> **Note**
>
> Refer to each insight type below for additional setup requirements.

Current Activities Badge Insight Type

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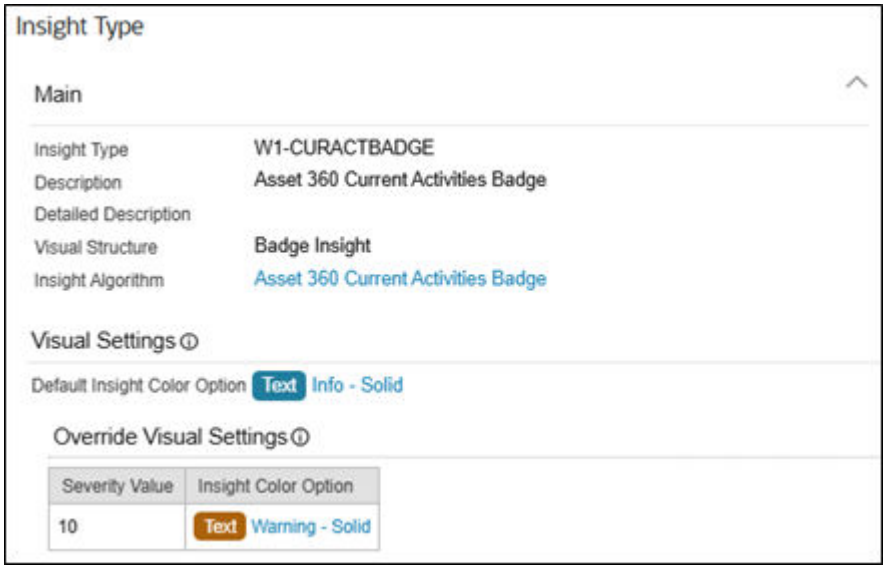
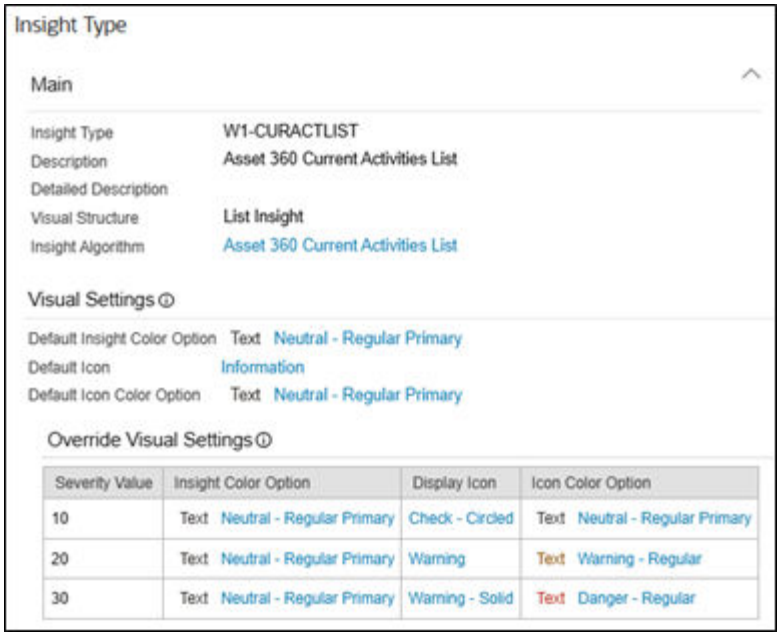


If the number of current activities for the asset is five or less, the information is displayed using the Default Insight Color Option. If there are more activities than displayed in the zone, it uses the Override Visual Settings.

Current Activities List Insight

The current activities list displays up to five of the asset's current activities, ordered by **Total Risk Priority** (highest first), **Required By Date** (oldest first), and **Activation Date** (oldest first).



By default, if the **Required By Date** has passed, the activity information is displayed using the Override Visual Setting - Severity Value 30. If the date has not passed, the Default Insight Option is used.

Lastly, follow the steps for **Bucket Configuration** and **Algorithm Parameters** to display the **Override Visual Settings** based on **Total Risk Priority**.

Bucket Configuration

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Create a new **Total Risk Priority** bucket configuration using the **Asset Bucket Configuration** BO. Refer to the screenshot below for suggested **Bucket Value Ranges**:

Bucket Value Ranges

Sequence	Start Range	End Range	Description
10	0.00	50.00	Low
20	50.00	75.00	Medium
30	75.00	100.00	High

Algorithm Parameters

Once the **Total Risk Priority** bucket configuration is set up, edit the Asset 360 Current Activities List (W1CURACTLIST) algorithm to add the new algorithm parameter values:

- **Bucket Configuration**: The bucket configuration you created above
- **Severity Number 1-10**: The Override Severity Value for it's corresponding Bucket Sequence Number. Leave blank to use the default visual setting.
- **Bucket Sequence Number 1-10**: Sequence numbers defined in the **Bucket Value Ranges**

For example, to display an orange badge (override value = 20) for a *Medium* (bucket value sequence number = 20) Total Risk Priority:

- **Severity Number**: 20
- **Bucket Sequence Number**: 20

Bucket Value Ranges

Sequence	Start Range	End Range	Description
10	0.00	50.00	Low
20	50.00	75.00	Medium
30	75.00	100.00	High

Configuring Attachments Zone

Attachments Zone

The **Attachments** zone displays an image of the asset along with up to eight attachments.

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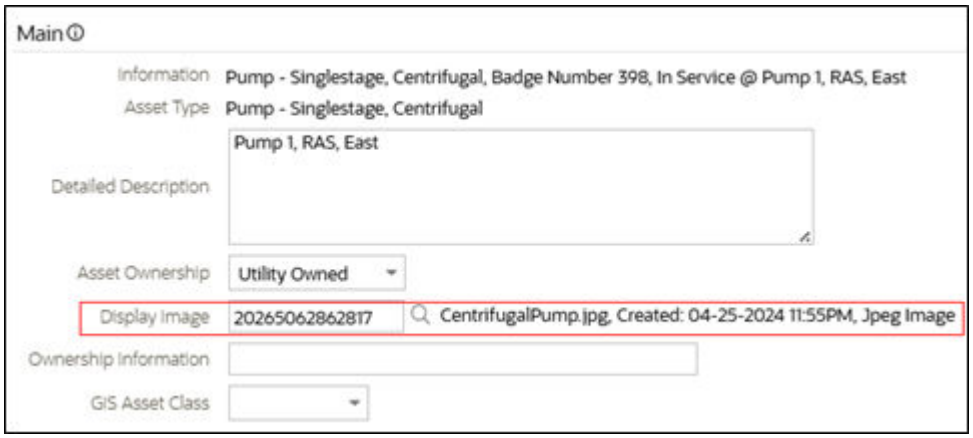
Display Image

To display an image of the asset, edit the asset record on the **Main** tab and select a JPG attachment as the display image.



Configuring Asset Cost Breakdown by Service Class Zone

Asset Cost Breakdown by Service Class Zone

The **Asset Cost Breakdown by Service Class** zone displays the total lifetime cost of the asset, as well as the cost per service class.

No additional setup is required to display the zone.

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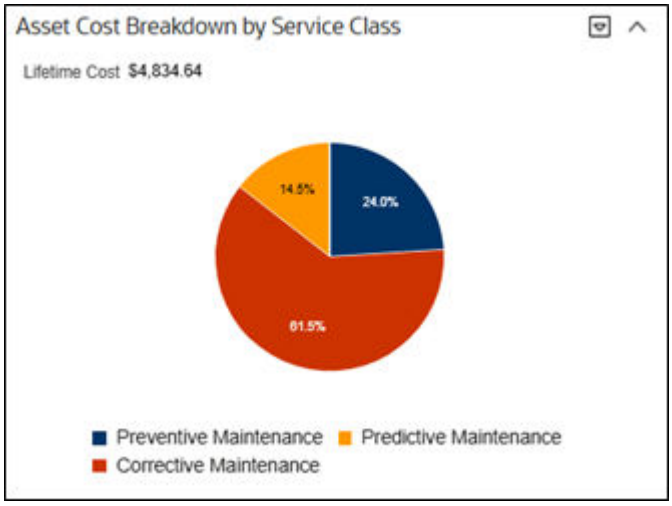


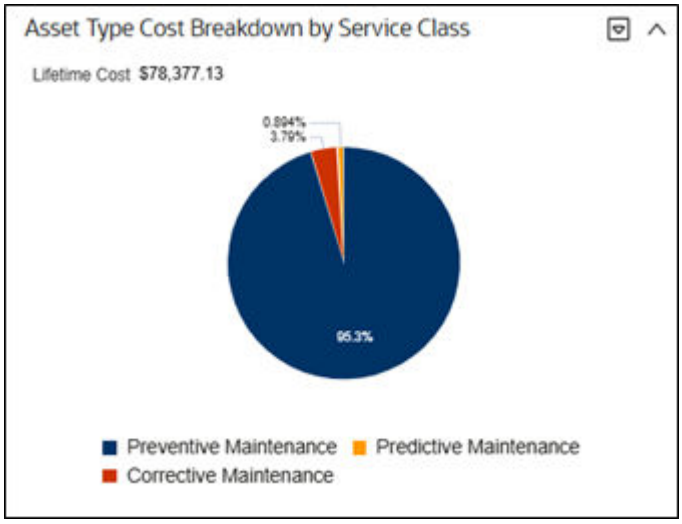
Configuring Asset Type Cost Breakdown by Service Class Zone

Asset Type Cost Breakdown by Service Class Zone

The **Asset Type Cost Breakdown by Service Class** zone displays the total lifetime cost of the asset type, as well as the cost per service class.

> **Note**
>
> The cost per service class for the asset type is updated by the **Asset Type** (W1-ASTYP) batch.

No additional setup is required to display the zone.



Configuring History Zone

History Zone

The **History** zone displays only those asset activities that are in a *Complete* or *Closed* status, all measurements, and all service histories. It also displays permits directly related to the asset

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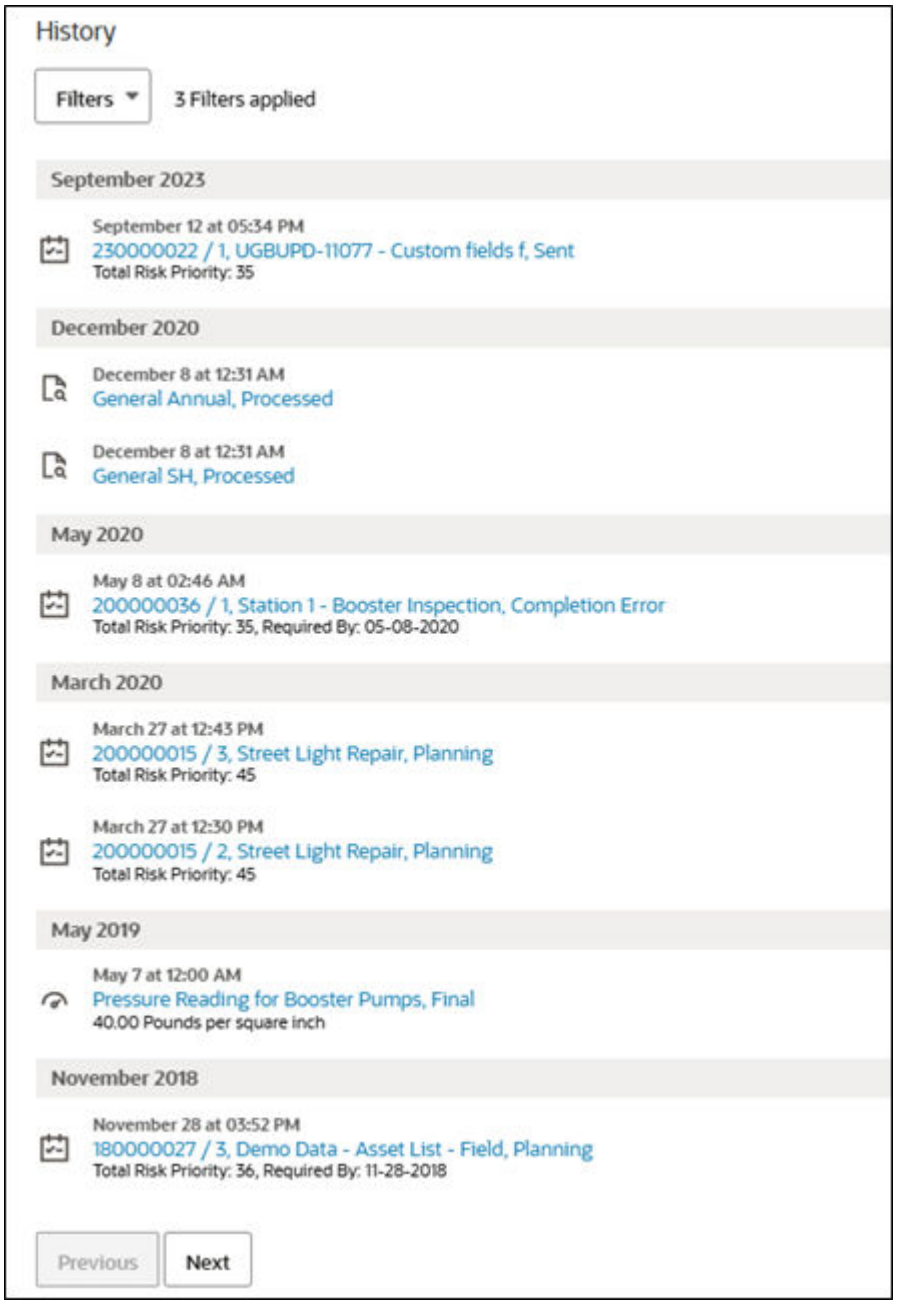
as well as permits related to activities that involve the asset. Only eight records are shown at a time with pagination enabled to view additional records.

No additional setup is required to display the zone.



Setting the Asset Portal Default Tab

The **Asset 360** tab is the default tab for the **Asset** portal once an Asset is selected. If this is not the result you are expecting, administrators have the option to override this configuration and set the **Main** tab as the default tab for the **Asset** portal. Overriding the default to be the **Main** tab can be configured on a system-wide basis or at the user-level. The system will check the default by first checking the user override followed by a check of the system-wide override setting.

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Take the following steps to override the default at a system-wide level:

1. Navigate to **Admin**, select **General**, and then select **Feature Configuration - Add** .
2. Enter a **Feature Name** and **Description**.
3. Enter *Asset 360* as the **Feature Type**.
4. Add a new Option:
    - Set **Option Type** to *Set Main as Default Tab in Asset Portal*.
    - Set **Sequence** to *1*.
    - Set **Value** to *Y (Yes)* .

Take the following steps to override the default at a user level:

1. Navigate to the **User** portal page.
2. Enter the **User ID**.
3. Click the **Characteristics** tab and add a new Characteristic Type:
    - Select *Set Main as Default Tab in Asset Portal from the **Characteristics Type** drop-down*.
    - Set the **Sequence** value to *1*.
    - Set the **Value** to *Y (Yes)* .

Project 360 Configuration

Project 360 is delivered with the following zones:

- Project
- Hierarchy
- Cost and Scheduling
- Cost by Category
- Reference Summary
- Reference Details

Setup is required to get the full Project 360 experience.

- Configuring Project Zone
- Setting the Project 360 Default Tab

Configuring Project Zone

Project Zone

The **Project Zone** offers essential information about the project, including the description, project manager, status, budget, and start and end dates. It also displays a list of attachments associated with the project. Additionally, a **View in Map** button is available if any project activities can be accessed in the **Map Viewer**.

Insight Group

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An Insight Group is required to display the project insight which includes the **View in Map** button.

Create a new insight group for the Project 360 Info and Actions Insight Type:

- **Insight Class**: Project 360 Info and Actions
- **Valid Visual Structures**: List Insight
- **Related Insight Types**: Project 360 Info and Actions

Setting the Project 360 Default Tab

The **Project 360** tab is the default tab for the **Project** once a Project is selected. If this is not the result you are expecting However, administrators have the option to override this configuration and set the **Main** tab as the default tab for the **Project**. Overriding the default to be the **Main** tab can be configured on a system-wide basis or at the user-level. The system will check the default by first checking the User Override followed by a check of the system-wide override setting.

Perform the following steps to override the default at a system-wide level:

1. Navigate to **Admin**, select **General**, and then select **Feature Configuration - Add**.
2. Enter a **Feature Name** and **Description**.
3. Enter *Project 360* as the **Feature Type**.
4. Add a new Option:
    - Set **Option Type** to *Set Main as Default Tab in Project Portal*.
    - Set **Sequence** to *1*.
    - Set **Value** to *Y (Yes)*.

Perform the following steps to override the default at a user level:

1. Navigate to the **User** portal page.
2. Enter the **User ID**.
3. Click the **Characteristics** tab and add a new Characteristic Type:
    - Select *Set Main as Default Tab in Project Portal from the **Characteristics Type** drop-down*.
    - Set **Sequence** value to *1*.
    - Set **Value** to *Y (Yes)* .

Home Page Configuration

The **Home Page** is the user's main page for reviewing and managing their work and can be configured as the first page launched when you log in to the application on the **User** portal's **Main** tab.

Users can personalize the arrangement of zones and how the zones are initially displayed on the **Home Page** from the **Portal Preferences** tab under the **User** profile page.

Additional **Home Page** configuration can be defined from **Master Configuration** portal.

Refer to Understanding Home Page Configuration in the **Administrative User Guide** for more information about **Home Page** configuration.

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Refer to About Home Page in the **Business User Guide** for general information about the **Home Page**.

Understanding Home Page Configuration

Please refer to About Home Page in the **Business User Guide** for a conceptual overview of home page functionality.

Beyond entering **Master Configuration** settings for the home page, you might also consider the following:

Configure User Settings for the Home Page

Users can add or remove zones on the **Home Page** by navigating to **Preferences** and selecting the **Portal Preferences** tab. Here, under the various Home Page sections, you can select which default zones display, whether or not they are initially collapsed or expanded, and the order in which they appear. Depending on your business practices, you can choose to disable this ability for users by modifying their access to these settings by assigning a **Template User** for **Portal Preferences** to each **User** record. Refer to Understanding Portals and Zones, or the User - Portal Preferences section under User Preferences in the **Oracle Utilities Application Framework** documentation for more information on using portal preferences.

Configure Insights Zone

All insight types configured in your insight group will be displayed on your Home Page. Insights are automatically generated based on your associations. If your user ID is linked to one or more planners, or your employee record includes service areas, these will be used to tailor the insights you see.

Customize Your Insights Zone

You can personalize your insights to display the information most relevant to you.

> **Note**
>
> Access to the User Miscellaneous Maintenance Object (W1-USERMISC) application service is required to allow user configuration through the **Configure** link. The configuration you select can also be accessed and updated in the **User** portal under the **Miscellaneous** tab.

To configure your insights:

1. Click the **Configure** link on your **Insights** zone.
2. Select which insight types you want displayed.
3. Set or update your planners, backlog groups, and service areas as needed.
4. Save your changes.

Your personal configuration will override the default settings, ensuring your insights display the most pertinent information for you.

Available Insight Types

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For each insight, the **View** button navigates you to the relevant search page and displays all records that match the criteria for that insight. You can use the available filters on the search page to further refine your results.

Here are the available insight types.

Table Available Insight Types

Insight Type	Description
Overdue Work Activities	Displays the number of work activities that are overdue (where the required by date is in the past and status is Active, In Progress, Finished, Completion Error, Sent, or In Progress (External)). The list of statuses included in this insight may be overridden by updating the **Valid Statuses** parameter in the Home Page Overdue Work Activities (W1HPIOVDUEWA) insight type algorithm.
Overdue Compliance Work Activities	Displays the number of compliance work activities that are overdue (where the compliance date is in the past and status is Active, In Progress, Finished, Completion Error, Sent, or In Progress (External)). The list of statuses included in this insight may be overridden by updating the **Valid Statuses** parameter in the Home Page Overdue Compliance Work Activities (W1HPIODCMWA) nsight type algorithm.
New Work Requests Assigned	Displays the number of work requests in Created, Pending Approval, or Approved status. The list of statuses included in this insight may be overridden by updating the **Valid Statuses** parameter in the Home Page New Work Requests Assigned (W1HPINEWWRAS) insight type algorithm.
Approved Work Requests	Displays the number of work requests that are in Approved status. The list of statuses included in this insight may be overridden by updating the **Valid Statuses** parameter in the Home Page Approved Work Requests (W1HPIAPRVDWR) insight type algorithm.
Approved Work Activities	Displays the number of work activities in Approved status. The list of statuses included in this insight may be overridden by updating the **Valid Statuses** parameter in the Home Page Approved Work Activities (W1HPIAPRVDWA) insight type algorithm.
Work Activities Ready for Scheduling	Displays the number of work activities in the Ready for Scheduling phase or those with no scheduled labor requirements. The list of statuses included in this insight may be overridden by updating the **Valid Statuses** parameter in the Home Page Ready for Scheduling Work Activities (W1HPIRSCHDWA) insight type algorithm. The Ready for Scheduling phase itself may be configured using the **Ready for Scheduling Phase** parameter in the same algorithm.
Upcoming Compliance Work Activities	Displays compliance work activities due in the next X days, where X is a configurable value. The default is 30 days. The list of statuses included in this insight can be overridden by updating the **Valid Statuses** parameters in the Home Page Upcoming Compliance Work Activities (W1HPIUPCMWA) insight type algorithm. The default number of days can be overridden using the **Lead Time (Days)** parameter in the same algorithm.

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For more information, see Insight Types in the *Oracle Utilities Application Framework* documentation.

Insight Group Configuration

A single insight group for the entire organization is required for **Home Page Insights**. If an insight group is not configured, the Insights zone will not be displayed on the Home Page.

Set up an insight group as follows:

- **Insight Class**: *Home Page Insights*
- **Valid Visual Structures**: *List Insight*
- **Related Insight Types**: One or more insight types from the table above as appropriate. The order you select will determine how insights are presented on the Home Page.

For more information, see Insight Groups in the *Oracle Utilities Application Framework* documentation.

Add Zones to the Home Page

You may find that it is beneficial to include additional zones on the **Main** tab of the **Home Page**, such as a zone to show **Saved Searches**, **Bookmarks**, or **Favorites**. You may also want to add organizational information such as a company news zone or additional custom zones. You can configure the Home Page, or any portal, to display the zones that you choose by configuring zone settings as described under Understanding Portals and Zones in the *Oracle Utilities Application Framework* documentation.

- Defining Statistics

Defining Statistics

The **Statistics** portal is used to display and maintain statistics.

Refer to Understanding Statistics in the Framework documentation for more information on statistics.

You can access the portal from **Admin**, select **WAM General**, then select **Statistics**.

The following zones may appear as part of the portal's **Main** tab page:

- **Statistics List**: This zone lists all property unit records. Broadcast a record to display the details of the selected record.
- **Statistics Display**: This zone displays information, such as statistical details and captured date and times for the selected statistic.
- **Statistics Log**: This zone displays log information about the statistic.

Understanding Online / Batch Loaders

Online / Batch Loaders enable the quick loading of data into the system. Data can be loaded for any business object as it uses the BO’s schema to load data into the application.

Two types of loaders are supported:

- **Online Loader** easily uploads smaller amounts of data. Use this type of upload process when uploading business objects without complex lifecycles and BO rules. For example, stock items, stock item detail, crafts, crews, and more. The data is loaded through the UI to create the target objects.

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- **Batch Loader** should be used for larger volumes of data and for complex business objects such as Organization, Asset, Commodity Codes, and so on. The Batch Loader uses a two-step process that first creates the inbound sync request and uploads the file to a staging table and secondly, uploads the sync request from the staging table to either create the target objects or create another dedicated inbound sync request that handles the complexity of a particular object.

Processing uses the creation of a request type to facilitate the upload process:

- For the **Online** request type, the actual data is stored within and processed by the request.
- For the **Batch** request type, two options for batch load are supported; from a file located on the server or from an attachment in the application. Either the file name (file on server) or the attachment id (attachments) is stored on the request, the data is loaded into the generic inbound sync requests, and the request acts as a header record for all the generic inbound sync requests.

A csv file is the format used for data uploads. The generic loader has very strict requirements as to the format of the file. Please see the “embedded” help in the **Online Loader Request Data** section for format and additional tips.

> **Note**
>
> Some attachments, such as videos can get very large. These larger attachments (larger than the current default threshold), should utilize external storage, for example, object storage. If the file is larger than the default threshold, you will need to split the file into multiple smaller files and upload them separately in order to keep them in the database. The default threshold limit is configurable and can be overridden from Feature Configuration.

- Creating CSV Files
- Initiating Requests

Creating CSV Files

While data can be manually entered into the system, the most efficient method for uploading the data is to use one of the CSV data templates already available for all appropriate business objects.

The first step is to create a .csv file (comma delimited) from the business object of the portal being loaded. The following is an example using expense codes:

1. Navigate to **Admin**, select **Financial**, select **Expense Code**, and then select **Search**.
2. Expand the **Record Information** zone and click the *Expense Code* hyperlink for the business object.
3. Click the *View Schema* hyperlink on the **Main** tab and then copy the elements from the business object to the CSV file and create your data.

1	**Sequence**	**Primary Key**	**Field 01**	**Field 02**
2	1	Expense Code	description	Cost Category
3	2	expenseCode	description	costCategory

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1	Sequence	Primary Key	Field 01	Field 02
4	3	WD-Inventory	200 – Inventory	WD-Stock
5	4	WD-LaborPremium	120–Labor - Premium	WD-Labor

- Columns in the top row match the elements in the list of the request BO (header).
- The row with the lowest sequence number (1) is the description of xpaths to help users read the file and is ignored by the processing.
- The BO processing treats the row with the second lowest sequence number (2) not as data, but as the xpath to move data to the target BO, in this case, W1-ExpenseCode.
  - Note that the configuration of some BOs mean that this cell may start with a “+” sign. Also note that the file always treats this cell as a formula and adds an “=” sign to the front of the data string, as indicated by “#NAME?” (For example: =+costCategory/expenseCode). You must reformat the cell to “Text” and remove the “=” sign.
- Rows with sequence number three and up are treated as data.

Other Formatting Issues

The following information addresses known formatting issues in working with the CSV data template:

- Dates need to be formatted as yyyy-m-dd (2020-10-27).
- Date and Time should be formatted as yyyy-mm-dd-hh.mm.ss.
- Columns based on lookup values that have leading zeroes will need to match the values in the CSV file. For example, the TD_PRIORITY_FLG value should be “030”, not “30”.
- A link needs to be created when you want to include the “parent”, which has a system generated ID, in the same file with the “child”. For example, you can load Organizations but if you want to populate the Parent Organization’s ID in the same file, you would need to insert a link (for example, @3, which is the @ symbol plus the Sequence #) in the row where the system generated ID would reside.
- If multiple rows contain the same **Primary Key**, only the last row is loaded. All values for the **Primary Key** need to be on the same row.

Initiating Requests

Facilitate the upload process by creating the request type and the request.

1. Create the request type

- Navigate to **Admin**, select **General**, select **Request Type**, and then select **Add**.
- Enter a meaningful description for the request type. For example, **Online Loader Request Type** or **Batch Loader Request Type**.
- Select the request type business object that corresponds to your request type. For example, either “Online Loader Request Type” or “Batch Loader Request Type”.
  - Note that for **Batch Loader Request Type**, the user will need to define whether the contents from the attachment record will be deleted once the upload is finished.

2. Create the request

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Online Requests

- Navigate to **Menu**, select **Tools**, select **Request**.
- Select your *Online* loader request type and then click **OK**.
- Select the business object you want to create.
- Select your CSV file to upload or enter the data directly into the **Data** zone and then click **Save**.
  - Note: If examples of online requests are already available in your system, search for the appropriate request, select **Edit**, and either use the existing data if it applies, or select **CSV File To Upload** to upload your already formatted and populated CSV file, or you can select **Download To CSV File** and manually populate the data into the file and then select **CSV File To Upload** to upload the file.
- Click on **Load Data** to submit the request.
  - Check the **Request Log** for requests that do not transition to a “Loaded” status. You may need to reset the request back to a created status and click **Edit** to fix the issue before resubmitting the request.

Batch Requests

- Navigate to **Menu**, select **Tools**, select **Request**.
- Select your *Batch* loader request type and then click **OK**.
- Select an external system.
- Select the business object you want to create.
- Enter a commit frequency.
- Enter the file name or select the attachment that should be in the request and click **Save**.
  - For **Batch File Upload** — *Filename* is specified in the request. Comma delimited file should uploaded / available in the server. Run the batch job W1-GBUPL to create the sync request. Parameter File Name and File Path should match the file name and path of the file. Once job has ended and the request is loaded, run batch job F1-SYSRQ to process the created sync request.
  - For **Batch Attachment Upload** — *Attachment ID* is specified in the request. Comma delimited file is uploaded as an attachment. Run the batch job W1-GAUPL to create the sync request. Parameter Request ID should match the created request. Once the job has ended and the request is loaded, run batch job F1-SYSRQ to process the created sync request.
- The F1–SYSRQ parameters are as follows:
  - **Maintenance Object**: F1–SYNCREQIN
  - **Restrict by Batch Code**: True
  - **Restrict by Business Object**: W1–GenericDataLoaderSync
  - **Restrict by Status Code**: PENDING

Table Setup Sequence

- OUAF Admin Setup
- General Data Setup

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- Approval Setup
- Asset Management Setup
- Construction Work Management Setup
- Financial Setup
- Inventory Setup
- Purchasing Setup
- Work Management Setup
- Batch Controls

OUAF Admin Setup

This section lists entities typically performed by an administrative user and are accessed from the **Admin** menu. Most of these objects establish global configuration. They are defined at implementation and usually do not change again.

Level	Entity	Comment
1	Defining Countries	Your organization's country.
1	Defining Currency Codes	Your organization's currency. The overall system uses the base currency defined in **Installation Options**, and all financial transactions use the base currency. However, the purchasing system supports other currencies which can be defined in the **Currency** portal.
1	Defining Display Profiles	Controls how dates, times, and numbers are displayed.
1	Defining Languages	The language to use for this implementation.
1	Defining Time Zones	Your organization's base time zone.
1	Defining To Do Roles	Used to associate users with To Do entries.
1	Defining Work Calendar	The work calendar for your organization which identifies your public holidays.
1	Defining Geographic Types	If your company uses geographic coordinates for dispatching or geographic information system integration, you need to setup a geographic (coordinate) type for each type of geographic coordinate you capture for assets.
1	Defining Extendable Lookups	The "lookup" table is a single table that holds valid values for many columns on many tables. Extendable lookups are custom fields where valid values are limited to a predefined list.

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1	Defining Lookups	The "lookup" table is a single table that holds valid values for many columns on many tables. Lookups are custom fields where values can be added. Only lookups where the “Custom” flag is checked can be modified.
1	Defining Outbound Message Types	**Prerequisites**: Business Object and Schema
1	Global Context Overview	You will need to set up an algorithm that populates global context values. The global context is used by various zones in the system to display relevant data. This algorithm is plugged-in on the installation record.
2	Defining Installation Options	Controls various aspects of the system. You must set up ‘Address Information’ and ‘Global Context’ algorithms.
2	Defining To Do Types	Used to define types of To Do Entries.
2	Defining Feature Configurations	**Prerequisites**: The Checkbox Feature Configuration needs the custom UI Maps. Add a feature configuration of feature type ‘Schema Constants’ and set the value for ‘Default Country’.
2	Characteristic Types	If you need to introduce additional fields to objects that were delivered with minimal fields, you can add a characteristic type for each field you want to capture.
2	External Systems	If you are using an integration you must configure the external system in this portal.

General Data Setup

This section lists entities typically performed by an administrative user and are accessed from the **Admin** menu. Most of these objects establish global configuration. They are defined at implementation and usually do not change again.

Level	Entity	Comment
1	Defining Communication Types	
1	Defining Statistics	
1	Defining Colors	
2	Maintaining Inbound Communications	

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3	Defining Document Types	It is recommended that you use Document Types and Documents instead of attachments in Oracle Utilities Work and Asset Management.

Approval Setup

This section lists entities related to approval management functionality in the order they should be defined.

Level	Entity	Comment
1	Defining Approval Profiles	**Prerequisite**: To Do Type, To Do Role, and Access Group. User groups are referenced on No Approval Required approval profiles to indicate the user groups that can create an approval request routed to the indicated approval profile. This helps to control which users are allowed to submit “no approval” requests. User groups are defined as a listing of user profiles in the User Group portal.

Asset Management Setup

This section lists entities related to asset management functionality in the order they should be defined.

Level	Entity	Comment
1	Defining Service History Questions	Condition Assessment
1	Defining Service Areas	
1	Defining Contact Types	
1	Defining Document Types	
1	Defining Employee Types	
1	Defining Organization Types	
1	Defining Service Classes	
1	Defining Storeroom Types	
2	Defining Configuration Types	**Prerequisites**: Configuration Type BOs and Lookups, Configuration Class, and Configuration Category
2	Defining Configurations	(ODM) Dependency
2	Defining Asset Location Types	

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2	Defining Measurement Identifiers	**Prerequisites**: Resource Class (custom lookup), Unit of Measure (UOM) (characteristic type), Time of Use (characteristic type), and Special Identifier (lookup)
2	Maintaining Contacts	
2	Defining Documents	**Prerequisites**: Document Category (lookup)
2	Defining Service History Types	**Prerequisites**: Service History Question (if using Base BO's), Service History BO (if need custom), and Service History Category (Lookup)
2	Defining Business Units	**Prerequisites**: Cost Center
2	Defining Out of Service Location Types	
2	Defining Out of Service Locations	
2	Defining Unit of Measure Resources	**Prerequisites**: Resource Unit of Measure Class (Lookup)
3	Maintaining Service History	**Prerequisites**: Activity, Failure Profile, Deficiency (custom lookup), General Weighted (custom lookup), Percent of New (custom lookup), Asset Disposition (custom lookup), and Downtime Reason (custom lookup)
3	Defining Asset Types	**Prerequisites**: Failure Profile
3	Maintaining Specifications	**Prerequisites**: Specification BO, Manufacturer, BOM ID, and Vehicle Detail (custom lookup) (fleet Specification)
3	Defining Condition Assessment Groups	
3	Maintaining Asset Locations	**Prerequisites**: Site Location (custom lookup) and Parent Asset Location
3	Defining Organizations	**Prerequisites**: Parent Organization (optional)
3	Maintaining Warranty Terms	**Prerequisites**: Vendor
3	Maintaining Bill of Materials	**Prerequisites**: Stock Item
3	Defining Measurement Types	
4	Defining Configuration Reports	
4	Defining Condition Assessment Class	
4	Maintaining Operational Readings	**Prerequisites**: Measurement Numeric Gauge Reason (lookup)
4	Maintaining Warranties	
5	Defining Condition Assessments	
5	Defining Employees	**Prerequisites**: User ID, Craft

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Construction Work Management Setup

This section lists entities related to contractor management functionality in the order they should be defined.

Level	Entity	Comment
1	Defining Property Units	
1	Defining Cost Centers	Capital Account Flag
1	Defining Compatible Unit Categories	Compatible Unit Class (custom lookup)
1	Maintaining Work Location	
2	Defining Equipment Groups	
2	Defining Compatible Unit Usages	
2	Configuring Resource Related Options	Related **Work Management Master Configuration** must be configured with a **Resource Type for Contractor Service**.
2	Defining Overheads	Resource Types needed on overheads are meant for indirect overhead. They are used to create **Other Direct Charges** or cost adjustments depending on what is defined on the **Work Management Master Configuration** as well as on the Overhead record.
2	Defining Service Classes	Construction or Construction Overhead Used to categorize activity types, identify renewal work, and defaults cost center on construction work activity if populated. Cost Center on Service Class is typically the default Work In Progress (WIP) account.
3	Defining Crew Types	
3	Defining Activity Types	Related **Financial Master Configuration** must be configured with a Reconciliation Distribution Code.
4	Defining Compatible Unit Sets	**Prerequisites**: CU Class (custom lookup)
4	Maintaining Vendors	**Prerequisites**: Country, Currency, Location Class (Lookup), Free On Board, Payment Terms, and Capability Type

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5	Defining Compatible Units	**Prerequisites**: Asset Type, CU Condition (lookup), CU Account Usage (lookup), CU ID Type (lookup), Stock Item, and Stock Item Detail. Identifies the materials, labor, and equipment necessary to install or remove assets in relationship to construction work.
6	Defining Compatible Unit Contractor Bids	Defines the materials, labor, and equipment necessary to install or remove assets in relationship to construction work.
7	Maintaining Work Designs	**Prerequisites**: Work Design Type (lookup), Work Design Priority (lookup), Work Design Phase (lookup), Price Type (lookup), Responsibility Party (lookup), and Service Position (lookup)
8	Maintaining Construction Work Orders	**Prerequisites**: Planner, Criticality (custom lookup), Work Class (custom lookup), Work Category (custom lookup), and Work Priority (custom lookup)
8	Maintaining Construction Work Activities	**Prerequisites**: Storeroom, Asset, Project, Phase (custom lookup), Crew (as applicable), and Backlog Group (custom lookup)
9	Maintaining Activity Reconciliations	

Financial Setup

This section lists entities related to financial functionality in the order they should be defined.

Level	Entity	Comment
1	Defining Accounting Calendars	
1	Defining Cost Centers	
1	Defining Factors	
1	Defining Distribution Codes	**Prerequisites**: GL Account Construction Algorithm
2	Defining Cost Categories	**Prerequisites**: Color
3	Defining Expense Codes	
3	Defining Tax Rate Schedules	
3	Defining Cost Adjustment Types	

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Inventory Setup

This section lists entities related to inventory functionality in the order they should be defined.

Level	Entity	Comment
1	Maintaining Manufacturers	
1	Defining Commodity Codes	
1	Defining Free on Board	
1	Defining Payment Terms	
1	Defining Capability Type	
2	Maintaining Vendors	**Prerequisites**: Country, Currency, and Location Class (lookup)
3	Defining Purchase Commodities	**Prerequisites**: Buyer
3	Maintaining Stock Items	**Prerequisites**: Resource, Unit of Measure (UOM), Usage and Inventory Expense Codes, and Stock Item Category (custom lookup)
4	Defining Storerooms	**Prerequisites**: Storeroom Type
4	Maintaining Stock Item Details	**Prerequisites**: Cost Center, Buyer, and Bin Information
4	Maintaining Reorder Reviews	
4	Maintaining Material Requests	**Prerequisites**: Expense Code

Purchasing Setup

This section lists entities related to purchasing functionality in the order they should be defined.

Level	Entity	Comment
1	Defining Buyers	
2	Defining Blanket Contract Access Lists	
3	Maintaining Blanket Contracts	**Prerequisites**: Stock Items, Vendor, Payment Terms, and Cost Center
4	Maintaining Purchase Requisitions	**Prerequisites**: Vendor and Stock Item
5	Maintaining Purchase Orders	**Prerequisites**: Vendor
6	Maintaining Expedite Purchase Orders	
6	Maintaining Invoices	
7	Maintaining Invoice Groups	

Work Management Setup

This section lists entities related to work management functionality in the order they should be defined.

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Level	Entity	Comment
1	Time Periods	
1	Defining Crew Shift Types	
1	Defining Labor Earning Types	
1	Defining Overtime Types	
1	Defining Failure Profiles	
1	Defining Preventive Maintenance Calendar	
1	Defining Project Categories	
2	Defining Maintenance Managers	
2	Maintaining Maintenance Plans	**Prerequisites**: Event Category (lookup)
2	Maintaining Preventive Maintenance Schedules	**Prerequisites**: Asset Type
2	Defining Planners	
3	Maintaining Template Work Orders	**Prerequisites**: Planner, Approval Profile, Work Class (custom lookup), Work Category (custom lookup), and Work Priority (custom lookup)
3	Defining Activity Types	
3	Maintaining Preventive Maintenance Triggers	**Prerequisites**: Maintenance Trigger Business Object, Service History Type, Service Class, Approval Profile, Outage Type (custom lookup), Backlog Group (custom lookup), Asset Condition, and Asset Location.
3	Defining Completion Event Types	**Prerequisites**: Service History Type
4	Defining Miscellaneous Resource	**Prerequisites**: Unit of Measure and Resource (non-material class items)
4	Defining Employee Unavailability Types	**Prerequisites**: Cost Center and Expense Code
4	Defining Equipment	**Prerequisites**: Cost Center and Unit of Measure
5	Maintaining Crew Shifts	**Prerequisites**: Crew
5	Defining Shift Plan Templates	**Prerequisites**: Resources, Crew, and Schedule Plan Type
5	Maintaining Work Orders	**Prerequisites**: Cost Center, Project, Crew, Planner, Criticality (custom lookup), Work Class (custom lookup), Work Category (custom lookup), and Work Priority (custom lookup)
5	Maintaining Maintenance Plan Triggers	
5	Defining Crew Types	**Prerequisites**: Craft
6	Defining Crews	**Prerequisites**: Employee

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7	Maintaining Work Activities	**Prerequisites**: Resources, Storeroom, Asset, Project, Service Class, Cost Center, Phase (custom lookup), and Backlog Group.

Batch Controls

It is important to properly manage the order and frequency with which batch processes are run. Below is a list of batch jobs which, if scheduled, must be configured in the order listed. These are recommended settings, not requirements, based on your configuration of the system and your business practices.

To find the details for batch controls, reference the **Batch Control** record and then look at the maintenanceObject Parameter.

Refer to Defining Batch Controls in the **Oracle Utilities Application Framework** documentation for information on controlling the order in which the processes run, scheduling processes, and other details.

Scheduled Monitor Processes

Batch controls are listed here in the general sequence that they should be run:

Batch Control	Description	Suggested Freq.
W1-ACTRR Activity Resource Requirement	Users can indicate a future ‘Reservation’ date on Material Requirements and the system will try to reserve the material when that date becomes current.	Run several times a day.
W1-ACT Activity MO Periodic Monitor Process	Updates the activity Held For Parts flag based on the availability of stock items. The monitor can be scheduled to re-evaluate the Held for Parts flag on all active activities against inventory quantity changes causes by stock re-order, material issue or return. This monitor also auto-activates approved activities based on the **Activation Date/Time** on an activity which defines a future activation date. The system will activate the activity once it is both approved and the ‘Activation Date’ becomes current.	Daily. Available inventory changes by the hour, however your implementation should avoid running this batch job too often, as it places a heavy burden on the system.

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Batch Control	Description	Suggested Freq.
W1-APVRQ Approval Request Periodic Monitor Process	Manages transitioning of approval requests and routing them to the appropriate approvers. For example, if the current approver times out due to not responding in the alotted amount of time, this processing moves the approval request to the next approver.	Daily. Approver time out is defined as number of days.
W1-ASSET Asset Periodic Monitor Process	Monitors preventive maintenance triggers to create the related work orders. This monitor also creates PM Forecast records for the Asset. Your implementation can define the number of days to generate the future forecast, or planning horizon. For example, 1825 days would be 5 years of PM forecasts for all triggers. The planning horizon is controlled by a parameter on the W1-ASTMNTMON algorithm.	Daily.
W1-ASTYP Asset Type Monitor Process	Calculates asset type average cost statistics.	Daily.
W1-BCHDR Blanket Contract Header Monitor Process	Transitions blanket contracts that are awaiting activation to Active when future blanket contracts become current.	Daily.
W1-BSRR Batch Stock Reorder Monitor Process	Creates the purchasing documents based on reorder review records.	Daily. (after W1-SID)
W1–CKLST Activity Checklist Monitor Process	Monitors the Activity Checklist by looking at all instances of the Checklist MO whose current state has monitor algorithms defined and, if so, invokes those monitor algorithms. Associated algorithm checks that all *Mandatory* Checklist Line Items are completed prior to allowing the Checklist to enter the *Complete* state.	Daily.
W1–CKLTY Activity Checklist Type Monitor Process	Monitors all instances of the MO whose current state has monitor algorithms defined and, if so, invokes those monitor algorithms.	Daily.
W1-COMIN Inbound Communication	If an external system sends inbound communications to WAM, e.g. to complete activity, this batch job needs to be run to process those inbound communications. Base BO’s have a deferred monitor algorithm on the initial state, which moves the	As often as needed.

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Batch Control	Description	Suggested Freq.
Periodic Monitor Process (both ODM and WAM)	inbound communication to the next state and is only executed when the batch is run. The reason why that monitor is a deferred is to avoid error(s) upon creation of the message.	
W1-COSTM Cost Center Periodic Monitor Process	Calculates monthly and year to date statistics per cost center. Note that users can also click a button online to calculate the statistics on demand.	Daily.
W1-CRSHF Crew Shift Periodic Monitor Process	Maintains crew shift status.	Daily.
W1-CUCTR CU Contractor Bid Periodic Monitor Process	Moves **CU Contractor Bids** through various lifecycle states including activating the bid once it reaches its effective date and expiring it once the expiration date is reached.	Daily.
W1-ERPFA ERP Fixed Asset Extract	For use with construction work management functionality: An external Fixed Asset Management system which manages the depreciation of fixed assets can interface with Oracle Utilities Work and Asset Management to retrieve fixed assets. This batch code creates a flat file to send these fixed assets to the external system. This batch code must also be referenced on the **Construction Parameter Work Order Master Configuration** to complete the following for fixed assets: • send fixed assets to an external system • to add a retired fixed asset entry to the general process table • to add an accept or return line entry to the general ledger for fixed assets • to add a cancel line entry to the general ledger for a stock item that is a capital spare	Daily.
W1-FTM Financial Transaction Periodic Monitor Process	Invokes monitoring rules associated with the current state of financial transactions. All monitoring rules throughout the financial transaction's business object's inheritance chain are considered. By default, the process periodically monitors financial transactions whose current state is not associated with a batch code. Batch parameters govern whether the processing is further restricted by batch code, business object and status.	Hourly.

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Batch Control	Description	Suggested Freq.
	This processing also transitions objects from Created status to Populate GL Details to Frozen, as applicable. If the system encounters errors, the object is transitioned to Error. For example the GL number might not be able to be generated because of an incorrect cost center/expense code combination. There is a monitor on the error state to try again. The error state creates a To Do. Users can always manually try to freeze the FT. However if the issue that caused the error has been fixed, the monitor will take care of the FT and To Do before users take actions. The W1-GLDL process, GL Download Extract, extracts and downloads the general ledger details.	
W1-GAUPL Batch Attachment Upload	This batch control uploads data from a .csv file that is stored in the application as an attachment. This batch control is designed specifically for the **Batch Loader Request** process and has some format requirements for the data in the file: • Information cell in the Excel spreadsheet is treated as a formula. Reformat the cell to *Text* and remove the “=” sign that was automatically added by Excel. Batch Loader Request can be accessed by navigating to **Menu**, click **Tools**, and then click **Request**. For each data row in the file, this batch creates a generic inbound sync request record which acts as a staging record. Submit batch F1–SYSRQ to create the records in the application.	As needed.
W1-GBUPL Batch File Upload	This batch control uploads data from a .csv file on the server. This batch control is designed specifically for the **Batch Loader Request** process and has some format requirements for the data in the file: • Information cell in the Excel spreadsheet is treated as a formula. Reformat the cell to *Text* and remove the “=” sign that was automatically added by Excel. Batch Loader Request can be accessed by navigating to **Menu**, click **Tools**, and then click **Request**. For each data row in the file, this batch creates a generic inbound sync request record which acts as a staging record. Submit batch F1–SYSRQ to create the records in the application.	As needed.
W1-GLDL GL Download Extract	Extracts and downloads the general ledger details by creating a flat file. The GL batch control code is defined in the **Financial Master Configuration.**	Daily.

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Batch Control	Description	Suggested Freq.
W1-MNTSC Maintenance Schedule Periodic Monitor Process	Calculate preventive maintenance statistics. This batch job must run in order to generate the statistics that are displayed on the **Analytics** tab in the **PM Schedule** portal.	Daily.
W1-MNTTR Maintenance Trigger Periodic Monitor Process	Calculate failure statistics.	Daily.
W1-MTRDP Material Disposition Monitor Process	Closes material dispositions after the assets have been processed (e.g. the new asset has been installed and the old asset have been either repaired and returned to a storeroom or retired).	Daily.
W1-ODCTR ODC MO Periodic Monitor Process	Posts approved direct charges to create financial transactions and to the general ledger.	Daily.
W1–RTM Resource Type Maintenance Object Monitor Batch Process	Monitors the Resource Types (Craft, Stock Item, Equipment, and Other) in order to maintain the Average Unit Price (AUP) field on the Stock Item, NOT the Stock Item Detail. The AUP on the Stock Item is the average unit price for that stock item across all storerooms.	Daily.
W1-SFWKT Shft Wkly Templt Periodic Monitor Process	Creates new shifts based on templates.	Daily.
W1-SID Stock Item Detail MO Periodic Monitor Process	Causes the stock item detail to monitor itself to check it's reorder levels and creates the reorder review as necessary. This batch control also monitors lot expiration dates. Note that W1–SID is the batch job for reorder review, not W1–RR. W1–RR is the standard monitor batch control delivered with the reorder review maintenance object, however, it does not perform the processing of creating reorder review records.	Daily.
W1-SSWO Svc Sched WO MO Periodic Monitor Process	ODM only— this monitor is only relevant to activity generators in 'Template' state. Create activity generator, from a template, based on the schedule defined on service history.	Daily.

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Batch Control	Description	Suggested Freq.
W1-STAT Statistic Monitor Process	Calculates home page statistics.	Daily.
W1-TMST Timesheet MO Periodic Monitor Process	Posts approved timesheets to create financial transactions and entries in the general ledger.	Daily or weekly (if time period on timesheets is weekly).
W1-WD Work Design MO Periodic Monitor Process	This process monitor keeps the resources on the Template Construction Work Order up to date.	Daily.
W1-WO Work Order MO Periodic Monitor Process	Causes the system to automatically close completed work orders after the indicated number of days after completion. This is relevant for auto close and service schedules.	Daily.
W1-WRNTY Warranty Periodic Monitor Process	This process monitors the warranty BO's active status to update the warranty to an "expired" status when the terms of the warranty is reached and to create a To Do when the warranty is about to expire.	Daily.

General Monitor Processes

Monitor controls are available in the base package so that if your implementation does add monitor algorithms to a business object for the related maintenance object, the batch control already exists to run. As delivered, the maintenance object instances current state does not reference a monitor process.

W1-ACPTL	Accept Line MO Periodic Monitor Process
W1-ACTRR	ARR MO Periodic Monitor Process
W1-ASCLS	Assessment Class Periodic Monitor Process
W1-ASGRP	Assessment Group Periodic Monitor Process
W1-ASCDU	Asset Current Disposition Update
W1-BCLIN	Blanket Contract Line Monitor Process
W1-BUYER	Buyer MO Periodic Monitor Process
W1-CEVT	Completion Event MO Periodic Monitor Process
W1-CMSYN	Composite Sync Request
W1-SICER	Composite Sync Request - Error
W1-CFG	Configuration Periodic Monitor Process
W1-CFGRP	Config Report MO Periodic Monitor Process

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W1-CVNR	Create Vendor from Characteristic
W1-CREW	Crew MO Periodic Monitor Process
W1-EMP	Employee MO Periodic Monitor Process
W1-EU	EU MO Periodic Monitor Process
W1-IA	IA MO Periodic Monitor Process
W1-INVHD	Invoice Header Monitor Process
W1-INVAP	Invoice AP Extract Batch
W1-MNTEV	Maintenance Event Monitor
W1-MNTMG	Maintenance Manager MO Periodic Monitor Process
W1-MSRMT	Measurement Periodic Monitor Process
W1-MTRQH	Material Request Header Monitor Process
W1-MTRQT	Material Request Template Monitor
W1-MTRTH	Material Return Header Monitor Process
W1-ODCDT	ODC Detail MO Periodic Monitor Process
W1-PIMSR	Physical Inventory Count Line Periodic Monitor Process
W1-SIOER	Ongoing Sync Request - Error
W1-SIOPE	Ongoing Sync Request - Pending
W1-PLANR	Planner MO Periodic Monitor Process
W1-POHDR	PO Header Monitor Process
W1-POLNE	Purchase Order Line Periodic Monitor Process
W1-PRHTR	PR Header MO Periodic Monitor Process
W1-PRJ	Project MO Periodic Monitor Process
W1-RCPTH	Receipt Header MO Periodic Monitor Process
W1-RCPTL	Receipt Line MO Periodic Monitor Process
W1-RTM	Resource Type MO Periodic Monitor Process
W1-RPINV	Reprocess Invoice
W1-RTNL	Return Line MO Periodic Monitor Process
W1-SVHST	Service Hist MO Periodic Monitor Process
W1-SYRQI	Inbound Sync Request MO Monitor Process
W1-SRSER	Sync Request Seeder - Error
W1-TMPW	Template WO MO Periodic Monitor Process
W1-TMPWO	Template WO MO Periodic Monitor Process Retrieves all the template activity resources for the template work order and updates the unit price on the template activity resource. Run process as needed.
W1-TSDTL	Timesheet Detail MO Periodic Monitor
W1-VNDRL	Vendor Location Periodic Monitor Process
W1-WR	Work Request MO Periodic Monitor Process

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Documents

- Understanding Documents
- Configuring Document Options

Understanding Documents

The product supports several classes of documents that can assist users in performing their work. This section describes topics related to managing and referencing documents.

Attachments

Any electronic file type, such as Word, PowerPoint, JPEG and so on can be uploaded into the system as an attachment. Refer to Attachment Overview for more information about file attachments.

An attachment may also reference a URL to an externally stored document. When using this type of attachment, the content of the document is not uploaded into the system. Instead, only the link to the document is captured on the attachment record.

Attachments, both *Owned* and *Referenced*, are consolidated into a single zone. A user can click the attachment hyperlink to navigate directly to the attachment record or click the **View** button to launch the file or URL associated with the attachment.

Attachments can be associated with most documents, such as purchase requisitions, purchase orders, and blanket contracts. However, for purchase orders only, when a purchase order includes an attachment and the record is revised, the attachment is copied from revision to revision.

Reference Attachments

When an attachment relates to or describes a specific entity, it is uploaded to the system as owned by that entity. For example, a picture of an asset is uploaded to the system as owned by the specific asset record. These attachments are typically uploaded and maintained on the portal of the owning entity.

An attachment that is owned by one entity may be listed for reference on another entity. For example, you may reference an asset's owned attachment on a work activity planned for that asset. These attachments are referred to as reference attachments. Note that such reference is not a copy of the original attachment but a link to it. When making a change to the content of the attachment being referenced, the changes are reflected everywhere it is referenced.

While many entities support the ability to capture their own attachments, only selected entities support the ability to reference attachments of other entities.

A Document Record Represents a Folder of Attachments

The **Document** entity may be used to organize multiple related attachments into folders when applicable. Each document record represents a folder to which you may upload multiple file attachments and add URL attachments. These attachments are owned by the document record and can be referenced elsewhere as needed.

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Standard Notes

Standard notes allow you to create boilerplate text, a note, which can be attached to records wherever a note might be needed to provide additional information. When a record includes a note and the record is revised or a new record gets created, the note is copied from revision to revision and between documents.

Notes are displayed in the Standard Notes zone of selected entities, such as stock items, blank contracts, purchase orders, and requisitions.

Configuring Document Options

Follow the steps described in this section to configure document options.

- Defining Document Types
- Defining Documents
- Defining Standard Notes

Defining Document Types

The **Document Type** portal is used to view and maintain document types.

Refer to Understanding Documents for more information.

You can access this portal from **Admin**, select **Resource Management**, then select **Document Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Document Type List**: This zone lists all the document types. Broadcast a record to display the details of a selected record.
- **Document Type**: This zone provides information about the selected document type.

Defining Documents

A document record includes basic details about the document, such as the document number, document type, and so forth.

Refer to Understanding Documents for more information.

The **Document** portal is used to view and maintain documents.

You can access this portal from **Menu**, select **Resource Management**, then select **Document**. You are brought to a query portal with options for searching for a specific document. Once the document has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Document**: This zone displays information about the selected record.
- **Attachments**: This zone lists all the attachments that are related to the selected record.

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Defining Standard Notes

A standard note is a text document that can be associated to records wherever additional information is needed. For example, “Ensure that payment terms are clearly visible on the Purchase Order report.”

Refer to Understanding Documents for more information.

The **Standard Notes** portal is used to view and maintain standard notes.

You can access this portal from **Admin**, select **Resource Management**, then select **Standard Note**. You are brought to a query portal with options for searching for a specific standard note. Once the standard note has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal’s **Main** tab page:

- **Standard Note**: This zone displays information about the selected record.

Organizations

- Understanding Organizations
- Understanding Contact Types
- Configuring Organization Options
- Configuring Contact Options

Understanding Organizations

Organizations are used for categorization and reporting for locations. For example, you may want to report on only the districts in a certain area or for a particular service. The reporting structure would involve the hierarchy that groups locations by a structure of parent and child organizations.

Refer to About Asset Locations for more information.

Organizations are defined by the following:

- **Organization Type**: Identifies the types of organizations (Division, Group, and so on) The organization type record identifies valid parent types within the organization. Parent organization types define the set of valid location types and organization types that can be used to define a parent location or parent organization.

  > **Note**
  >
  > Use caution in creating too many Organization Types as it can become restrictive when placing your Organizations within the hierarchy.

- **Organization Disposition**: The current status of the organization (Active or Inactive).
- **Parent Organization**: The parent organization, if applicable.
- **Main Contact**: A contact for the organization.

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Understanding Contact Types

Contact types define the attributes of a specific type of contact. Some examples of contact types might be a *Person* contact type where the person is a residential customer or a passerby, a *Business* contact type where the business contact is the point of contact when interacting with a business, or an *Employee* contact type when receiving information from a coworker.

Contact types can be created using the following Contact Business Objects:

- **Business (W1)** (W1-Business): Used for business contacts. Cannot be changed.
- **Person (W1)** (W1-Person): Used for person contacts. Cannot be changed.
- **Contact (W1)** (W1-Contact): Can be used for Business or Person contacts. Use the **Person/Business** drop-down to specify Business or Person. This business object allows for contacts to be changed from Business to Person, or Person to Business if needed.

Refer to Contacts for more information.

Configuring Organization Options

Follow the steps described in this section to configure organizational options.

- Defining Organization Types
- Defining Organizations

Defining Organization Types

The **Organization Type** portal is used to display and maintain organization types.

Refer to Understanding Organizations for more information.

You can access the portal from **Admin**, select **Location**, and then select **Organization Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Organization Type List**: This zone lists all organization type records. Broadcast a record to display the details of the selected record.
- **Organization Type**: This zone displays information about the selected organization type.

Defining Organizations

The **Organization** portal is used to display and maintain organizations.

Refer to Understanding Organizations for more information.

You can access the portal from **Admin**, select **Location**, and then select **Organization**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Organization**: This zone displays information about the organization.

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- **Child Locations/Organizations**: This zone lists the child locations or organizations associated with the current record.

The following zones may appear as part of the portal's **Tree View** tab page:

- **Organization Hierarchy**: This zone displays a hierarchy view for the organization.
- **Organization/Location Hierarchy**: This zone provides an alternative hierarchy view that displays a configurable number of child nodes for each expanded organization or location and lets users load additional child nodes as needed. It expands the path to the current organization. By default, this zone is configured to not be displayed. To display this zone, update the applicable portal configuration to display the **Organization/Location Hierarchy** zone instead of the existing **Location Hierarchy** zone.

Configuring Contact Options

Follow the steps described in this section to configure contact options.

- Defining Contact Types

Defining Contact Types

The **Contact Type** portal is used to display and maintain contact types.

Refer to Understanding Contact Types for more information.

You can access the portal from **Admin**, select **Purchasing**, then select **Contact Type**. You are brought to the contact type list page.

The following zones may appear as part of the portal's **Main** tab page:

- **Contact Type List**: This zone lists all contact types. Broadcast a record to display the details for the selected record.
- **Contact Type**: This zone displays information about the selected contact type.

Compliance

- Understanding Compliance
- Configuring Compliance Options

Understanding Compliance

Compliance is work that has established guidelines or financial incentives to ensure the work gets completed within agreed upon timeframes. Compliance work can also manage timeframes for the rechecking and resolving of issues.

Refer to Understanding Preventive Maintenance for more information on compliance.

This section describes various compliance features.

- Preventive
- Corrective

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Preventive

Preventive compliance refers to work which has guidelines established by regulatory agencies, service level agreements, and manufacturer warranties. These guidelines would include a compliance date that must be met to stay in compliance.

Preventive work usually refers to routine maintenance type work on assets to prevent them from failing. An example of this type of work includes routine and periodic inspections.

Refer to Understanding Preventive Maintenance for more information.

Corrective

Corrective compliance manages acceptable timeframes for follow-up work resulting from issues that were found during an originating call. The process is driven through the use of service histories which is used to define and create the types of work, including follow-up work, that enables the business to remain in compliance.

Some types of issues that may require follow-up work are repairs or rechecks to water mains after a break or for gas lines after a leak.

Follow-up work is automatically generated using the compliance date definitions on the general service history type. A *Calculate Compliance Date* algorithm is used to calculate the compliance date.

Configuring Compliance Options

Follow the steps described in this section to configure compliance options.

- Defining Compliance Categories
- Defining Compliance Types

Defining Compliance Categories

The **Compliance Category** portal is used to maintain compliance categories. A compliance category represents a broad category of compliance work, such as leaks, inspections, and preventive maintenance.

Refer to Understanding Compliance for more information.

You can access this portal from **Admin**, select **Compliance**, then select **Compliance Category**. The user is taken to the search query portal with options for searching for a specific compliance category.

The following zones may appear as part of the portal's **Main** tab page.

- **Compliance Category**: This zone displays information about the selected compliance category.

Defining Compliance Types

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The **Compliance Type** portal is used to maintain compliance types. A compliance type represents a broad category of compliance work, such as annual compliance, leak repairs, and regulator inspections.

Refer to Understanding Compliance for more information.

You can access this portal from **Admin**, select **Compliance**, then select **Compliance Type**. The user is taken to the search query portal with options for searching for a specific compliance type.

The following zones may appear as part of the portals **Main** tab page.

- **Compliance Type**: This zone displays information about the selected compliance type, such as Compliance Date Parameters, Compliance Date Adder, and Preventive Maintenance Interval information.
- **Unlink PM Triggers**: This zone removes the compliance type from the preventive maintenance triggers.
- **Link PM Triggers**: This zone updates preventive maintenance triggers with the compliance type.

> **Note**

The Unlink and Link PM Triggers zones are applicable and available only when *Preventive Maintenance*, NOT *Corrective Maintenance*, is defined for the **Compliance Class** field.

Service History

- Understanding Service History Types
- Understanding Service History Questionnaires
- Configuring Service History Options

Understanding Service History Types

Service history types define the main attributes for service history of a certain type. Some examples of service history types might include maintenance, inspection, service, test, measurement, and so on.

Service history types are defined by the following:

- **Service History Business Object**: The business object used to create service history records of this type.
- **Category**: The category to which service history records of this type belong. The base package includes the following categories:
  - Downtime
  - Failure
  - Inspection
  - Maintenance

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  - Repair
- **Follow-up Actions**: Enables work orders and work activities to be generated as follow-up actions to the original work order or activity.
- **Service Schedules (ODM Only)**: One or more template activity generators and time intervals that should be used to schedule field activity generation for service history records of this type.
- Failure Profiles
- Service History Questionnaires
- Follow Up Work

Failure Profiles

Failure profiles group failure types, failure modes, failure repairs, and failure components into a profile which can be attached to an asset type to define valid failure information for assets of that type. Effective use of failure profiles can help to ensure that assets run without fail, increase cost effectiveness, improve machine uptime, and help your organization to understand the level of risk you have undertaken with certain assets.

Generally the process includes the following:

- Define Failure Modes Effects and Critically Analysis:
  - Identify assets, asset functionality, and the standards of performance for those assets.
  - List all possible ways that the assets could fail and provide the required functions.
  - Provide detail on the types of events that could cause these failures.
  - Identify the effects on the system when failures happen.
- Define the following according to your business practices:
  - **Failure Cause**: Describes what caused the failure. For example, too much exposure to sunlight, too little or too much lubrication, too much moisture, and so on.
  - **Failure Mode**: Describes the result of the failure to the asset, such as broken, bent, corroded, and contaminated.
  - **Failure Repairs**: Indicates how the failure will be corrected. For example, adjusted, repaired, rebuilt, or cleaned.
  - **Failure Component**: Indicates the part of the asset which has failed.
- Indicate the maintenance that can be performed to prevent or avoid such failures. This maintenance contains cost effective tasks to preserve functions that are important to the system.

Service History Questionnaires

Service History questionnaires enable a company to assess the condition of an asset through a series of questions and answers.

See Understanding Service History Questionnaires for more information.

The following is a sample of service history questions and answers that could be provided on a questionnaire:

What is the condition of the pipe?

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- **Good**. No severe cracks and less than 2 small defects per 100 ft.
- **Acceptable**. No severe cracks and less than 5 small defects per 100 ft.
- **Needs Attention**. No severe cracks but 5 or greater small defects per 100 ft.
- **Needs Immediate Attention**. One or more severe cracks detected.

> **Note**
>
> The bulleted items would appear as radio buttons in the actual questionnaire as answers.

> **Note**
>
> Also note, this question and answer format supports the determination of a rating or score as to the overall condition of the asset.

> **Note**
>
> Additionally, questions marked as **Required** = *Yes* must be answered for the system to move forward in processing results.

Questionnaires also support a "fill in the blanks" format. A similar question to that above might appear as follows with “fill in the blanks”:

Assess the condition of the pipe:

- Small Defects per 100 ft.: |_____|
- Number of severe Cracks: |_____|

> **Note**
>
> In this case, each blank would appear as text boxes in the actual questionnaire to capture the answers.

> **Note**
>
> The “fill in the blanks” format, unlike the radio selection method mentioned above, does not support a rating for the overall condition of the asset.

Follow Up Work

The service history type can be configured to automatically generate follow-up actions using work orders or work order activities.

For example, if you have a Service History Type of “Grade 2 Gas Leak”, users could define a follow-up action of “Recheck” which could be configured with a “30 day” Compliance Type and a follow-up action of “Repair” which could be configured with a “1 year” Compliance Type. Note

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that you will need to specify a compliance type if a regulatory compliance requirement is associated with your follow-up action.

Refer to Understanding Compliance for additional information.

Understanding Service History Questionnaires

Service History questionnaires can be created to guide workers through corrective and preventive inspection processes.

During the completion process, workers are guided through a series of questions assessing the condition of the asset. The answers can be “weighted”, which when calculated, gives an overall score as to the condition of the asset. The calculation is generally a sum (answer points * question weight), but can vary depending on the service history type. The total inspection points are then normalized to an overall grade or score. The condition rating and confidence rating are also calculated and the asset is updated with the appropriate values.

Questionnaire and failure details are displayed in the **Completion** tab once the activity is completed. For integrations, Questionnaire and failure information is also sent to the external system using the activity outbound sync. The **Integration Parameters** section of the **Work Management Master Configuration** uses two mutually exclusive settings - **Exclude Questionnaire Details in the Activity Details** and **Exclude Failure Information in the Activity Details** - to manage whether Questionnaire or Failure details are sent or excluded from the sync message. When setting is either *Blank* or *No*, details are sent to the external system. When setting is *Yes*, details are excluded from being sent and assumes the customer will use their own method for retrieving these details.

Questions are defined on the service history type and can be marked as **Required** or **Repeatable**. If a question is defined as **Required** = *Yes*, it must be answered by the serviceperson during the completion process. If a question is marked as **Repeatable** = *Yes*, that question can be asked more than once throughout the questionnaire. Service history questionnaires are associated to a Questionnaire Service History Type which is then associated to an asset type. The Questionnaire Service History Type can also be defined to automatically generate follow up work activities using work requests or work orders.

Answers on the service history questionnaire can be defined as check boxes, multiple choice, or free-form text.

After you've created all of your questions and have saved the service history type, you can make questions conditional, meaning that you can attach follow-up questions depending on the answer selected for the original question. You do this by selecting the follow-up question in the **Follow Up Question** field for each answer that requires a follow-up question.

Configuring Service History Options

Follow the steps described in this section to configure service history options.

- Defining Service History Questions
- Defining Failure Causes
- Defining Failure Modes
- Defining Failure Components
- Defining Failure Repairs
- Defining Failure Profiles

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- Defining Service History Types

Defining Service History Questions

The **Service History Question** portal is used to display and maintain condition assessment questions.

You can access the portal from **Admin**, select **Asset Management**, then select **Service History Question**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Service History Question**: This zone provides information on question and answers for conditional assessments.
- **Service History List**: This zone displays a list of associated service history types.

Defining Failure Causes

The **Failure Cause** portal is used to display and maintain failure causes.

You can access the portal from **Admin**, select **Asset Management**, then select **Failure Cause**.

The following zones may appear as part of the portal's **Main** tab page:

- **Failure Cause List**: This zone lists all failure cause records. Broadcast a record to display the details of the selected record.
- **Failure Cause**: This zone provides information about the cause of the failure, such as bent, collapsed, twisted, and so on.
- **Included on Failure Profile**: This zone lists the failure profiles associated with a particular failure.

Defining Failure Modes

The **Failure Mode** portal is used to display and maintain failure modes.

You can access the portal from **Admin**, select **Asset Management**, then select **Failure Mode**.

The following zones may appear as part of the portal's **Main** tab page:

- **Failure Mode List**: This zone lists all failure mode records. Broadcast a record to display the details of the selected record.
- **Failure Mode**: This zone provides information about what has failed, such as arcing, binding, backward, and so on.
- **Included on Failure Profile**: This zone lists the failure profiles associated with a particular failure mode.

Defining Failure Components

The **Failure Components** portal is used to display and maintain failure components.

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You can access the portal from **Admin**, select **Asset Management**, then select **Failure Component**.

The following zones may appear as part of the portal's **Main** tab page:

- **Failure Component List**: This zone lists all failure component records. Broadcast a record to display the details of the selected record.
- **Failure Component**: This zone identifies the part of the asset which has failed, such as instrument, electrical, mechanical drive, and so on.
- **Included on Failure Profile**: This zone lists the failure profiles associated with a particular failure component.

Defining Failure Repairs

The **Failure Repair** portal is used to display and maintain failure repairs.

You can access the portal from **Admin**, select **Asset Management**, then select **Failure Repair**.

The following zones may appear as part of the portal's **Main** tab page:

- **Failure Repair List**: This zone lists all failure repair records. Broadcast a record to display the details of the selected record.
- **Failure Repair**: This zone identifies the repair that will be made to the failed asset.
- **Included on Failure Profile**: This zone lists the failure profiles associated with a particular failure repair.

Defining Failure Profiles

The **Failure Profile** portal is used to display and maintain failure profiles.

You can access the portal from **Admin**, select **Asset Management**, then select **Failure Profile**.

The following zones may appear as part of the portal's **Main** tab page:

- **Failure Profile List**: This zone lists all failure profile records. Broadcast a record to display the details of the selected record.
- **Failure Profile**: This zone identifies the selected failure profile.
- **Failure Causes**: This zone lists the failure causes associated with this failure profile.
- **Failure Modes**: This zone lists the failure modes associated with this failure profile.
- **Failure Repairs**: This zone lists the failure repairs associated with this failure profile.
- **Failure Components**: This zone lists the failure components associated with this failure profile.

Defining Service History Types

The **Service History Type** portal is used to display and maintain service history types.

You can access this portal from **Admin**, select **Asset Management**, then select **Service History Type**. You are brought to a query portal with options for searching for a specific

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service history type. Once the service history type has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zone may appear as part of the portal's **Main** tab page.

- **Service History Type**: This zone provides information about the service history type, including settings for creating and stopping follow-up actions.
- **Questionnaire Tree**: This zone displays a list of questions and answers associated with the appropriate service history type.
- **Unlink Asset Types**: This zone displays a list of associated asset types that can be removed from the service history type.
- **Link Asset Types**: This zone enables a user to search for an asset type and link it to the service history type. Linked assets will display in the **Unlink Asset Types** zone until removed.

Assets

- Understanding Asset Location Types
- Understanding Asset Types
- Understanding Functional Process Types
- Defining Functional Process Types
- Understanding Configuration Types
- Configuring Asset Options
- Configuring Activity Generation Configurations

Understanding Asset Location Types

Asset location types define the details of asset or component storage and install locations.

Valid asset locations might be service points, other locations for installed assets, or any other location as defined by your organization, for example:

- General asset location types define a type of asset location that is used to indicate the physical location where assets or components are installed.
- Plant asset location types define a type of asset location for a fixed organizational structure such as a building, factory, or other facility.
- Linear asset location types define a type of asset location that is part of a system such as pipes and manholes or poles and cables.

Out of Service Location Types

Out of service location types define attributes of types of locations where assets that are out of service are stored and maintained. Examples of out of service locations include warehouses, storerooms, and repair shops.

Out of service location types are defined by the following:

- **Class**: The general class (storeroom, meter shop, etc.) of out of service locations of this type

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- **Location Business Object**: The business object used for out of service locations of this type
- **Valid Parent Location/Organization Types**: One or more valid parent locations and parent organizations that can be referenced on out of service locations of this type. Used primarily for reporting.
- Location Hierarchy
- Valid Asset Location Attributes

Location Hierarchy

Locations can be grouped according to a customer's organizational structure and displayed within the application in a hierarchy or tree view.

Valid Asset Location Attributes

For simple use cases where additional details about an asset location needs to be captured and these details vary by location type, you may define these details as location-related characteristic types and associate them with each asset location type as needed. With this simplified extension method, the base location BOs may be used as is without any schema change.

Implemented as a characteristic, the value of such asset location attributes may only be of a free text or restricted to a predefined list of characteristic values.

Use the following steps to guide configuration:

- Consider what attributes you want to have recorded for each of your asset location types. For example, Facility ID or Life Cycle Status.
- Define a characteristic type of the appropriate type value. Use a Predefined Value Characteristic Type for a list of valid values and an Adhoc Value Characteristic Type for a simple text value. Link the Characteristic Type to the Asset Location Attributes (W1_NODE_TYPE_ATTRIBUTE) entity.
- Associate each attribute with the asset location types it is applicable to. Asset locations created from the asset location type will display the list of asset location attributes in the **Asset Location Attributes** zone on the **Asset Location** record.

> **Note**
>
> Asset Location Attributes zone will only display on the Asset Location record if the Asset Location Type it was created from includes at least one asset location attribute.

- Consider whether your business process requires validation algorithms to be plugged in on the asset location business object to further validate or enforce other business rules related to asset location attributes.

Understanding Asset Types

Asset types define the attributes for assets and components of a certain type including information such as the valid location types and service history types for the assets and

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whether or not such assets can have attached components. Also, average cost statistics are graphically displayed on the asset type record.

Assets may be associated with a unique asset number and/or badge number to allow the asset to be tracked throughout its lifecycle. Users can enter unique asset or badge numbers manually or configure the individual asset types to allow the system to create the asset and/or badge numbers automatically.

Configuration to auto-generate numbers involves defining the number generation for either the Asset number, Badge number, or for both and defining a Prefix as part of the unique numbering:

- Asset Number
  - **Asset Number Generation**: Set to *Yes*.
  - **Asset Number Prefix**: For example, M for meter, P for pole, and so on.
  - **Asset Number Calendar Prefix**: Use either 4-digit calendar year or 2-digit calendar year (For example, 2023 or 23)
  - **Asset Number Sequence Length**: 12 digits or less
- Badge Number
  - **Badge Number Generation**: Set to *Yes*.
  - **Badge Number Prefix**: For example, M for meter, P for pole, and so on.
  - **Badge Number Calendar Prefix**: Use either 4-digit calendar year or 2-digit calendar year (For example, 2023 or 23)
  - **Badge Number Sequence Length**: 12 digits or less

Asset types are defined by:

- **Component Relationship**: A flag that indicates if components can be installed on assets or components of this type.
- **Asset Business Object**: The business object used for assets or components based on this asset type.
- **Valid Location Types**: A list of location types where assets or components of this type can be located.
- **Valid Attached To Asset Types**: A list of valid asset types where components of this type can be attached (applicable to components only).
- **Valid Service History Types**: A list of valid service history types that can apply for assets or components of this type.

Refer to Defining Asset Types for more information about setting up asset types.

Asset Classes

Assets are defined by classes, each of which is based on a specific business object, and determines the type of asset: an asset or a component.

The table below lists the asset classes and the business object for each.

Asset Class	Business Object
Asset	W1-AssetType (Operational Device Asset Type)
Component	W1-ComponentType (Operational Device Component Type)

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- Valid Service History Types
- Valid Attributes
- Valid Measurement Types
- Condition Assessment Class

Valid Service History Types

Valid Service History Types are defined on the asset type record and describes the valid service history types that apply to a specific asset or component created from this asset type.

Valid Attributes

For simple use cases where additional details about an asset need to be captured and these details vary by asset type, you may define these details as asset-related characteristic types and associate them with each asset type as needed. This can also be done for the engineering specifications. With this simplified extension method, the base asset BOs may be used as is without any schema change.

Implemented as a characteristic, the value of such asset and specification attributes may only be of a free text or restricted to a predefined list of characteristic values.

Use the following steps to guide configuration:

- Consider what attributes you want to have recorded for each of your asset types. For example, Pole asset type attributes might include Set Year, Material, Material Class, and Current Height and engineering specification attributes might include fuel type or vehicle type.
- Define a characteristic type of the appropriate type value. Use a Predefined Value Characteristic Type for a list of valid values and an Adhoc Value Characteristic Type for a simple text value. Link the Characteristic Type for asset attributes to (W1–AssetAttributes) entity and the engineering specification attributes to (W1-SpecificationAttributes) entity.
- Associate each attribute with the asset types and engineering specification it is applicable to. Assets created from the asset type will display the list of asset attributes in the **Asset Attributes** zone and a list of engineering specification attributes in the **Engineering Specification Attribute Types** zone on the **Asset** record. Both the Asset and Specification attributes can be ordered by sequence number if populated, otherwise the attributes are ordered alphabetically by their description.

> **Note**
>
> Sequence Numbers must be unique and any attributes without a sequence number will have a zero default value.

> **Note**
>
> **Asset Attributes** zone and **Engineering Specification Attributes Types** zone will only display on the Asset record if the Asset Type it was created from includes at least one asset or engineering specification attribute.

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- Consider whether your business process requires validation algorithms to be plugged in on the asset business object to further validate or enforce other business rules related to these asset attributes.

Valid Measurement Types

Measurement types define the units to use for a particular measurement and establish the values needed to support the evaluation of measurements such as upper and lower reading thresholds, maximum reading value, and so on. Asset measurements, or operational data, might include mileage, hours of uptime, number of start-stops, and so on.

Please note the following with regard to of implementing measurement types.

- Each asset is assigned a list of valid measurement types to regulate the types of measurements taken for that asset.
  An **Asset** can have many measurement types, but the measurement identifiers of the asset must be unique. In other words, if two measurement types share the same measurement identifier, then they will not be allowed on a single asset, at the same time. This rule enforces the notion that when a user enters data, or when a report queries data, there will never be any overlap in measurement history.
- Typically measurement types would be metered reads or gauge reads. Gauge reads are usually compared to a threshold or valid range of values. For example, tire pressure for a typical truck tire should be between 34 and 36 psi. These would be defined as the lower limit and upper limit for the measurement type.
- Measurement type identifiers can be used if the measurement type needs to be identified in an external system.
- Measurement types can be configured to trigger to dos or automatically create work when readings are recorded that fall inside or outside of defined tolerances.

Measurement Type Exception Handling

The exception handling fields define the parameters for how the system should respond if there are issues with the reading such as the To Do Type and Role that should receive alerts, retries, and discard reason. For example, if the reading is outside of the measurement range, the system sends an alert to the indicated To Do Role.

Measurement Identifiers

Measurement identifiers establish the units used to measure assets. Each measurement type is meant to represent a unique combination of Unit of Measure, Time of Use, and a Special Identifier to uniquely describe the set of measurement readings taken for an asset. This might include tire pressure (psi), temperature ratings (degrees), daytime usage (kWh) (peak), and so on. The special identifier is used to uniquely describe unusual measurement configurations, like pressure input vs. pressure output (psi input, psi output) or even gas compositions (% argon, % helium)

Measurements

Measurements manage the asset operational and runtime data which is collected and tracked for assets. Asset measurements might include mileage, hours of uptime, number of start-stops, and so on.

Please note the following with regard to measurements:

- Configure the extendable lookup for **Gauge Reason** as needed.
- Measurement readings are entered in the **Measurement** maintenance portal via the **Measurement Quick Entry** zone.

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Condition Assessment Class

Assessment classes are used to group and manage a set of similar assets (for example, bridges can be an assessment class and hydrants can be another assessment class, and so on) using their asset type. Each assessment class is managed according to a set of inspection criteria and are used to define an inspection rating system for inspections. The purpose of this rating system is to measure the deterioration of the assets and the effect of the deterioration on the service levels that are expected of the asset.

An assessment group identifies a grouping of classes in order that the assets associated with those classes can be scored and weighted against other assets of that type. Service history types defined specifically for condition assessments can also be defined on the assessment group record and associated to the assessment class.

Understanding Functional Process Types

Functional process types categorize functional processes of a certain type. Examples of functional process types might include a grouping of asset locations that contribute to Corrosion, Waterfront tanks, waste water, or HVAC.

Refer to About Functional Processes for more information.

Defining Functional Process Types

The **Functional Process Type** portal is used to display and maintain functional process types.

You can access the portal from **Admin**, select **Asset Management**, then select **Functional Process Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Functional Process Type List**: This zone lists all functional process type records. Broadcast a record to display the details of the selected record.
- **Functional Process Type**: This zone provides general information about the selected functional process type.

Refer to Understanding Functional Process Types for more information.

Understanding Configuration Types

Configuration types define the information required for various asset configurations with other assets, components, firmware, and other data.

Configurations are referenced on specifications which are then referenced on assets and components to indicate the best way that these entities can work with the other entities that they are connected to in the field.

Configuration types are defined by the following:

- **Configuration Class**: The class for configurations of this type.
- **Configuration Category**: The category of configurations of this type.

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- **Configuration Business Object**: The business object used for configurations of this type.

Configuration Classes

In general configuration classes define the types of connections that are being configured. Each configuration class is based on a specific business object, which is the business object used for configurations of each class and type.

The table below lists the configuration classes and the business object for each.

Configuration Class	Business Object
Single Asset	W1-SingleAssetConfig (Single Asset Configuration)
Asset/Component	W1-AssetCompConfig (Asset/Component Configuration)
Asset to Asset	W1-AssetToAssetCompConfig (Asset to Asset/Component Configuration)
Asset/Component to Asset	W1-AssetCompToAssetConfig (Asset/Component to Asset Configuration)
Asset to Asset/Component	W1-AssetToAssetConfig (Asset to Asset Configuration)
Asset/Component to Asset/Component	W1-AssetCompToAssetCompConfig (Asset/Component to Asset/Component Config)

Configuring Asset Options

Follow the steps described in this section to configure asset options.

- Defining Measurement Identifiers
- Defining Measurement Types
- Defining Asset Location Types
- Defining Out of Service Location Types
- Defining Out of Service Locations
- Defining Condition Assessment Groups
- Defining Condition Assessment Class
- Defining Condition Assessments
- Defining Asset Types
- Configuring and Enabling the Asset Summarization Feature

Defining Measurement Identifiers

The **Measurement Identifier** portal is used to display and maintain measurement identifiers.

You can access the portal from **Admin**, select **Asset Management**, then select **Measurement Identifier**.

The following zones may appear as part of the portal's **Main** tab page:

- **Measurement Identifier List**: This zone lists all measurement identifier records. Broadcast a record to display the details of the selected record.
- **Measurement Identifier**: This zone provides information about the selected measurement identifier.

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Defining Measurement Types

The **Measurement Type** portal is used to display and maintain measurement types.

You can access the portal from **Admin**, select **Asset Management**, then select **Measurement Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Measurement Type List**: This zone lists all measurement type records. Broadcast a record to display the details of the selected record.
- **Measurement Type**: This zone provides information about the selected measurement type, including upper and lower threshold limits and inner and outer threshold exceeded details.

Defining Asset Location Types

The **Asset Location Type** portal is used to display and maintain asset location types.

You can access this portal from **Admin**, select **Location**, and then select **Asset Location Type**.

The following zones may appear as part of the portal’s **Main** tab page.

- **Asset Location Type List**: This zone lists all the asset location types. Broadcast a record to display the details for the selected record.
- **Asset Location Type**: This zone provides information about the selected asset location type, including valid breaker location types, valid parent location and organization types, asset location attibute types, valid connect to location types, and valid runtime source location types information.

Defining Out of Service Location Types

The **Out of Service Type** portal is used to display and maintain out of service location types.

You can access the portal from **Admin**, select **Location**, and then select **Out of Service Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Out of Service Location Type List**: This zone lists all out of service location type records. Broadcast a record to display the details of the selected record.
- **Out of Service Location Type**: This zone provides information about the selected out of service location type.

Defining Out of Service Locations

The **Out of Service Location** portal is used to display and maintain out of service locations.

You can access the portal from **Admin**, select **Location**, and then select **Out of Service Location**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

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The following zones may appear as part of the portal's **Main** tab page:

- **Out of Service Location**: This zone provides information about the out of service location, such as address information, field information and contacts.
- **Current Activities**: This zone lists the current activities associated to the location.
- **Asset Summary**: This zone displays statistical information about assets currently associated with the location.
- **Attachments**: This zone enables users to manage all types of attachments for the specific record.

The following zones may appear as part of the portal's **Tree View** tab page:

- **Organization Hierarchy**: This zone displays a hierarchy view for the organization.
- **Organization/Location Hierarchy**: This zone provides an alternative hierarchy view that displays a configurable number of child nodes for each expanded organization or location and lets users load additional child nodes as needed. It expands the path to the current out of service location. By default, this zone is configured to not be displayed. To display this zone, update the applicable portal configuration to display the **Organization/Location Hierarchy** zone instead of the existing **Location Hierarchy** zone.

The following zones may appear as part of the portal's **Log**tab page:

- **Out of Service Location Log**: This zone displays log information for the current out of service location record.

Defining Condition Assessment Groups

The **Condition Assessment Group** portal is used to display and maintain condition assessment groups.

You can access the portal from **Admin**, select **Condition Assessment**, then select **Condition Assessment Group**.

The following zones may appear as part of the portal's **Main** tab page:

- **Condition Assessment Group List**: This zone lists all condition assessment group records. Broadcast a record to display the details of the selected record.
- **Assessment Group**: This zone provides information about the selected condition assessment group, such as aging factors and service history types.

Defining Condition Assessment Class

The **Condition Assessment Class** portal is used to display and maintain condition assessment classes.

You can access the portal from **Admin**, select **Condition Assessment**, then select **Condition Assessment Class**.

The following zones may appear as part of the portal's **Main** tab page:

- **Assessment Class List**: This zone lists all condition assessment class records. Broadcast a record to display the details of the selected record.
- **Assessment Class** Display: This zone provides information about the selected condition assessment class, such as associated assessment groups, status, and status date and time.

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Defining Condition Assessments

The **Condition Assessment** portal is used to display and maintain condition assessment records.

You can access the portal from **Menu**, select **Condition Assessment**, then select **Condition Assessment**. You are brought to a query portal with options for searching for a specific assessment. Once an assessment has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Service History**: This zone displays details, such as consumable information, PM anniversary information, and effective dates, about the selected assessment.
- **Attachments**: This zone enables users to manage all types of attachments for the condition assessment record.

Defining Asset Types

The **Asset Type** portal is used to display and maintain asset types.

You can access the portal from **Admin**, select **Asset Management**, then select **Asset Type**. You are brought to a query portal with options for searching for a specific asset type. Once the asset type has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Asset Type**: This zone provides information about the asset type, including various attribute types that can be associated with an asset and a list of locations where assets and components of this type can be attached.
- **Asset Type Statistics**: This zone displays a graphical breakdown of cost and count details by service class.

The following zones may appear as part of the portal's **Asset Performance** tab page:

- **Asset Performance**: This zone displays valuation costs for the selected asset.

Refer to Service Class for more information on service classes.

Configuring and Enabling the Asset Summarization Feature

> **Note**
>
> Asset Summarization relies on generative AI models that must be deployed as part of your cloud service implementation. Please contact your Oracle Customer Success Manager if you wish to use Asset Summarization.

Configuring and enabling the Asset Summarization feature involves the following:

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Bucket Configuration

Asset Summarization uses a bucket configuration to interpret values during the summarization process. Asset summarization should use the bucket configurations defined for the Asset 360 portal if defined.

See Asset 360 Configurationand Maintaining Bucket Configurations for more information.

If your system doesn't have the following bucket configurations defined, add them as outlined in the sections below, adjusting specific values as appropriate for your implementation:

Confidence Rating

- **Business Object**: Asset Bucket Configuration (W1-AssetBucketConfiguration)
- **Bucket Configuration**: ASSET_360_CONF
- **Description**: Asset 360 Confidence Rating
- **Bucket Value Ranges:**

Sequence	Start Range	End Range	Description
10	0.00	0.01	Unrated
20	0.01	0.20	Very Low
30	0.20	0.40	Low
40	0.40	0.60	Medium
50	0.60	0.80	High
60	0.80	1.00	Very high

Condition Rating

- **Business Object**: Asset Condition Score Bucket Configuration (W1-AssetConditionScoreBuckets)
- **Bucket Configuration**: ASSET_CONDITION_RATING
- **Description**: Asset Condition Rating
- **Bucket Value Ranges:**

Sequence	Start Range	End Range	Description
5	0	1	Unrated
10	1	2	Very Good
20	2	3	Good
30	3	4	Average
40	4	5	Poor
50	5	99999	Very Poor

Criticality

- **Business Object**: Asset Criticality Bucket Configuration (W1-AssetCriticalityBuckets)
- **Bucket Configuration**: ASSET_CRITICALITY
- **Description**: Asset Criticality
- **Bucket Value Ranges:**

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Sequence	Start Range	End Range	Criticality Category	Description
10	0	4	Low	Low
20	4	7	Medium	Medium
30	7	9	High	High
40	9	99999	Critical	Critical

Risk

- **Business Object**: Asset Bucket Configuration (W1-AssetBucketConfiguration)
- **Bucket Configuration**: ASSET_360_RISK
- **Description**: Asset 360 Risk
- **Bucket Value Ranges:**

Sequence	Start Range	End Range	Description
10	0.00	1.00	Unrated
20	1.00	15.00	Low
30	15.00	30.00	Medium
40	30.00	45.00	High
50	45.00		Critical

Asset Summary Master Configuration

If the Asset Summary Master Configuration has not been configured, create it as follows:

Business Object: Asset Summary Master Configuration

Bucket Configuration Parameters:

Bucket	Bucket Configuration
Confidence Rating	Asset 360 Confidence Rating (the Confidence Rating configuration you created above)
Condition Rating	Asset Condition Rating (the Condition Rating configuration you created above)
Criticality	Asset Criticality (the Criticality configuration you created above)
Risk	Asset 360 Risk (the Risk configuration you created above)

See Defining Master Configurations for more information.

Add Application Service to Applicable User Groups

To enable access to the Asset Summarization feature, add the Asset Summary Page Action (W1-ASTSUMPA) application service to the appropriate user groups.

Configuring Activity Generation Configurations

Follow the steps described in this section to configure activity generation configurations.

- Defining Configuration Types

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- Defining Configurations
- Defining Configuration Reports

Defining Configuration Types

The **Configuration Type** portal is used to display and maintain configuration types.

You can access the portal from **Admin**, select **Asset Management**, then select **Configuration Type**. You are brought to a query portal with options for searching for a specific configuration type. Once the configuration type has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Configuration Type List**: This zone lists all configuration type records. Broadcast a record to display the details of the selected record.
- **Configuration Type**: This zone displays required information for various asset configurations, such as asset to asset, asset to components, and so on.

Defining Configurations

The **Configuration** portal is used to display and maintain configurations.

Refer to Understanding Configuration Types for more information.

You can access the portal from **Admin**, select **Configuration Report**, and then select **Configuration**. You are brought to a query portal with options for searching for a specific configuration. Once the configuration has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Configuration**: This zone provides information about the configuration, such as asset and specification details.
- **Attachments**: This zone displays attachments related to the specific record.

Defining Configuration Reports

The **Configuration Report** portal is used to display and maintain configuration reports.

Refer to About Operational Devices for more information.

You can access the portal from **Admin**, select **Configuration Report**, then select **Configuration Report**. You are brought to a query portal with options for searching for a specific configuration report. Once the configuration report has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Configuration Report**: This zone provides report criteria about the selected configuration report.

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Operational Device Management

- Understanding Operational Device Management
- Configuring Operational Device Management Options

Understanding Operational Device Management

Oracle Utilities Operational Device Management provides functionality to handle large volumes of assets and to manage the receipt, installation, maintenance, tracking, and removal of those assets. Oracle Utilities Operational Device Management is purchased as a separate license to further enhance Oracle Utilities Work and Asset Management. However, since these two products are typically always sold together, this guide includes seamless documentation for both products. Contact your sales representative or Oracle Support for more information.

Please refer to the About Operational Device Management section in the **Business User Guide** for a conceptual overview of asset functionality.

Device Assets and Components

The application provides a number of utilities specific business objects that can generally be used to create assets and components for specific purposes. However, your implementation will likely require several business objects to define assets and components of other types. Refer to the Understanding Asset Types section for general information on configuring assets and components.

- Asset and Component Configuration Types

Asset and Component Configuration Types

Configuration types define the information required for various asset configurations with other assets, components, firmware, and other aspects of a functioning configured system.

Configurations are referenced on specifications which are then referenced on assets and components to indicate the best way that these entities can work with the other entities that they are connected to in the field.

In general configuration classes define the types of connections that are being configured. The generic classes that are available include:

- Single Asset
- Asset/Component
- Asset to Asset
- Asset/Component to Asset
- Asset to Asset/Component
- Asset/Component to Asset/Component

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Configuring Operational Device Management Options

Follow the steps described in this section to configure Operational Device Management options.

- Defining Asset Configuration Types

Defining Asset Configuration Types

The **Configuration Type** portal is used to display and maintain configuration types.

You can access this portal from **Admin**, select **Asset Management**, and then select **Configuration Type**. You are brought to a query portal with options for searching for a specific configuration type. Once the configuration type has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zone may appear as part of the portal's **Main** tab page.

- **Configuration Type List**: This zone lists all configuration type records. Broadcast a record to display the details of the selected record.
- **Configuration Type**: This zone displays required information for various asset configurations, such as asset to asset, asset to components, and so on.

Inventory

- Understanding Inventory
- Configuring Inventory Options

Understanding Inventory

As inventory falls and reorder becomes necessary, the Inventory system passes this information to the Purchasing system so that purchases of new inventory can be carried out. Using reorder review, the system can be configured to automatically reorder stock items or notify a specified user when the quantities reach predetermined reorder points.

Each time inventory quantity is changed, the system generates a transaction record, and you have access to this information through related logs and historical information zones.

Managing inventory means balancing the need to order new items against the available supply, maintaining an optimum inventory stock level, and stocking and ordering items for upcoming work and safety requirements.

This section describes how various processes work together to manage inventory throughout the system.

Please refer to the About Inventory section in the **Business User Guide** for procedural tasks related to these concepts.

Refer to the Configuring Inventory Options section in the **Administrative User Guide** for configuration guidelines.

- Storerooms

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- Vehicles as Storerooms
- Shipment Deficiency

Storerooms

Storerooms define the physical location where stock items are stored.

Valid storerooms might include actual storerooms, warehouses, or any other location as defined by your organization.

Storerooms can be defined in hierarchies with parent and child locations. The parent can define attributes or identifiers common to all child locations, however specific location information must be defined on each location individually. A child location cannot be in an active status if the parent location is inactive. It is also not possible to make a location inactive if it has associated assets or child locations.

Vehicles as Storerooms

Vehicles, just like buildings and warehouses, can be considered a storeroom since they store pieces of equipment that are required to perform certain types of work.

Equipment, such as meters, pumps, clamps, and so on can be stored on a vehicle and made available for work.

Shipment Deficiency

A shipment deficiency is an entry created when there is a problem with a shipment; either in the number of receipt line items that were received, damage to line items or packaging, expired items or items not working properly, and so forth.

Shipment deficiency records can be created for “material” receipt line items only. Select the **Edit** hyperlink in the **Shipment Deficiency** zone to create, edit, comment, resolve, or delete shipment deficiency details.

Once the deficiency is created, buyers are able to view the deficiencies on a variety of records and receive To Dos so they can manage and track the deficiencies as they work to resolve the issue with the vendor.

- Deficiencies are very noticeable as “Deficient” text displays in red in the info string on a variety of records; purchase order header, purchase order line, receipt line, receipt header, and also in the **Shipment Deficiencies** zone on the **Vendor Location** portal and in the **Inventory Transactions** zone on the **Availability** tab of the **Stock Item Detail**.
- A Shipping Deficiency To Do Type can be configured to generate a To Do to the buyer listed on the purchase order. This To Do includes a link that takes the buyer to the receipt line that has the deficiency. The deficiencies can then be edited, added to, or resolved directly from the **Shipment Deficiency** zone on the **Receipt Line** portal. Definition to automatically generate this To Do is defined in the **Receiving Parameter** zone of the **Master Configuration**.

> **Note**
>
> Please note that the buyer must be associated with the To Do Role defined for the Shipping Deficiency To Do Type.

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Configuring Inventory Options

Follow the steps described in this section to configure inventory options.

- Defining Storeroom Types
- Defining Storerooms
- Defining Shipment Deficiency Types

Defining Storeroom Types

The **Storeroom Type** portal is used to display and maintain storeroom types.

Refer to Understanding Inventory for more information.

You can access the portal from **Admin**, select **Inventory**, then select **Storeroom Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Storeroom Type List**: This zone lists all storeroom type records. Broadcast a record to display the details of the selected record.
- **Storeroom Type**: This zone provides information about the selected storeroom type.

Defining Storerooms

The **Storeroom** portal is used to display and maintain storerooms.

Refer to Understanding Inventory for more information.

You can access the portal from **Admin**, select **Inventory**, then select **Storeroom**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Storeroom**: This zone provides information about the storeroom, such as address information, accounting information, reorder information, and so on.
- **Current Activities**: This zone provides summary information about activities that are currently associated with this location.
- **Asset Summary**: This zone displays statistical information about the assets associated with this location.
- **Child Locations/Organizations**: This zone lists the child locations and organizations associated with the location or organization.
- **Attachments**: This zone enables users to manage all types of attachments for the storeroom record.

Defining Shipment Deficiency Types

The **Shipment Deficiency Type** portal is used to display and maintain shipment deficiency types.

Refer to Understanding Inventory for more information.

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You can access the portal from **Admin**, select **Inventory**, then select **Shipment Deficiency Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Shipment Deficiency Type List**: This zone lists all shipment deficiency type records. Broadcast a record to display the details of the selected record.
- **Shipment Deficiency Type**: This zone provides a description of the selected shipment deficiency type.

Purchasing

- Understanding Purchasing
- Understanding Invoices
- Configuring Purchasing Options

Understanding Purchasing

Purchase requisitions can be created directly from the **Menu**, through work orders, or through the review of storeroom stocked items.

Following a typical procurement life cycle, a requested item or service is listed on a requisition. Once reviewed and approved, if necessary, the requisition is copied into a purchase order. The purchase order is approved and issued to a vendor, and the requested item is received and inventoried. Throughout the process, different areas within the application are automatically maintained such as storeroom quantities and values depending on the type of item being purchased.

If changes are required for a purchase order that has already been approved, a revision can be created within the purchase order. The system also facilitates expediting purchase orders and full or partial receipt of items.

This section describes how various processes work together to manage purchasing throughout the system.

Refer to the About Purchasing section in the **Business User Guide** for procedural tasks related to these concepts.

Refer to the Configuring Purchasing Options section in the **Administrative User Guide** for configuration guidelines.

- Buyers
- Commodities
- Vendors
- Capability Types
- Freight on Board (FOB)
- Payment Terms

Buyers

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Buyers are persons designated within your organization to make purchases and purchasing decisions.

Buyers can be referenced on purchase requisitions and purchase orders to provide an official point of contact for the purchasing transaction. Depending on your business process and configuration settings, buyers may also be able to make changes on approved purchasing documents that affect price and quantity without re-obtaining approval.

Buyers also manage automatic reordering.

Commodities

Purchase commodities are used to assign a specific buyer to a classification of stock items in the storeroom.

A buyer is specified on the purchase commodity so that when the commodity is then referenced on a stock item, the buyer association to that item is made. This allows buyers to be associated with a specialization over specific materials, equipment, and so on. When items of that type are needed, the purchase commodity helps you to identify the buyer with that specialty.

Vendors

Each main Vendor record provides general information about your relationship with the vendor such as active blanket contracts, open requisitions, purchase order history, and a list of vendor locations.

Vendor Locations

One or many vendor locations are defined for each vendor to distinguish between multiple vendor sites. Each location provides more detailed information about the vendor site such as address, capabilities, payment details, contacts, and so on.

For example, it may be valuable to understand which location is shipping the goods that you have ordered from the vendor. Also, some vendors might ship from one site, but your payment terms are set with an alternate site. Capabilities would provide information such as when one location offers pick up at that location whereas another location may not. Commodities describe the types of commodities, such as mechanical, electrical, plumbing and the like, that are associated with a particular vendor at a specific vendor location.

When a vendor has multiple locations, alternate locations are listed as “related” locations.

Capability Types

Capability types refer to the types of products and services provided by a vendor. they are referenced on vendor locations to help identify what the vendor can provide, per location.

Since they are primarily informational, your organization may use capability types in a variety of ways. For example, you might run reports on which vendors provide particular goods or services to have this information handy for buyers' reference when making purchasing decisions.

Freight on Board (FOB)

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Freight on Board or Free on Board (FOB) represents the delivery charge terms negotiated for purchase orders from the vendor. This also includes the vendor or the seller's obligation to deliver goods at a designated place.

This information is referenced on vendor locations, blanket contracts and expedite orders to help define delivery terms.

Payment Terms

Payment terms represent the payment and credit agreement between your organization and the vendor such as the number of days your organization has to pay the invoice or the forms of payment that are accepted.

Understanding Invoices

Please note the following with regard to invoicing:

Master Configuration

Ensure that you create master configuration settings in Purchasing Master Configuration and Financial Master Configuration to process invoicing transactions.

Default Approval Profile for Invoice Submission

If your implementation would like to define a default approval profile and status reason when users submit an invoice for approval processing, you must configure each individual user record with an approval title.

- Navigate to the user and click the **Characteristics** tab.
- In the **Characteristic Type of Invoice Approval Profile** field, enter an approval profile for characteristic value.

  To have the invoice go straight to approved status, select an approval profile based on a **No Approval Required** type of profile.

Invoice Total Cost Validation

The Check Invoice Total algorithm validates that any manually entered invoice total matches the system calculated invoice total. If your implementation wants to enforce matching totals, you can introduce two new algorithms to enforce matching totals:

- Create a validation algorithm to make the Manually Entered Total field on the invoice required.
- Create a copy of W1-CKINVCTTL and modify it so that it produces an error rather than a warning.

  This will force the user to correct the invoice before the system allows it to be processed. Once this copy is created, you should inactivate W1-CKINVCTTL.

Automatic Invoicing

In order for the system to complete automatic invoicing against purchase orders, the vendor on the purchase order must be set as an "auto pay" vendor. When the purchase order is created, it must also be set as "auto pay". After items are received against the purchase order, the system automatically creates an invoice with line items. When an invoice is automatically created, no additional line items can be added to the created invoice and none of the line items can be deleted. If the receipt included more items received than ordered, these invoice line items are placed in "Pending Resolution" status when the invoice is submitted for approval. An

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authorized user must then change the quantity on the purchase order before the invoice can be reprocessed successfully.

Note that when **Require Receipt for Services** is set to “No” in Purchasing Master Configuration, users cannot create a receipt against a purchase order which was created for services. This also affects automatic invoicing in that when this is set to "No", invoices for services must be created manually even when the vendor is set as an "Auto Pay" vendor.

A/P Interface

If WAM owns invoice in your implementation and you need to interface invoices to your A/P system, the base product provides support to batch your invoices. You need to define an algorithm based on the W1-ADENTRYGP algorithm type and plug this algorithm onto the appropriate status of the invoice header BO, e.g. ‘Posted’. This algorithm writes a record in **F1_GEN_PROC** table for that invoice with a batch code, which should be defined in the ‘Invoice A/P Extract’ parameter of the Purchase Master Configuration, and batch run number.

Please note that the base product doesn’t deliver the actual batch process that extracts and formats the data. It’s the implementation team’s responsibility to develop such batch process. You can use the base GL batch extract as a template. The batch control for the GL extract is ‘W1-GLDL’.

If invoice is owned by your ERP system, there is a productized integration to transfer WAM related invoices into WAM, please refer to the ERP integration documentation for more information.

Tax Rate Schedule Selection

A Tax Rate Schedule defines the various tax components for each type of tax (such as state, city, and local tax) that get applied to materials, labor, equipment, and other resource requirements at various instances in times. The tax components for each type of tax identifies the effective date, the sequence in which the tax component is applied, and the factor associated with the specific tax component. If taxes are paid directly to a taxing authority, a cost center and expense code should also be defined.

The actual tax rate depends on the taxing state or taxing city characteristics on the invoice line itself. If the invoice line's taxing state is California, then CA's taxing rate will be applied. But if the invoice line's "Taxing State" is blank, it means state tax is not applicable.

Configuring Tax Characteristics for Invoice Lines

Your implementation must complete the following to ensure that tax component characteristics are captured on Invoice line items:

- For each required tax component, create one **characteristic type** with an **entity flag** of **Tax Component** and one **characteristic type** with an **entity flag** of **Factor**.

  This ensures that the characteristic type will be included on the **Factor Characteristic Types** drop down on **Factors**.

- Introduce a flattened characteristic element for the characteristic type in the Invoice Line business object.

  In order to include these elements in the base business object, the corresponding Invoice Info data area included in the business object can be extended to add the characteristic element(s).

- Configure a pre-processing algorithm for the BO to set default values for the tax characteristic element, if necessary.

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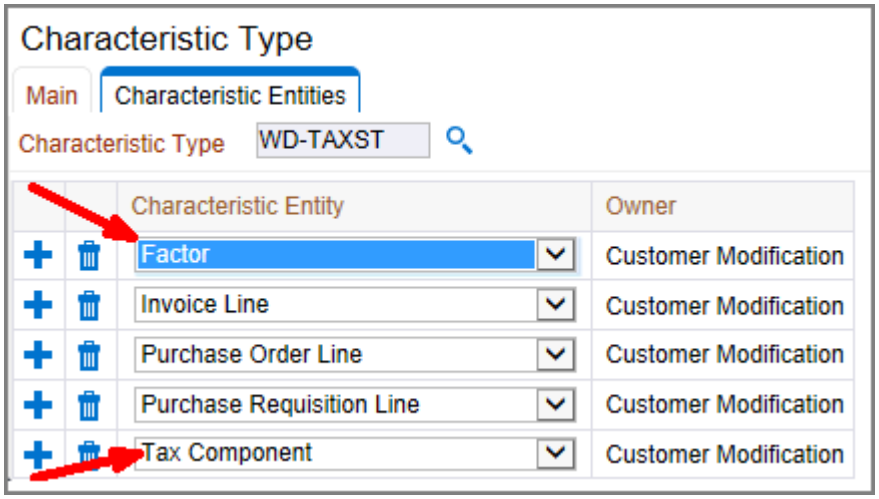
- Use the **Retrieve Characteristic Value from Input Factor Characteristic List** characteristic source algorithm for the factor that will be referenced for the tax component.

Cost Allocation

Note that if any of the cost allocation settings for invoicing are set as “general” the system creates a financial transaction with the following entries:

- **Freight:**
  - Debit Freight Expense; cost center/expense code from Purchasing Master Configuration
  - Credit Payables Clearing; cost center/expense code from Financial Master Configuration
- **Extra Cost:**
  - Debit Extra Cost Expense; cost center/expense code from Purchasing Master Configuration
  - Credit Payables Clearing; cost center/expense code from Financial Master Configuration
- **Discount:**
  - Debit Payables Clearing; cost center/expense code from Financial Master Configuration
  - Credit Discount; cost center/expense code from Purchasing Master Configuration



Configuring Purchasing Options

Follow the steps described in this section to configure purchasing options.

- Defining Blanket Contract Access Lists
- Defining Buyers
- Defining Commodity Codes
- Defining Purchase Commodities
- Defining Capability Type
- Defining Free on Board

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- Defining Payment Terms
- Defining Exchange Rates

Defining Blanket Contract Access Lists

The **Blanket Contract Access List** portal is used to display and maintain blanket contract access lists.

Refer to Understanding Purchasing for more information.

You can access the portal from **Admin**, select **Purchasing**, then select **Blanket Contract Access List**.

The following zones may appear as part of the portal's **Main** tab page:

- **Blanket Contract Access List**: This zone lists all blanket contract access records. Broadcast a record to display the details of the selected record.
- **Blanket Contract Access List Display**: This zone displays a list of authorized users for the list being created.

Defining Buyers

The **Buyer** portal is used to display and maintain buyers.

Refer to Understanding Purchasing for more information.

You can access the portal from **Admin**, select **B**, then select **Buyers**.

The following zones may appear as part of the portal's **Main** tab page:

- **Buyer List**: This zone lists all buyer records. Broadcast a record to display the details of the selected record.
- **Buyer**: This zone displays various information about the buyer, such as email address and primary phone number.

Defining Commodity Codes

This portal is used to view and maintain commodity codes.

Refer to Understanding Inventory for more information.

You can access the portal from **Admin**, select **Inventory**, then select **Commodity Code**.

The **Commodity Code Hierarchy** zone on the portal's **Main** tab page displays a hierarchical view of all commodity codes.

Defining Purchase Commodities

The **Purchase Commodity** portal is used to display and maintain purchase commodities.

Refer to Understanding Purchasing for more information.

You can access the portal from **Admin**, select **Inventory**, then select **Purchase Commodity**.

The following zones may appear as part of the portal's **Main** tab page:

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- **Purchase Commodity List**: This zone lists all purchase commodity records. Broadcast a record to display the details of the selected record.
- **Purchase Commodity**: This zone displays information about the purchase commodity, such as the default buyer.

Defining Capability Type

The **Capability Type** portal is used to display and maintain capabilities.

Refer to Understanding Purchasing for more information.

You can access the portal from **Admin**, select **Purchasing**, then select **Capability Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Capability Type List**: This zone lists all capability type records. Broadcast a record to display the details of the selected record.
- **Capability Type**: This zone displays information about the capability type.

Defining Free on Board

The **Free on Board** portal is used to display and maintain free on board records.

Refer to Understanding Purchasing for more information.

You can access the portal from **Admin**, select **Purchasing**, then select **Free on Board**.

The following zones may appear as part of the portal's **Main** tab page:

- **Free on Board List**: This zone lists all free on board records. Broadcast a record to display the details of the selected record.
- **Free on Board**: This zone displays free on board information.

Defining Payment Terms

The **Payment Terms** portal is used to display and maintain payment terms.

Refer to Understanding Purchasing for more information.

You can access the portal from **Admin**, select **Purchasing**, then select **Payment Terms**.

The following zones may appear as part of the portal's **Main** tab page:

- **Payment Terms List**: This zone lists all payment term records. Broadcast a record to display the details of the selected record.
- **Payment Terms**: This zone displays various information about payment terms, such as discounts, fixed number of days, etc.

Defining Exchange Rates

To properly set up exchange rates for alternate currencies, you must configure the following:

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> **Note**
>
> Refer to the demo environment for the full example.

- Define the currency in the **Currency** portal.
  Demo Example:
  - Canadian Dollars (CAD)
- Configure a **Characteristic Type** and **Value** to define a single value.

  > **Note**
  >
  > The base package contains the Factor Characteristic Source Single Value (W1-FCSV) characteristic type that be used for this.

  Demo Example:
  - Single Value
- Configure a **Characteristic Source Algorithm** for the factor which will define the conversion.

  > **Note**
  >
  > The base package contains the Retrieve Characteristic Value from Input Factor Characteristic Source Algorithm (W1-RETCVFCS) algorithm that be used for this.

  Demo Example:
  - Factor Retrieve Single Value Characteristic
- Configure a factor to define the exchange rate to use.
  Demo Example (U.S. to Canadian exchange rate):
  - **Factor**: USD to CAD Exchange Rate
  - **Factor Characteristic Type**: Single Value
  - **Factor Characteristic Value**: Single Value
  - **Effective Date/Time**: 01–01–2015
  - **Factor Value**: 1.2200000
    This value represents the value of your base currency converted to the foreign currency. In this case, 1 US dollar converted to Canadian.
- Add the factor to the **Purchasing Master Configuration** under **Alternate Currency Exchange Rates**.

When the currency is referenced on a vendor location and processing completes from issued purchase order through to receipt, the system calculates the converted unit price and total. The purchase order displays both values: In this example, **Order Total** in USD and **Converted Total** in CAD.

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Work Options

- Understanding Activity Types
- Understanding Resource Requirements
- Understanding Resource Charges
- Understanding Projects
- Understanding Construction Work
- Understanding Permit Templates
- Understanding Completion Events
- Understanding Service Call
- Configuring Resource Related Options
- Configuring Resource Charges Options
- Configuring Work Options
- Configuring Construction Work Options

Understanding Activity Types

Activity types define the main attributes for activities of a certain type and act as a model and template for **Activity** records. Activity types are created in an *Active* status by default but can be toggled to *Inactive* to prevent the activity type from future use.

The activity type specifies the applicable service class, scheduling information as applicable, default requirements, how to handle errors or exceptions, and completion details for activities of the type. Refer to About Asset Activities for more information.

This section describes various features controlled by activity type configuration.

- Default Labor Requirements
- Checklist Types
- Planned Service History Types
- Categories
- Service Class
- Completion Event Types

Default Labor Requirements

A default set of labor requirements can be defined for each type of activity performed by the company. The system then uses this information to schedule activities of a certain type to the crew shift having the skills to complete the work.

Default labor requirements are defined on the activity type and include the following definitions:

- **Craft** typically indicates a special skill, such as electrician, mechanic, and so on.
- **Quantity** refers to the number of each craft that is needed to work the activity.

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- **Hours** refer to the time requirement to work the activity for each craft.

Checklist Types

Checklist types can be used for managing regulations around permit processes or for basic procedural steps in completing work activities. Refer to Checklistsfor more information on checklist functionality.

General Checklist Type

Checklists of this type are procedure driven and ensures the user works a predefined set of steps in the right order. A checklist type can have one to many line items with each line being marked either mandatory or not. Line items on the checklist type are defaulted to a checklist during the checklist's initial creation.

A checklist type also defines the following:

- The maintenance object such checklists are applicable to; for example, *Activity* or *Permit*.
- The impact such checklists should have when such a checklist is associated with a particular instance of the applicable maintenance object, for example, an activity when that object enters certain statuses in its lifecycle and the checklist has not been completed. The impact could be no impact, warning, or stop processing (error).
- The statuses such checklists should impact.

Permit Item Only Checklist Type

Similar to the General Checklist Type but with the following exceptions:

- Each line item on this checklist type must reference a permit template. Each line item on a checklist of this checklist type refers to a permit whose permit template must match that on the corresponding line items on the checklist type.
- Applicable maintenance object is only limited to Activity in the base product.

Planned Service History Types

Users are able to specify a default list of planned service history types for an activity type. When the activity is created without a template, the list of planned service history types default onto the corresponding zone on the activity allowing the planner to adjust the list as needed.

Users can also specify on the activity type whether a service history type should be required or optional. If set as required, the service history would need to be completed before the activity or template activity can be closed. This is used when reviewing an asset's service history for preventive maintenance purposes.

Categories

The **Categories** field on the activity type refers to a broad range of categories associated with a particular activity type. Some examples are activity types for major repairs could be categorized as a *work activity*, field activities could be categorized as a *field activity*, and asset replication activities could be categorized as a *Replication*.

Categories are defined as a field name under the CATEGORY_FLG lookup.

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Service Class

Service class is a broad categorization of activity types, allowing an activity type to belong to more than one service class. Each activity type must belong to at least one service class.

Examples of service classes include a maintenance service class for all activities associated with preventive maintenance services, an operational service class for activities associated with operations, a renewal service class for all activities associated with renewal services, and a municipal service class for all activities associated with municipal services.

Some of the main usages of service classes are as follows:

- Crews may not be allowed to perform certain classes of work on specific shifts. Activities of the types included in these service classes would not be assigned by the scheduler to these shifts.
- Supervisors would be able to monitor work of a certain service class.

The scheduler uses service class when scheduling work to shifts based on their defined resource requirements. This is matched up with the service class indicated on the activity to help determine which crew shift can work the activity.

Renewal Work

The service class includes a **Service Class Type** field which can be defined as *Renewal* to indicate the work that is done to restore or replace an asset towards its original size, condition, or capacity. The system separately calculates costs for renewal work and displays those costs under the **Renewal** section of the **Asset Cost Summaries** on the **Statistics** tab. Also, if the Service Class Type is for *Construction* or *Construction Overhead*, the **Construction Work In Progress (CWIP) Cost Center** is defaulted onto the activity.

Review your activity types and group them to various service classes to meet your business requirements.

Completion Event Types

Completion event types are used to define the completion events that capture closeout information received from an external application.

Completion event types are referenced on activity types to indicate which completion events are valid and should be included as part of the lifecycle of activities of that type and can be defined as optional or required. As examples, this can affect when service history is created for an activity and the disposition of the assets on an activity as the activity is processed.

> **Note**
>
> You will need to add the completion event type to the activity type using the **Activity Type** portal in order to set the completion event types as optional or required. Also, setting a **Default Event Date Time** on the completion event type controls whether or not the completion event can be created automatically without user input.

Work activities received from an external system require the following completion event types to be listed on the activity type:

- Update Worked Assets (W1-MobileUpdateWorkedAssets)
- Remove Tracked Asset (W1-RemoveTrackedAsset)

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- Remove Non-Tracked Asset (W1-RemoveNonTrackedAsset)
- Install Tracked Asset (W1-InstallTrackedAsset)
- Install Non-Tracked Asset (W1-InstallNonTrackedAsset)
- Attach Component (W1-AttachComponent)
- Create Operational Reading (W1-CreateOperationalRead)
- Create Any Service History (W1-CrAnyServiceHistComplEvtTyp)

> **Note**
>
> Removal completion event types must be listed before installation completion event types to support proper processing of asset exchanges.

Understanding Resource Requirements

This section describes various features of Resource Requirements configuration.

- Internal Versus Purchased
- Crafts
- Equipment
- Miscellaneous Resources
- Materials

Internal Versus Purchased

The system uses the *Internal* or *Purchased* **Resource Source Flag** (RESRC_SRC_FLG) value set on the **Resource Type** in determining how it should process the Activity Resource Requirement (ARR). If set to *Internal*, the resource is added to the estimate. If set to *Purchased*, the system automatically generates a purchase request requisition to be processed to a purchase order for *Issue* to a vendor as soon as the ARR or Activity becomes activated.

Crafts

Crafts, or labor, defines a skill or work specialty for crew members, such as mechanic, electrician, plumber, arborist, and so on. The actual number of labor hours required to work a task is able to be tracked using timesheets.

Every employee as a crew member is defined with a principal craft. This principal craft is used in scheduling activity labor requirements to shifts.

When principal crafts are defined, a secondary craft can also be added as part of the craft definition. Secondary crafts are regarded as additional or complementary skills to the principal craft. While secondary crafts are considered as an available craft during scheduling, their capabilities are given less importance in the schedule.

Likewise, a default set of crafts can be defined in the **Crew Type Labor Profile** zone at the crew type level. Crafts listed in this zone supersede the crafts defined for employees listed on

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the crew shift and total available hours for a particular craft is multiplied by the number of people.

Equipment

Equipment is another type of resource and is considered to be machinery, tools, or vehicles that are required to work activities. Examples of equipment might include trucks, bulldozers, cranes, hammers, and drills.

The actual number of equipment hours required for the task can be tracked using timesheets.

Miscellaneous Resources

Miscellaneous or “Other” resources are those resources that are not considered to be either craft, equipment, or material and which enable a crew member to work an activity. Some examples of resources that are considered “other” are meals, hotel stays, mileage, and so on.

Materials

Material is another type of resource and can be considered the stock items required for the work.

Costs are derived from the stock item when issued to the activity from a material request or from a purchase order's invoice if a direct stock item.

Refer to About Inventory for more information about stock items.

Understanding Resource Charges

An employee may report time and equipment usage as well as miscellaneous other direct charges against an activity they have worked. The resource charges are then produced and posted to the Oracle Utilities Work and Asset Management application.

These reports are not critical to the activity completion process and as such, not considered as activity completion information. The mobile application sends a separate message for each report when the employee marks it as complete.

Completed reports are locally queued and when the device is connected, the mobile application automatically delivers them to the server.

By default, time and resource usage reports may not be entered against a completed activity unless explicitly permitted to do so on the Work Management Master Configuration.

If the employee is allowed to complete the activity they may report time for the entire crew otherwise they may only enter time for themselves.

> **Note**
>
> Time and resource usage reports initiated from the mobile application are yet to be approved as usual by an authorized user using the main application.

- Labor Earning Types
- Time Periods

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- Timekeepers

Labor Earning Types

Your workforce may have to perform different types of work that affect their base wage rate, such as working with hazardous materials, working in confined spaces, or being the lead person on a job. Labor earning types define these types of earning codes and include *Adder* and *Multiplier* fields so the base wage rates can be automatically adjusted.

Time Periods

Your organization must create time periods to define valid *from* and *to* dates for labor costing and timesheet reporting. Time periods have to be distinct and cannot overlap. When a new timesheet is created, the system defaults to the current time period.

Timekeepers

Timekeepers are authorized users who are able to create timesheets or enter and edit timesheet data for one or more employees that are assigned to them. Timekeepers are able to create and adjust hours, travel time, and a variety of other timesheet elements for an individual worker or for multiple workers at one time. Refer to Timesheet Quick Entry for more information.

A Timekeeper record associates a user with a list of employees whom the user is responsible for entering time for, regardless of their supervisor or employee relationship.

One option is available to secure who can search for or update a **Timekeeper** record. Users who are designated as timekeepers should be members of the *Owning Org* **Access Group**. You can then assign the timekeeper to a particular **Owning Org** by populating the **Owning Org** field on the **Timekeeper** record. Once a timekeeper has the **Owning Org** populated, only users of that **Owning Org** can search for, and thus view or update that **Timekeeper** record.

Adding Timesheets from an Activity

Timekeepers can add timesheets for a crew or for an employee directly from the context menu of an activity. The activity must either be in an *Active*, *In Progress*, or *Finished* status and both the crew and the employees must be active.

- When the **Add Crew Timesheet** option is selected, a drop-down list of active crews that the timekeeper has access to displays. Selecting a crew displays a list of the crew's members who are assigned to the timekeeper.
- When the **Add Employee Timesheet** option is selected, a drop-down list of active employees the timekeeper has access to display.

Understanding Projects

This section describes various features of Project configuration:

- Able to be organized into a hierarchical structure
- Linked to many transactional records and cost centers in the system primarily for cost reporting purposes
- Able to be configured to require approval processing

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Key data components on a project include the following:

- Estimated and actual start and end dates
- Budgeted and actual amounts
- Project supervisor

Understanding Construction Work

Configuring for this functionality involves setting up the construction work management specific objects discussed in this section.

Refer to Construction Work Management Setup for the setup sequence and prerequisites.

Fixed Assets

Fixed assets (or Capital assets) are company-owned long-term assets. These assets are initially capitalized but then depreciate over time. The capital cost for installing fixed assets is allocated amongst the associated capital cost centers. All capital cost must also be associated with fixed assets since cost is part of the value of the fixed assets for depreciation purposes. If you assign a capital cost center to an accessory compatible unit or to a removal compatible unit, that same capital cost center must be defined on an install compatible unit with a property unit. The system includes validation to ensure these rules are met and creates an error message whenever an error in data is detected. Users can click directly on the error message to get a more detailed description of the error.

Property Units

Property units group capital and fixed assets that have similar depreciation characteristics. Deprecation is currently not managed within Oracle Utilities Work and Asset Management. Oracle Utilities Work and Asset Management can interface fixed assets, for example, property unit, quantity, in service date, value, and so on, to an external fixed asset management system.

CU Category

CU Category provides a categorization for compatible units.

Every CU Category must belong to a CU Class. A CU Category can be referenced by one or many CU Equipment Groups (for example, Pipes, Poles, or Wires).

Equipment Groups

Equipment groups categorize CU Sets. Every CU Set must reference a single equipment group however, an equipment group can have many CU Sets.

Likewise, every equipment group has a single CU Category, but a CU category can have many equipment groups.

CU Usage

Defines usage categories for compatible units. When planners add compatible units to a work design or construction work order, they can choose a CU Usage, which filters the cost centers to use for the CU. Each CU usage can be associated with one or more cost centers.

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Overhead

Overhead defines how expenses get applied against work designs and construction work orders.

There are two classes of overhead, *Direct Overhead* and *Indirect Overhead*.

- Direct Overhead refers to costs charged to a general Construction Overhead activity. For example, a Construction Work Order could have many actual construction work activities, but only one construction overhead activity for people to book the time they spend designing the entire construction project. Other examples of direct overhead cost could be contingencies, permitting fees, and easement fees. Direct Overhead cost is distributed among those actual construction activities when they close.
- Indirect Overhead refers to costs that are not tracked within **Work and Asset Management** but should be considered as part of the capital expenditure. For example, some construction work is funded by a loan or bond which have costs of their own.
- Compatible Units

Compatible Units

Compatible Units define the materials, labor, and equipment necessary to install or remove assets in relationship to construction work. Compatible units can be referenced by other compatible units to build more complex configuration and allow users to properly group resources together.

Compatible Unit Type

The Compatible Unit Type determines how a compatible unit can be used:

- **Compatible Unit Base**: A simple compatible unit only consists of materials and serves as a building block for function compatible units. They cannot be selected directly on a work design or construction work activity and do not reference a property unit. Base compatible units are meant to model basic stock items used to build up a functional or accessory compatible unit. Changes to the stock item will be reflected on the compatible unit.
- **Compatible Unit Function**: This type of compatible unit is considered as the primary compatible unit which is added to work designs and construction work activities. Functional compatible units can include materials, labor, and equipment and require a function to install or remove the compatible unit. They can also be defined with a condition and property unit. Functional compatible units are intended to model an asset (such as a pole) and to create fixed or physical assets.
- **Compatible Unit Accessory**: This CU is meant to be used in conjunction with other CUs and is not meant to be capitalized. An accessory can be directly selected on a work design or construction work activity and can be designated with a function and condition, but not a property unit. Accessory compatible units are meant to model optional asset accessories that can be added to a work design or construction work activity to accompany the build out of an asset but which don’t directly contribute to the asset as a whole. A CU Accessory can also inherit from a Base CU if there is a desire to abstract the stock items in the Base CU from the various ways the CU can function as a CU Accessory. Note that CU Accessories do not create fixed or physical assets.

Functional and Accessory compatible units are primarily used in two ways:

- On a work design to determine a quote, and perhaps pick between various design options.

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- On a construction work order to initially populate the planned estimates and to drive the assets that will be created.

The accounting information on the compatible unit is used during the construction reconciliation process to produce the true cost of the new asset as well as allocate cost across the appropriate accounting codes. A CU Usage value can be added to the compatible unit to enable the system to retrieve all the valid Cost Center values for the selected CU Usage. If the compatible unit does not include a CU Usage value, a list of all CU Usages are rendered for the planner to choose from and to specify a cost center specific to that usage.

About CU Sets

CU Sets group related compatible units, usually by factors such as equipment group and size. Every compatible unit must belong to at least one CU Set, but may belong to multiple CU Sets.

The main goal of a CU Set configuration is to make it easy to search for and add CUs to work designs and construction work activities by these groupings. A best practice is to ensure that a CU Set is defined for every equipment group and size combination, and to ensure that a set includes the Functional CUs and Accessory CUs together. This will ease the selection of CUs when creating a work design or construction work order.

About CU Contractor Bids

CU Contractor bids define the details of a contractor's proposal to perform the work for a particular Compatible Unit on a construction project.

Contractors must be defined in the system by a vendor location. Bids can only be added to functional or accessory compatible units and they may or may not include materials. Bids have both an effective date and an expiration date.

Activating the bid will ensure that it can be included on the construction work activity where the compatible unit is referenced.

Understanding Permit Templates

Permit information is derived from a Permit Template. A Permit template includes the permit classification and safety details required for a job site and enables the template to be reused for multiple work order permits.

When a planner prepares for an activity, they decide what permits are needed for the job and then they create and add the permit to the activity.

Refer toAbout Permits for more information.

This section describes concepts related to setting up and maintaining permit templates.

Understanding Completion Events

Completion events are used to capture closeout information against activities received from an external application. For example, completion events may be configured for several types of asset processing such as updating worked assets, creating service histories, and creating operational read information.

All external activities have a set of required and optional completion events that can be executed to see the activity to completion. The **Completion** tab on the activity shows any other system objects that are associated to the completed object. For example, if you are looking at the completion event for an activity, the **Completion** tab shows the valid completion-related

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actions, service history, and measurement information that may be associated with the activity, asset, or location in context.

The **Relationship Information** section shows any other system objects that are associated to the completed object. For example, if you are looking at the completion event for an activity, the relationship information shows the asset, any components, the location, service history, and so on.

- Processing an Activity Completion Message
- Completion Event Workflow

Processing an Activity Completion Message

Activity completion is captured in relation to an asset listed on the activity and includes the following details:

- Was any work performed on the asset?
- Was one or more measurements taken for this asset?
- Was there one or more service histories filled out for this asset?

The completion message is locally queued and when the device is connected, the mobile application automatically delivers it to the server.

Completion Event Workflow

Completion events are used to capture closeout information against activities received from an external application. The following is the typical workflow of a completion event:

Pending

This is the initial status of the completion event.

Executed

This status checks for the required completion event.

Discarded

This status indicates the completion event was discarded and is eligible for deletion.

Understanding Service Call

Work designs, work requests, work orders, work orders from templates, and activities can all be created as a result of a service call.

This section describes various features of service call configuration.

- Service Codes
- Service Categories

Service Codes

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Service categories include a list of valid service codes. These service codes drive the processing of the service call record into a work document.

Service codes can be configured to automatically create follow-up work for service calls that include a service code with one or more of the following definitions:

- To Do is created when the **To Do Type** and the **To Do Role** is defined.
- A work request is created when the **Create Work Request** field is set to “Yes”. Optionally, the **Work Request Approval Profile** can also be defined.
- A work order is created when a **Template Work Order** is defined. Optionally a **Work Order Approval Profile** can also be specified.

Refer to the Understanding Approval Processing section of the **Administrative User Guide** for more information on Approval Profiles.

Service Categories

A service category represents a broad grouping of services. Some examples of service categories can include Gas Trouble, Electric Trouble, Water Issues, Vegetation Management, and Customer Requests.

Configuring Resource Related Options

Follow the steps in the order they are described in this section to configure resource related options.

- Defining Unit of Measure Resources
- Defining Crafts
- Defining Equipment
- Defining Miscellaneous Resource

Defining Unit of Measure Resources

The **Unit of Measure —Resource** portal is used to maintain unit of measure resources. A unit of measure is used to quantify a resource.

Refer to Understanding Resource Requirements for more information.

You can access this portal from **Admin**, select **Inventory**, then select **Unit of Measure-Resource**.

The following zones may appear as part of the portals **Main** tab page:

- **Resource UOM List**: This zone lists all the units of measure. Broadcast a record to display the details for the selected record.
- **Resource UOM**: This zone provides information about the selected resource UOM.

Defining Crafts

The **Craft** portal is used to maintain craft resources. Crafts are the labor and skill required to work an activity.

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Refer to Understanding Resource Requirements for more information.

You can access this portal from **Admin**, select **Resource Management**, then select **Craft**. The user is brought to a query portal with options for searching for a specific craft. Once the craft has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zone may appear as part of the portals **Main** tab page:

- **Craft**: This zone provides information about the selected craft, including scheduling information, secondary crafts, and accounting information.
- **Hourly Rate**: This zone enables an hourly rate and effective date to be defined for the craft.
- **Craft Notes**: This zone displays any notes associated with the craft.
- **Attachments**: This zone enables users to manage all types of attachments for the craft record.

Defining Equipment

The **Equipment** portal is used to maintain equipment resources. Equipment is a resource required to work an activity.

Refer to Understanding Resource Requirements for more information.

You can access this portal from **Admin**, select **Resource Management**, then select **Equipment**. The user is brought to a query portal with options for searching for a specific equipment. Once the equipment has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zone may appear as part of the portals **Main** tab page:

- **Equipment**: This zone provides information about the selected equipment, including accounting information.
- **Unit Price**: This zone enables a unit price and effective date to be defined for the equipment.
- **Notes**: This zone displays any notes associated with the equipment.
- **Attachments**: This zone enables users to manage all types of attachments for the equipment record.

Defining Miscellaneous Resource

The **Miscellaneous Resource** portal is used to maintain miscellaneous resources. Miscellaneous resources refers to such things as meals, hotel stays, mileage, documents, attachments, and so forth that are associated with working an activity.

Refer to Understanding Resource Requirements for more information.

You can access this portal from **Admin**, select **Resource Management**, then select **Miscellaneous Resource**. The user is brought to a query portal with options for searching for a miscellaneous resource. Once the resource has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zone may appear as part of the portals **Main** tab page:

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- **Miscellaneous Resource**: This zone provides information about the selected miscellaneous resource, including accounting information.
- **Unit Price**: This zone enables a unit price and effective date to be defined for the miscellaneous resource.
- **Notes**: This zone displays any notes associated with this miscellaneous resource record.
- **Attachments**: This zone enables users to manage all types of attachments for the miscellaneous resource record.

Configuring Resource Charges Options

Follow the steps described in this section to configure resource charges options.

- Defining Labor Earning Types
- Defining Overtime Types
- Defining Timekeepers

Defining Labor Earning Types

The **Labor Earning Type** portal is used to display and maintain labor earning types.

Refer to About Timesheets for more information.

You can access the portal from **Admin**, select **Resource Management**, then select **Labor Earning Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Labor Earning Type List**: This zone lists all labor earning type records. Broadcast a record to display the details of the selected record.
- **Labor Earning Type**: This zone provides information about the selected labor earning type, including adder and multiplier values.

Defining Overtime Types

The **Overtime Type** portal is used to display and maintain overtime types.

Refer to About Timesheets for more information.

You can access the portal from **Admin**, select **Resource Management**, then select **Overtime Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Overtime Type List**: This zone lists all labor earning type records. Broadcast a record to display the details of the selected record.
- **Overtime Type**: This zone provides information about the selected overtime type.

Defining Timekeepers

The **Timekeeper** portal is used to maintain timekeeper records.

Refer to Understanding Resource Charges for more information.

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You can access this portal from **Admin Menu**, select **Resource Management**, then select **Timekeeper**. You are brought to a query portal with options for searching for a specific record. Once the timekeeper record has been selected, you are brought to the maintenance portal where you can view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Timekeeper**: This zone provides information about the selected timekeeper, the status of the timekeeper and the list of employees the timekeeper can enter time for.

Configuring Work Options

Follow the steps in the order they are described in this section to configure work related options.

- Total Risk Lookups
- Defining Project Categories
- Defining Checklist Types
- Defining Permit Classes
- Defining Permit Templates
- Defining Service Classes
- Defining Completion Event Types
- Defining Completion Events
- Defining Service Codes
- Defining Service Categories
- Defining Activity Types

Total Risk Lookups

Work priority and criticality custom lookups require special configuration since they can be searched by range and by greater than and less than values.

The following code descriptions for work priority and asset criticality are delivered as part of the base product:

- **Work Priority**: 09 Emergency
- **Asset Criticality**: 01 Asset Failure Low Impact

The system multiplies the location criticality by the activity work priority to derive a usable total risk value.

To this end, you must configure these lookups, WORK_PRIORITY and CRITICALITY, with the following considerations:

- The **Field Value** or code must be a 2–digit number. This is required even if your codes do not exceed 09. They must be 2 digits for sorting to function properly.
- The description of the value must have the same two digits at the beginning. Since lookup values show up as drop-downs and drop-down values are sorted by description, starting the description with the code will ensure proper sorting.

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Defining Project Categories

The **Project Category** portal is used to maintain project categories. A project category represents a broad classification for projects such as maintenance, capital, construction, and so on.

Refer to Understanding Projects for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Project Category**.

The following zones may appear as part of the portals **Main** tab page:

- **Project Category List**: This zone lists all project categories. Broadcast a record to display the details for the selected record.
- **Project Category**: This zone provides information about the selected project category.

Defining Checklist Types

The **Checklist Type** portal is used to maintain checklist types. A checklist type defines the maintenance object it is applicable to, the impact it should have with its applicable maintenance object, and the statuses it should impact.

Refer to Understanding Activity Types for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Checklist Type**.

The following zones may appear as part of the portals **Main** tab page:

- **Checklist Type List**: This zone lists all permit classes. Broadcast a record to display the details for the selected record.
- **Checklist Type**: This zone provides information about the selected checklist type, including defaulted checklist items and processing constraints.

Defining Permit Classes

The **Permit Class** portal is used to maintain permit classes. A permit class represents a broad category of permits, such as safety permits or permits for right of way.

You can access this portal from **Admin**, select **Work Management**, then select **Permit Class**.

The following zones may appear as part of the portals **Main** tab page:

- **Permit Class List**: This zone lists all permit classes. Broadcast a record to display the details for the selected record.
- **Permit Class**: This zone provides information about the selected permit class, including expiration warnings.

Defining Permit Templates

The **Permit Template** portal is used to maintain a list of permit templates.

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Refer to Understanding Permit Templates for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Permit Templates**. The user is brought to a query portal with options for searching for a specific permit template. Once the template has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zone may appear as part of the portals **Main** tab page:

- **Permit Template**: This zone provides information about the selected permit template. This zone can also include information on the valid checklist types and planned service history, as well as for additional resources, such as labor and material for internal permits.
- **Notes**: This zone lists notes associated with the permit template.
- **Attachments**: This zone displays attachments associated with the permit template. Attachments added here are made available as reference information related to the permit template and are available on a work activity.

Defining Service Classes

The **Service Class** portal is used to maintain service classes. A service class represents a broad class of services.

Refer to About Service Calls for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Service Class**.

The following zones may appear as part of the portals **Main** tab page:

- **Service Class List**: This zone lists all service classes. Broadcast a record to display the details for the selected record.
- **Service Class**: This zone provides information about the selected service class, including the service class type and cost center.

Defining Completion Event Types

The **Completion Event Type** portal is used to maintain various completion event types.

Refer to Understanding Activity Types for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Completion Event Type**. The user is brought to a query portal with options for searching for a specific completion event type. Once the completion event type has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zone may appear as part of the portals **Main** tab page:

- **Completion Event Type**: This zone provides information about the selected completion event type, such as inbound communications and attachments.
- **Unlink Activity Types**: This zone enables the removal of an activity type from the completion event type.
- **Link Activity Types**: This zone adds an activity type to the completion event type.

Defining Completion Events

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The **Completion Event** portal is used to maintain various completion events.

Refer to Understanding Completion Events for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Completion Event**. The user is brought to a query portal with options for searching for a specific completion event. Once the completion event has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zone may appear as part of the portals **Main** tab page:

- **Completion Event**: This zone displays various details about the completion event, such as assets, components, locations and so on associated with the completion event, as well as any related objects and attachments.
- **Completion Event Related Objects**: This zone displays the related objects associated with the completion event.
- **Attachments**: This zone enables users to manage all types of attachments for the completion event.

Defining Service Codes

The **Service Code** portal is used to maintain a list of valid service codes. Service Codes are used to create the appropriate work record from the service call.

Refer to Understanding Service Calls for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Service Code**. The user is brought to a query portal with options for searching for a specific service code. Once the service code has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zone may appear as part of the portals **Main** tab page:

- **Service Code**: This zone provides information about the selected service code and enables user functions to manage To Dos, work requests, work orders and work priorities.
- **Unlink Service Categories**: This zone enables the removal of a service code from the valid service code list of service categories.
- **Link Service Categories**: This zone adds a service code to the valid service code list of service categories.

Defining Service Categories

The **Service Category** portal is used to maintain service categories. A service category represents a broad category of services.

Refer to Understanding Service Calls for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Service Category**.

The following zones may appear as part of the portals **Main** tab page:

- **Service Category List**: This zone lists all service categories. Broadcast a record to display the details for the selected record.

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- **Service Category**: This zone provides information about the selected service category, including a list of valid service codes.

Defining Activity Types

The **Activity Type** portal is used to maintain activity types. An activity type represents a broad range of activities, such as maintenance, repairs, inspections, and so on.

Refer to Understanding Activity Types for more information.

You can access this portal from **Admin**, select **Work Management**, then select **Activity Type**. The user is brought to a query portal with options for searching for a specific activity type. Once the activity type has been selected, you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portals **Main** tab page:

- **Activity Type**: This zone defines the main attributes of an activity type. Activity type definitions can include some of the following: Default Labor Requirements, Activity Scheduling information, Planned Service History, Completion Event Types, and so on.
- **Attachments**: This zone enables users to manage all types of attachments for the activity type.

Configuring Construction Work Options

Follow the steps in the order they are described in this section to configure construction work related options.

- Defining Property Units
- Defining Compatible Unit Categories
- Defining Compatible Units
- Defining Compatible Unit Sets
- Defining Compatible Unit Usages
- Defining Compatible Unit Contractor Bids
- Defining Equipment Groups
- Defining Overheads

Defining Property Units

The **Property Unit** portal is used to display and maintain property units.

Refer to Understanding Construction Work for more information.

You can access the portal from **Admin**, select **Financial**, then select **Property Unit**.

The following zones may appear as part of the portal's **Main** tab page:

- **Property Unit List**: This zone lists all property unit records. Broadcast a record to display the details of the selected record.
- **Property Unit**: This zone provides information about the selected property unit.

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Defining Compatible Unit Categories

The **Compatible Unit Category** portal is used to display and maintain compatible unit categories.

Refer to Understanding Construction Work for more information.

You can access the portal from **Admin**, select **Construction Work Management**, then select **CU Category**.

The following zones may appear as part of the portal's **Main** tab page:

- **CU Category List**: This zone lists all compatible unit category records. Broadcast a record to display the details of the selected record.
- **CU Category**: This zone provides information about the selected compatible unit category.

Defining Compatible Units

The **Compatible Unit** portal is used to display and maintain compatible units.

Refer to Understanding Construction Work for more information.

You can access the portal from **Admin**, select **Construction Work Management**, then select **Compatible Unit**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Compatible Unit**: This zone provides information about the compatible unit.
- **Compatible Unit Hierarchy**: This zone displays a hierarchy tree view of the compatible unit.
- **Contractor Bids**: This zone displays contractor bid details associated with the compatible unit.
- **Referencing Compatible Units**: This zone displays a table view of compatible units that reference the current compatible unit.
- **CUs for the Same CU Set**: This zone displays a table view of compatible units that are in the same compatible unit set.
- **Attachments**: This zone enables users to manage all types of attachments for the compatible unit record.
- **Notes**: This zone displays note information about the compatible unit.

The following zones may appear as part of the portal's **Resources** tab page:

- **CU Materials**: This zone displays material cost details, such as Stock Item, Unit of Issue, Quantity, Unit Price, and any derived costs.
- **CU Labor and Equipment**: This zone displays labor and equipment cost details, such as Craft, Number of People, Hours Per Person, Craft Rate, Total Hours, and any derived cost associated with labor and then Equipment, Unit of Measure, Quantity, Duration, Equipment Rate, Total Duration, and any derived costs associated with equipment.

The following zones may appear as part of the portal's **Log** tab page:

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- **Compatible Unit Log**: This zone displays log information for the current compatible unit record.
- **Approval Request History**: This zone lists the approval requests for the current compatible unit.

Defining Compatible Unit Sets

The **Compatible Unit Set** portal is used to display and maintain compatible unit sets.

Refer to Understanding Construction Work for more information.

You can access the portal from **Admin**, select **Construction Work Management**, then select **Compatible Unit Set**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Compatible Unit Set**: This zone provides information about the compatible unit set.
- **Compatible Units**: This zone displays a table of the compatible units in the set and enables you to link an existing compatible unit or add a new compatible unit.
- **Compatible Units Hierarchy**: This zone displays a tree view of the compatible units in the set.
- **Attachments**: This zone enables users to manage all types of attachments for the compatible unit set record.
- **Notes**: This zone displays notes about the compatible unit set.

Defining Compatible Unit Usages

The **Compatible Unit Usage** portal is used to display and maintain compatible unit usages.

Refer to Understanding Construction Work for more information.

You can access the portal from **Admin**, select **Construction Work Management**, then select **CU Usage**.

The following zones may appear as part of the portal's **Main** tab page:

- **CU Usage List**: This zone lists all compatible unit usage records. Broadcast a record to display the details of the selected record.
- **CU Usage**: This zone provides information about the selected compatible unit usage, such as the CU Usage Description and its associated Cost Centers.

Defining Compatible Unit Contractor Bids

The **CU Contractor Bids** portal is used to display and maintain contractor bids.

Refer to Understanding Construction Work for more information.

You can access the portal from **Admin**, select **Construction Work Management**, then select **CU Contractor Bid**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

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The following zones may appear as part of the portal's **Main** tab page:

- **CU Contractor Bid**: This zone provides information, such as bid amount and currency, about the contractor bid.
- **Other Bids by Contractor**: This zone displays a list of compatible units and associated contractor bids.
- **Attachments**: This zone enables users to manage all types of attachments for the compatible unit contractor bid record.
- **Notes**: This zone displays notes about the contractor bid.

Defining Equipment Groups

The **Equipment Group** portal is used to display and maintain equipment groups.

Refer to Understanding Construction Work for more information.

You can access the portal from **Admin**, select **Construction Work Management**, then select **Equipment Group**.

The following zones may appear as part of the portal's **Main** tab page:

- **Equipment Group List**: This zone lists all equipment group records. Broadcast a record to display the details of the selected record.
- **Equipment Group**: This zone provides information about the selected equipment group.

Defining Overheads

The **Overhead** portal is used to display and maintain overhead details.

Refer to Understanding Construction Work for more information.

You can access the portal from **Admin**, select **Construction Work Management**, then select **Overhead**.

The following zones may appear as part of the portal's **Main** tab page:

- **Overhead List**: This zone lists all overhead records. Broadcast a record to display the details of the selected record.
- **Overhead**: This zone provides percentage details for Additional Overhead not specific to any Resource Type as well as Work Designs and Construction Work Orders associated with a selected overhead, including material overhead, labor overhead, equipment overhead, and other overhead.

Preventive Maintenance

- Understanding Preventive Maintenance
- Configuring Preventive Maintenance Options

Understanding Preventive Maintenance

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Preventive maintenance programs can be utilized to keep your business in compliance with regulatory requirements and business needs. Users can define compliance rules to ensure the work is completed in a timely manner and to track and report against compliance work.

Please refer to Understanding Compliance for more information.

The system supports scheduled preventive maintenance and event based maintenance.

Event Based Maintenance

Event based maintenance is work that is performed based on trigger dates. Events differ from maintenance schedules because the system does not manage when to cycle the work. Instead, planners decide upon the next schedule date for the event and enter it on the **Maintenance Event** record. Work performed can include inspections, repairs, replacements, and so on, but it is typically associated to planned outages or other event based maintenance. Work records are generated on the trigger date based on the indicated defaults and templates.

Maintenance Forecasts

The upcoming maintenance for an asset is forecast based on the maintenance schedule and triggers defined for that asset. This information is displayed in the **Asset** portal on the **Asset Maintenance Trigger Forecast** zone.

About Maintenance Specification

Assets inherit their maintenance schedule from their **Maintenance Specification**. One **Maintenance Specification** can be linked to multiple maintenance schedules; one for each applicable asset situation. For example, you might configure a maintenance schedule for “in Service” and another for “in Stores”.

Configuration Guidelines

Set up preventative maintenance for your assets by completing the following general steps:

1. Decide on the type of maintenance schedule needed for the asset:

   Preventive Maintenance

   - A **Maintenance Schedule** is associated with an **Asset Type** and provides a series of predefined **Maintenance Triggers** which define when to perform specific activities on the asset to ensure its continued operation.
   - There are four methods of calculating the maintenance schedule, as defined by the **Trigger Type** — calendar anniversary, calendar interval, runtime anniversary, and runtime interval. The triggers are defined in terms of either time duration (for calendar-based methods) or runtime values.

     Refer to Maintenance Triggers for more information on maintenance triggers.
   - Assets inherit their maintenance schedule from their **Maintenance Specification**. One **Maintenance Specification** can be linked to multiple maintenance schedules; one for each applicable asset situation. For example, you might configure a maintenance schedule for “in Service” and another for “in Stores”.

   Event Based Maintenance

   Instead of using scheduled preventive maintenance, you might find that event based maintenance is more appropriate for the asset. Event based maintenance is typically used to execute planned outages.

   - Maintenance plan triggers are used to configure a specific work order for a particular location for use by a maintenance event. They define the maintenance plan, template

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work order, activity type, service history type, work order defaults and asset location for the work being created for the maintenance event, as applicable. The work order template indicated on the trigger defines the pre-planned requirements for the work that is created for the event. The trigger location can either be defined on the work order template specified or on the trigger itself. Specifying an asset location on the trigger allows for the reuse of a common work order template.

2. Plan for the preventive or event based maintenance work by setting up a template work order.
3. Schedule the work plan:
    - **Preventive Maintenance** Set up a maintenance schedule and maintenance triggers.

      Note that maintenance triggers for compliance work also involves the definition of a **Compliance Category** and **Compliance Type** so that work orders can be generated.

        - **Compliance Category** is the grouping of compliance types that are applicable to preventive or corrective maintenance.
        - **Compliance Type** links the associated compliance category and compliance class to a specific maintenance trigger.
    - **Event Based Maintenance** Set up a maintenance plan and maintenance triggers.
4. Trigger, execute and closeout the work.
   Preventive Maintenance
    - Monitor algorithms generate **Asset Maintenance Trigger Forecast** records with the date at which the asset is due for the preventive maintenance.
    - The trigger creates the preventive maintenance work order and activity, (using the template work order) which then becomes part of the asset's service history.
    - The forecast is based on the horizon days set on the asset monitor.
    - Forecast information is displayed on the **Asset Maintenance Trigger Forecast** zone in **Asset** portal.

   Event Based Maintenance
    - Planners decide upon the next schedule date then create or modify **Maintenance Event** records.
5. Evaluate results and plan effectiveness then modify the maintenance work plans as needed.

About Failure Mitigation

Failure profiles group failure types, failure modes, failure repairs, and failure components into a profile which can be attached to an asset type to define valid failure information for assets of that type. Effective use of failure profiles can help to ensure that assets run without fail, increase cost effectiveness, improve machine uptime, and help your organization to understand the level of risk you have undertaken with certain assets.

Generally the process includes the following:

- Define Failure Modes Effects and Critically Analysis:
    - Identify assets, asset functionality, and the standards of performance for those assets.
    - List all possible ways that the assets could fail and provide the required functions.
    - Provide detail on the types of events that could cause these failures.
    - Identify the effects on the system when failures happen.

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- Define the following according to your business practices::
  - **Failure Cause** — Represents the specific manner or way by which a failure occurs in terms of failure of the part. This may generally describe the way a failure occurs such as due to corrosion, debris, or distortion.
  - **Failure Mode** — Describes what has failed.
  - **Failure Repairs** — Indicates the repair that will be performed on the asset in case of failure.
  - **Failure Component** — Indicates the part of the asset for which the failure has occurred.
- Indicate the maintenance that can be performed to prevent or avoid such failures. This maintenance contains cost effective tasks to preserve functions that are important to the system.
- Set up preventive maintenance plans in the same way as described above using maintenance schedules, triggers and linking these to the assets using specifications. Base package **Maintenance Schedule Activity Types** and **Completion Event Types** can be used when setting up schedule plans and work requirements.
- Preventive Maintenance Calendars

Preventive Maintenance Calendars

Preventive maintenance calendars establish calendars with explicit effective dates and schedule dates. These are used to schedule activities created by preventive maintenance triggers. The main function of the calendar is to allow direct control over scheduled work dates.

The effective date is determined using the activity work date with the “desired work date” as the activity work window start date.

Configuring Preventive Maintenance Options

Follow the steps described in this section to configure preventive maintenance options.

- Defining Maintenance Managers
- Defining Preventive Maintenance Calendar

Defining Maintenance Managers

The **Maintenance Manager** portal is used to display and maintain maintenance managers.

Refer to Understanding Preventive Maintenance for more information.

You can access the portal from **Admin**, select **Location**, then select **Maintenance Manager**.

The following zones may appear as part of the portal's **Main** tab page:

- **Maintenance Manager List**: This zone lists all maintenance manager records. Broadcast a record to display the details of the selected record.
- **Maintenance Manager**: This zone provides information about the selected maintenance manager.

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Defining Preventive Maintenance Calendar

The **Preventive Maintenance Calendar** portal is used to display and maintain preventive maintenance calendars.

Refer to Understanding Preventive Maintenance for more information.

You can access the portal from **Menu**, select **Preventive Maintenance**, then select **Maintenance Calendar**.

The following zones may appear as part of the portal's **Main** tab page:

- **Maintenance Calendar List**: This zone lists all maintenance calendar records. Broadcast a record to display the details of the selected record.
- **Maintenance Calendar**: This zone provides information about the selected maintenance calendar.

Scheduling

- Understanding Scheduling
- Understanding Shift Plan Templates
- Configuring Scheduling Options

Understanding Scheduling

A schedule manages a scope of work. The schedule takes into consideration various resource requirements:

- Crew type drives craft availability on the daily schedule.
- Assignment of the crew to a shift with exact time span when the crew is available.
- Matches crew capabilities with crew shifts resource requirements.
- Uncompleted work is reassigned to the next available shift.
- Automatically queries the system for unfinished backlog of work.
- Employees
- Crews
- Planners
- Service Area Criteria
- Service Class Criteria

Employees

Employee records are used to manage human resource level information for the workers within your organization.

Details such as name and personal information, work status, the main craft worked by the employee, their business unit, payroll information, hire date, and timesheet information can all

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be maintained from the employee record. The employee record can also tie the employee to a service area where they are allowed to work as well as track training completed by the employee, assign assets (such as computer equipment or vehicles), and define the employee's billable rate.

Mandatory or optional training courses can be specified on the employee record to manage and track the employee's qualifications. Only active course records are presented on the value list when associating a training course to an employee record. However, once a course is associated to an employee record, it is displayed on the employee record regardless of the status of the course. After the course is selected, a mandatory **Effective Date** for the course must be specified (If not specified, the value will default to the current date. All other fields are optional). Courses are defined as an **Extendable Lookup BO (W1-Course)** and provide optional settings for the course, such as enabling the sending of email to the employee and to the employee's supervisor when a course is about to expire; Set **Employee Notification** value to *Yes* if you want to send an email to the Employee and set **Supervisor Notification** value to *Yes* if you want to send an email to Supervisor. Next, set the **Notification Lead Days** for the Employee, for the Supervisor, or for both of how many days before the expiration date the system should send the email.

Employee records are not required to reference a corresponding user profile. When there is no associated user profile, the module can be used to simply store information about employees who do not use the application. Information from the employee portal can be integrated with your external human resources system.

Employee is referenced throughout the system on other records such as crews and crew shifts, contacts, direct charges, timesheets, leave requests, and to indicate which employee is responsible for or in possession of an asset, and so on. These various records can be searched for using employee as the search criteria.

Timesheet Schedule

The individual lines of an employee's timesheet can be configured to automatically generate directly from the **Timesheet Schedule** tab on the **Employee** record for any *active* employee.

- **Auto Timesheet Creation** enables or disables the automatic creation of timesheet rows for the selected employee record.
- **Work Calendar** is an optional field on every employee record. If selected, **Work Calendar** identifies the normal business days for the organization and takes priority over the generation of the rows. For example, if **Work Calender** is specified for an employee that works on a **Saturday** or a holiday, the timesheet row for those days will not be automatically generated since **Saturdays** and holidays are not normal work days defined in the **Work Calendar**.
- **Start Date** defines the date to generate the timesheet header rows.
- **End Date** defines the date the system is to stop creating the timesheet header rows.

> **Note**
>
> Generation of timesheet header rows are only generated up to and including the current date.

- Authorized users are able to make changes to the timesheet information for the selected employee. Such fields as craft, hours, charge types, days of the week, and start and end dates are some of the available information that can be edited for each row.

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> **Note**
>
> **Start** and **End** dates for the individual rows supersedes the start and end date on the header. This process does not exclude approvals since planners or other authorized users must still validate timesheet information and submit an approval.

The *W1–EMP* batch is used to trigger the *W1CREAUTOTS* and *W1–MONTRMDT* algorithms on the *W1–EmployeeInformation* business object's *Active* lifecycle to generate the automatic timesheet rows and monitor the termination date of the employee. The Last Processing Date field enables users to see the last date the timesheet row was generated.

Leave Requests

Employees can request leave or it can be requested on their behalf through the Employee Unavailability portal. Timesheets to cover these time periods of unavailability can be created in advance and then submitted for approval, which tells the system to skip the auto timesheet creation for those time periods. Refer to Employee Unavailability for more information.

Employee Calendar

The employee calendar is available on the **Employee** record when the employee is assigned to at least one shift or the employee has scheduled leave.

Crews

A crew is a group of workers that can be assigned to complete work. Crews are used to group workers, schedule work, and help organize work schedules.

Once a crew is created, shifts can be generated. Work order labor requirements can be assigned to the crew shift and to a particular individual on the crew.

Note that an employee can be assigned to more than one crew.

Employees are defined as primary as well as secondary members of the crew and may access the crew's schedule of work using the mobile application.

Planners

Planners and maintenance managers are defined for your organization as personnel authorized to perform certain functions or who are responsible for overseeing specific work. For example, planners are usually responsible for planning work and materials for assets. Maintenance managers are typically more involved with an aspect of work such as managing hazardous materials or specialized equipment. The usage of these roles depends entirely upon your business practices.

Every planner and maintenance manager references the User ID of the assigned person. Work statistics on the **Home Page** can be configured to display by planner or by maintenance manager.

Service Area Criteria

A service area defines a company's territorial boundary. This may mean that your organization may define the service area geographically, by region or territory, or by business unit, such as construction, inventory, or purchasing, or by any other business need.

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Service areas are used for scheduling and routing purposes:

- Matches the service area defined on the activity to the service area where the crew is allowed to work.

Service area can be defined at the crew level, which is the most common method, or on the employee record or crew shift.

Service Class Criteria

Service class on the crew shift assists the system in scheduling activities:

- Indicates the type of work a shift is able to perform.
- Prompts the system to prefer one service class over another.

A list of service classes can be defined on the crew shift to enable it to be matched with the service class listed on the activity.

Understanding Shift Plan Templates

While crew shifts can always be manually created to address a specific situation, they are typically planned and generated ahead of time based on recurring templates. Templates provide a tool for quickly generating large numbers of shifts based on predefined parameters.

A shift plan template defines a cyclical weekly pattern made up of weekday shift templates.

For example, you might define a weekly template in which the crew works its regular 9-5 shift Monday - Friday every week and also works an on-call shift on Saturday and Sunday every third week. Thus the shift plan template would rotate every 3 weeks.

Resource planners can create shift plan templates for specific crews, or they can create common templates and subscribe multiple crews to one template.

This section describes concepts related to setting up and maintaining shift plan templates.

A batch monitor associated with the subscription template business object performs the shift generation just like the crew specific shift weekly template. The base product implementation of generating shifts for a subscription uses the common template referenced on the subscription along with complementary details from the crew entity.

- A Shift Plan Template is Made of Shift Templates
- Crew Specific Plan Template
- Common Plan Templates
- One Effective Plan Template for a Crew
- Shift Generation
- Overridden Shift Details
- Draft and Original Templates

A Shift Plan Template is Made of Shift Templates

A weekly shift plan template describes general information about the shift plan-the number of weeks in rotation, crew, and effective date. The shift plan template also includes shift templates that describe the recurring daily shift patterns that were defined on the shift plan template for the number of weeks in the rotation. The details associated with each daily shift within the

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rotation is what is captured on the daily shift template record. For example, a weekly shift plan template might use a different daily shift template on Fridays than the one used on other days.

This section describes concepts related to setting up and maintaining shift templates.

Shift Templates versus Actual Shifts

Each shift template starts with the selection of a Crew Shift Type, and then other details, such as work availability hours, crew members, service classes, and service areas can be populated as needed. These details defined on the shift template is what is used to generate the actual shifts. A Shift Weekly Template Periodic Monitor Process (W1-SFWKT) is used to create the actual shifts based off the template.

The system enforces the close pairing between the shift template and the shift it creates by storing both the actual shift and the shift template records in the same table (this is done so that similar details can be shared). Also, the same crew shift type defines both the business object used to create the actual shifts of this type as well as the business object used to create the shift templates of that type. Additionally, generated shifts maintain a reference to the shift template that was used to generate it to ensure that any changes made to the template may be reapplied to those shifts.

Refer to Defining Crew Shift Types for more information on how to create crew shift types.

Complete versus Partial Shift Details

If the weekly shift plan template is dedicated to a specific crew, each daily shift template may include the complete shift information needed to generate a shift.

A weekly shift plan template may be defined as a common template to be Maintaining Crew Shifts shared by multiple crews. As such, details unique to each crew, such as the crew and the resources allocated to it, cannot be specified on the common template as they differ for each crew. The crew specific details are taken from the crew record at shift generation time.

Refer to Shift Generation for more information.

Crew Specific Plan Template

Crew specific plan templates are dedicated to a specific crew and cannot be shared with other crews. As such, each weekday shift template is fully defined with everything that the shift generator needs to generate a shift for this crew.

The initial date of the cyclical weekly pattern is the effective date of the template.

This type of plan template references the crew it is designed for, as well as the resources allocated to the crew, on each shift template. This allows for more complex situations where different resources are allocated to the same crew on different days of the week.

This section describes concepts related to setting up and maintaining crew specific plan templates.

Defining and Applying A Template

When you create a new shift plan template, its status is **Pending**. No shifts are generated while the template is in this state allowing you some time to properly define the weekday shift templates and review them as needed.

After you have defined the shift templates, you must apply the crew specific plan template so that actual shifts are generated from it based on the template's effective period. Applying the template changes its status to **Applied** and the system right away generates future shifts

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starting from the template's effective date (or from now if that date is in the past) and until the template's expiration date, if any.

> **Note**
>
> Generating shifts online is limited to a pre-configured number of days in order to avoid the apply action from taking too long and timing out. The parameter is defined on the shift generation algorithm.

Once applied, the shift generation background process manages the generation of shifts going forward.

Refer to Shift Generation for more information about the generation algorithm as well as the overall process.

Making Changes To An Applied Template

Extending or shortening the effective period of an applied template adjusts future shifts accordingly as soon as you make the change.

If you attempt to add, delete, or modify a shift template for an applied crew specific plan template, the system automatically creates a draft copy of the entire crew specific plan template it belongs to. The changes are made to the draft copy, leaving the original template unchanged. This allows you to make changes in a more controlled way.

You make changes to the draft copy and preview the shifts that would be generated should you accept the draft. If you decide to accept the draft, the original template is updated to match the draft and changes are immediately applied to already generated future shifts accordingly.

Refer to Draft and Original Templates for more information.

Common Plan Templates

You can set up common plan templates which can be shared across multiple crews. This is helpful for the efficient generation of shifts in organizations where there are sometimes hundreds or possibly even thousands of crews that follow the same weekly shift patterns.

This section describes concepts related to setting up and maintaining common plan templates.

Subscription

The common plan template defines the initial date of the cyclical weekly pattern as well as the details for each shift template. These shift templates cannot include crew specific information, such as the resources allocated to the crew on that shift and so on, as they need to be shared by multiple crews.

You may subscribe multiple crews to a common plan template to use as their template for generating shifts. Shifts generated from the common plan template are exactly the same except for crew specific details which are defaulted from the crew record. Any crew that subscribes to a common template must have these types of details defined on the crew record.

Subscription to a common template is effective dated so that crews can subscribe to follow a common template as of a given date and this relationship can expire. Each crew can subscribe at different times, but their shifts are generated in the same rotation timing as all other subscribed resources, regardless of when they subscribed.

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You may also unsubscribe a crew from the common template at any time or change effective dates to affect the creation of future shifts for those crews.

Activation

In a typical workflow, you would create a common plan template and then subscribe multiple crews to the template. When template and subscriptions are ready to be used to generate shifts, you activate the template. Shifts are generated only when the common template is active.

Since a common template may involve a large number of subscriptions, actual shift generation is performed the next time the shift generation batch process runs. Note that you may still test your template and process it online for a subscribed crew without waiting for the next scheduled batch run.

Refer to Shift Generation for more information.

Making Changes To An Active Template

Changes made to an already active common plan template affect future shifts of all subscribed crews. Since a common plan template may involve a large number of subscriptions, such changes are not applied right away to all these shifts but rather they take effect the next time the shift generation batch process runs. This includes extending or shortening the effective period of an active template, subscribing or unsubscribing a crew, and so on.

If you want to test your recent changes without waiting for the next scheduled batch run you can do so by processing them online for one of the subscribed crews.

Similar to crew specific shift templates, if you attempt to add, delete, or modify a shift template for a shift plan template, the system automatically creates a draft copy of the entire shift plan template, leaving the original template unchanged.

This allows you to make changes in a more controlled way. You make changes to the draft copy and preview the shifts that would be generated should you accept the draft. If you decide to accept the draft, the original template is updated to match the draft. However, unlike crew specific templates, the impact on these changes on future shifts only takes effect the next time the shift generation batch process runs.

Refer to Draft and Original Templates for more information.

One Effective Plan Template for a Crew

A crew's specific shift plan template and subscription to common templates are either effective for a specified number of weeks starting from their effective date, or they may be perpetual, which means they have an effective date but no end date.

The crew can switch from a specific shift plan template designed just for this crew or subscribe to a common template, and vice versa over time, but their shifts may be generated by a single shift template at any given point in time. In other words, a crew's shift templates must never overlap in time.

Shift Generation

The system generates future shifts for crews based on the shift plan templates with which they are associated.

Common templates do not generate shifts as they are not defined for specific crews. Only a crew specific plan template and a crew's subscription to a common template are used to generate shifts for the crew throughout their effective period. Unlike a crew specific shift plan

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template that is self contained, a crew's subscription to a common template sets the shift generation effective period, whereas template details as well as the initial rotation date are defined on the common template.

Shifts are generated based on the cyclical pattern of the shift plan template, starting from the shift plan template's effective date (or from now if the effective date is in the past) and up to a predefined number of days known as the planning horizon, or earlier, if the template expires before then.

The planning horizon is defined as a Global Configuration Setup parameter and is used by the shift generation process to control the maximum number of days for shifts to generate and be available for planning purposes at any point in time.

If the template references a work calendar, the process skips generating shifts that even partially overlap with a public holiday.

The first few shifts may be initially generated online when you apply a crew specific shift template or verify the setup for a crew's subscription to a common template, but the ongoing process of generating additional shifts to meet the planning horizon is handled by the shift plan template monitor process.

> **Note**
>
> The shift generation process relies on the shift plan template being periodically monitored by the **Shift Weekly Template Periodic Monitor** batch process as often as appropriate to meet your organization's needs.

The background process is designed to add new shifts as needed on a daily basis. However, if any shift template was changed, the process would automatically regenerate future shifts that were earlier generated by that template to match its latest version. By default, even shifts that were manually overridden are regenerated to match the latest template version, but you may explicitly indicate to retain these changes when making a shift template change.

Refer to Overridden Shift Details for more information.

When a shift is about to be generated but happens to overlap with another shift for the crew that was not generated by this template, the generation of the shift is skipped and a user is notified by raising a to do entry that reports the situation.

> **Note**
>
> Logic used to generate shifts from a shift template resides in a "Generate Shifts" algorithm on the shift template's business object.

Overridden Shift Details

In a situation where crew shift details differ from their template on a particular date, generate the shift initially from the template and then manually adjust it to override the template settings. This includes canceling a shift that is no longer needed. These modified shifts are called overridden shifts as they no longer match the template from which they were generated.

By default, any changes made to a shift template is automatically reapplied to all future planned but not yet closed shifts that were generated from that template and any manual overrides will be lost. If you wish to retain overridden shifts you may indicate so on the shift template being changed.

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Draft and Original Templates

If you attempt to add, delete, or modify a shift template for a shift plan template that has been applied (or activated for common templates), the system automatically creates a draft copy of the entire shift plan template. This allows you to make your changes to the draft and preview the shifts that would be generated if you accepted the draft.

You can also see if any manual edits were made to previously generated shifts. By default, such overrides are lost when the shift template that generated them is changed when a draft is accepted. You may explicitly request to retained overrides when making the shift template change.

If you have reviewed this information and are sure you want to make the proposed changes, you may accept the draft. Otherwise, you may delete the draft copy to discard the proposed changes.

When a draft template is accepted, the original template is updated to match the draft.

- If a shift template was changed, future shifts generated by this template are regenerated to match the changed template.
- If a shift template was deleted by the draft, the corresponding original template is also deleted if not yet used to generate shifts, otherwise it is marked inactive. Future shifts generated by this template are deleted.
- New shifts are generated for any shift templates that were added by the draft.

By default, changes made to a shift template impacts all future planned but not yet closed shifts generated by it, including overridden templates.

> **Note**
>
> If the original shift plan template is a crew specific template, changes are reapplied to future shifts right away when you accept the draft. If the original template is a common template, the impact is delayed to the next time the shift generation batch process runs.

Refer to Overridden Shift Details for more information.

Once a draft has been accepted, any further changes made to the original template will result in a new draft being created.

Configuring Scheduling Options

Follow the steps described in this section to configure scheduling options.

- Defining Employee Types
- Defining Employees
- Defining Employee Unavailability Types
- Defining Crew Shift Types
- Defining Crew Types
- Defining Crews
- Defining Planners

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- Defining Service Areas
- Defining Shift Plan Templates
- Defining Shift Templates

Defining Employee Types

The **Employee Type** portal is used to display and maintain employee types.

Refer to Understanding Resource Requirements for more information.

You can access the portal from **Admin**, select **Resource Management**, then select **Employee Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Employee Type List**: This zone lists all employee type records. Broadcast a record to display the details of the selected record.
- **Employee Type**: This zone provides information about the selected employee type.

Defining Employees

The **Employee** portal is used to display and maintain employees.

Refer to Understanding Resource Requirements for more information.

You can access the portal from **Admin**, select **Resource Management**, then select **Employee**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Employee**: This zone provides information about the employee, such as personal information, employment information, training information, and payroll information.
- **Employee Assets**: This zone identifies the relationship types between assets and employee.
- **Employee Shifts**: This zone provides a calendar view of employee shifts.
- **Billable Rate**: This zone provides hourly rate and effective date information for the selected employee.

The following zones may appear as part of the portal's **Timesheet Schedule** tab page:

- **Timesheet Schedule**: This zone enables or disables the automatic generation of timesheet rows for an individual employee. Also, timesheet and scheduling information can be edited directly from this zone.

Defining Employee Unavailability Types

The **Employee Unavailability Type** portal is used to display and maintain employee unavailability types.

Refer to Understanding Scheduling for more information.

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You can access the portal from **Admin**, select **Resource Management**, then select **Employee Unavailability Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Employee Unavailability Type List**: This zone lists all employee unavailability type records. Broadcast a record to display the details of the selected record.
- **Employee Unavailability Type**: This zone provides information about the selected unavailability type.

Defining Crew Shift Types

The **Crew Shift Type** portal is used to display and maintain crew shift types.

Refer to Understanding Scheduling for more information.

You can access the portal from **Admin**, select **Resource Management**, then select **Crew Shift Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Crew Shift Type List**: This zone lists all crew shift type records. Broadcast a record to display the details of the selected record.
- **Crew Shift Type**: This zone provides information about the selected crew shift type.

Defining Crew Types

The **Crew Type** portal is used to display and maintain crew types.

Refer to Understanding Scheduling for more information.

Refer to Resource Usage for a better understanding of crew charge rates.

You can access the portal from **Admin**, select **Resource Management**, then select **Crew Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Crew Type List**: This zone lists all crew type records. Broadcast a record to display the details of the selected record.
- **Crew Type**: This zone provides information about the selected crew type.
- **Crew Type Labor Profile**: This zone lists the craft resources for the crew type.
- **Crew Type Equipment Profile**: This zone lists the equipment resources for the crew type.

Defining Crews

The **Crew** portal is used to display and maintain crews.

Refer to Understanding Scheduling for more information.

You can access the portal from **Admin**, select **C**, then select **Crew**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

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- **Crew**: This zone provides information about the crew, such as primary and secondary crew members, default crew service classes and crew service areas.
- **Shift Plan Template**: This zone provides details about the shift plan template.
- **Crew Calendar**: This zone displays a calendar view of the crew's shifts.

Defining Planners

The **Planner** portal is used to display and maintain planner records.

Refer to Understanding Scheduling for more information.

You can access the portal from **Admin**, select **Work Management**, then select **Planner**.

The following zones may appear as part of the portal's **Main** tab page:

- **Planner List**: This zone lists all planner records. Broadcast a record to display the details of the selected record.
- **Planner**: This zone provides information about the selected planner.

Defining Service Areas

The **Service Area** portal is used to display and maintain service area records.

You can access the portal from **Admin**, select **Location**, then select **Service Area**.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Area List**: This zone lists all service area records. Broadcast a record to display the details of the selected record.
- **Service Area**: This zone provides information about the selected service area.

Defining Shift Plan Templates

The **Shift Plan Template** portal is used to display and maintain shift plans.

Refer to Understanding Shift Plan Templates for more information.

You can access the portal from **Admin**, select **Resource Management**, then select **Shift Plan Template**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Shift Plan Template**: This zone provides details about the shift plan template, such as shift plan controls and the template's effective period.
- **Shift Templates**: This zone displays a default weekly calendar view.

The following zones may appear as part of the portal's **Review** tab page:

- **Preview Calendar**: This zone provides a calendar view in order to review details of the shift plan.

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Defining Shift Templates

The **Shift Template** portal is used to view and maintain a shift template as part of setting up a shift plan template.

Refer to Understanding Shift Plan Templates for more information.

You can access the portal from the shift templates zone on the shift plan template.

The following zones may appear as part of the portal's **Main** tab page:

- **Crew Shift Template**: This zone provides information about the shift, including the various maintenance actions applicable to its current state.
- **Overridden Shifts**: This zone shows shifts that were generated by this template but their setup has since been manually changed from the setup defined by the template.

Approvals

- Understanding Approval Processing
- Defining Approval Profiles
- Understanding Change Request Types
- Defining Change Request Types
- Enabling the Work Order and Work Request Approval Summarization Features

Understanding Approval Processing

One of the ways that the system simplifies and speeds up work is by routing records when they require approval. For example, purchase requests, work requests, employee leave, and other functions can be configured to require approvals.

Basic approval processing requires that the person creating or managing a record that requires approval must create an approval request. This is done by clicking the **Submit for Approval** button on the record when it is in a pending approval status and then selecting the appropriate approval profile for the document. Once a record is submitted for approval, the request is emailed to approvers, sent to their To Do List, or both.

- The **Approval Request** shows the related document, the person who submitted it and when, who has approved it so far, and which roles still need to provide an approval decision.
- Approval requests use an **Approval Profile** to determine the properties and requirements for the approval. A common structure defines the approval process, users, and limits for each given functional area that uses approval processing. The **Approval Profile** indicated on the approval request identifies the people who need to approve the record and their role. Sometimes there are multiple approvers needed depending on how the approval profile is set up and your business practices. Often records will have a set of approval profiles which are defined for all records of that type. For example, when a new work request is routed for approval, the options for approval profile are limited to those defined for work requests. Most users only need to know which **Approval Profile** to choose when they submit a record for approval. This selection will depend on your business processes

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and how your approval profiles are configured. For example, when a user submits an approval request for a timesheet, they should only see approval profiles available for a timesheet. See Approval Profiles for more information.

- Approvers can access information about approvals that require their attention using the **Approval Dashboard**. Also, the person (requestor) who submitted the record for approval can check the status of the approval from a zone on their home page or by checking the individual record. The requestor is notified by e-mail when the record has been approved or if the request times out.
- Most approvers also have access to the **Approval Request Action** zone on the side **Dashboard** where they can record and submit their decision to reject or approve the approval request. Access to this zone is controlled by your **Portal Preferences** in your user profile.
- The **Log** tab on the record being approved indicates who approved the record and when.

Refer to About Approvals for more information.

- Approval Hierarchy
- No Approval Needed
- Example

Approval Hierarchy

Approval profiles can reference one or many **To Do Roles**. The way in which you structure your approval profiles depends on how regulated the structure needs to be for your organization.

Your business practices may be such that your approvals can go to a limited number of supervisor and manager roles, or they can be more advanced having detailed levels. To this end, the To Do Roles you create can be shared across document types or they can be kept discrete to business process and functionality. This is also true for the **No Approval** user group. There can be one role to be reused across your approval processing configuration, or you can set more roles to address different functions.

One type of record, such as work order, might require several different **Approval Profiles** to address different situations. For example,

- PM work might be “auto-approved” since the work needed has already been analyzed, planned and approved.
- Emergency work might bypass normal approval processing since it might come in at off hours or will otherwise be subject to different approvals than regular work.
- Regular work will likely require general approval processing.

Approval Types

Approval Types indicate whether the approval role is standard, mandatory, or notification only:

- **Standard**: A standard approver might appear on the approval hierarchy with other approvers with equal approval authority. Any standard approver can record the decision before the record moves on to the next approver in the hierarchy.
- **Mandatory**: Indicates that this approver must provide an approval decision on the record. Approval processing is not complete until this decision is recorded.

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- **Notification Only**: Notification only approvers are only sent an email that the approval is pending. The system does not validate an amount limit and the approver does not have to respond in order for the record to be approved.

> **Note**
>
> If an approver with enough authority approves the request, and there are no other mandatory approvers, the approval request is complete. In this case, other *standard* and *notification only* approvers on the approval path are skipped. No action can be taken to approve or reject the approval request.

Additional Approval Profile Settings

- **Initial Notification Method**: Indicates whether the approver receives an e-mail, an alert in their To Do List, both, or none.
- **Authorized to Approve**: (Non-Amount Based only) When multiple To Do Roles are added to the profile, this field identifies which is authorized to approve. At least one to do role must be added with this value set to Yes.
- **Amount Limit**: Provides the maximum amount that the approver in the indicated role is allowed to approve. If the value on the record in need of approval exceeds this limit for the role, the approval path must move on to the next approver or the requester is notified that no one on the approval profile has sufficient authority to approve the request.
- **Timeout Threshold**: Indicates the amount of time that the approver has to respond to the approval request, in days. For example, if the threshold is set to “2”, the approver has 2 days to approve requests.
  If the approver does not respond within the set time, another alert is sent. Additional alerts are sent up to the set number of retries.
- **Maximum Retry**: Indicates the number of times that the system will retry sending the approval request to approvers with the To Do Role before timing out the request. For example, if the Timeout Threshold is set to “2” and the Maximum Retry is set to “3” the system will try three times for a total of 6 days resending the alert or email every 2 days. If the approvers fail to respond, the request is routed to the next approver in the hierarchy and that person receives the email or alert.

No Approval Needed

User groups referenced on **No Approval Required** approval profiles indicate the user groups that can create an approval request in which the system automatically approves the record. Some examples of where a **No Approval Required** approval profile can be used might be for emergency type work which could be generated at anytime or for routine maintenance type work that has a lower impact on business processes.

Example

The following table provides examples of the types of roles you may need to create in order to support your approval hierarchy:

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Admin Object	Example of Data to Create
To Do Types	These default types are delivered with the base package with the ToDo Type Usage set to **Automatic**: • Approval Type — Employee Unavailability • Approval Type — ODC • Approval Type — Project • Approval Type — Purchase Order • Approval Type — Purchase Requisition • Approval Type — Timesheet • Approval Type — Work Order • Approval Type — Work Request
To Do Role	• General Approver • General Director • General Manager • General Notification Only Approver • General Supervisor • General Work Management Supervisor • General Work Management Manager • General Purchasing Manager • General Purchasing Supervisor
User Groups	• Authorized for No Approval
Approval Profiles	• Approval Amount – General Purchasing Approver – High Value Purchasing Approver – General Work Request Approver – General Work Order Approver – High Value Work Order Approver – Project Approver – Other Direct Charges Approver • No Approval – Emergency Work Approval • No Amount – Employee Unavailability Approver – Timesheet Approver

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Using a scenario of a moderate structure with a separate approval profile for each document type, refer to the following table for an example of the hierarchy:

Seq	To Do Role	Approval Type	Initial Notification Method	Amount Limit	Time Out Threshold	Maximum Retry
10	Supervisor	Standard	To Do List Only	$1000	2 (days)	1 (retry)
20	General Manager	Mandatory	Both (email and To Do List)	$5000	2 (days)	2 (retries)

This example establishes a hierarchy where the first role to receive the approval request is at the supervisor level with a minimal approval limit. This supervisor would approve the request only to inform the general manager that they approve, but since the General Manager has been set with a mandatory approval type, the General Manager must approve the request for the processing to be considered complete.

Defining Approval Profiles

The **Approval Profile** portal is used to display and maintain approval profiles.

You can access the portal from the **Admin** menu, select **WAM General,** then select **Approval Profile**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Approval Profile**: This zone provides information about the approval profile.
- **Approval Information**: This zone provides additional details about the approval profile, such as the To Do to be used and the hierarchy to use when an approval record is submitted.
- **User Groups**: This zone provides information on what user groups can create the approval request.

Understanding Change Request Types

A change request type defines the related object, for example, Asset, that change requests of this type are for and the applicable approval profiles for such change requests.

Refer to About Change Requests for more information.

The related object is defined by the extendable lookup “Change Request Related Object”. The product comes with support to several key entities but your implementation may extend this configuration to support additional entities.

The following sections describe concepts and features related to change request configuration.

- Entity Specific Versus General Change Requests
- Initiating Change Requests
- Enabling Change Request For Another Entity

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Entity Specific Versus General Change Requests

An "Entity Specific” change request type supports the tracking and approval of changes requested for an existing entity. A general change request type supports all other types of requests, for example:

- A request to update several entities where the request describes in text what should be changed.
- A request to add one of more entities that do not exist yet.

Initiating Change Requests

A dashboard zone allows users to view or create a change request for the entity currently being displayed when at least one active change request type exists for such entity. For example, if a change request type exists for an asset then the dashboard zone would appear when an asset is displayed.

> **Note**
>
> Though the product comes with some “Change Request Related Object” extendable lookup values, you can still control which ones to enable by only creating the change request types for the ones you need.

Only one in-progress change request is allowed for a specific entity, for example a specific asset, therefore the button, when applicable, may only be available if such a request does not already exist. If the change request exists, a link to the in-progress request is provided, allowing any user to navigate to it and review the requested changes.

If there is no in-progress change request for that specific instance, a **Create Change Request** button is made available on the **Dashboard** for users with or without “Update” security access to that object.

By definition, this dashboard is not applicable to “General” change requests. Users need to use the menu to add such change requests.

Enabling Change Request For Another Entity

To enable change request for another object, you need to do the following:

- Add a new value to the “Change Request Related Object” extendable lookup.
  - Select the corresponding entity value. For example, Cost Center.
  - Select the corresponding FK reference, which is used to search for a specific instance of the related object. For example, a particular cost center.
- Create the change request types for the new related object.
- Associate the maintenance portal of that entity to the dashboard change request context sensitive zone as follows:
  - Find the maintenance portal by navigating to **Admin**, select **Portal**, and then search for the portal page.

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  - Click the **Navigation Option** hyperlink to navigate to the portal's navigation option.
  - Go to the **Target Transaction** and copy the navigation key.
  - Navigate to **Admin**, click **Context Sensitive Zone**, and then paste the navigation key into the **Navigation Key** field and click **Search**.
  - Add the **Change Request Dashboard** (W1–CGRQDASH) to the **Zone** column for this navigation key.
- If you want to have a nicely formatted UI on the change requests with separate fields for users to enter new values, you need to do the following:
  - Create a "mini" BO for that object.
  - Navigate to the entity's maintenance object, select the **Options** tab, and select the change request "Valid BO Option Type" for the entity's maintenance object options.
  - Define the "mini" BO as a BO option of **Option Type** "Change Request BO" on the base BO for that object. Please refer to those objects delivered as product values for the "Change Request Related Object", except for "**General**" change requests. For example, if you go to BO "W1-Vendor", you will see such BO options.
- Please Note:
  - The mini BO should simply include a list of elements you would like to include in the change request process but without **Record Actions** and so forth. Please refer to our base "mini" BO's for an example.
  - Without a "mini" BO, users can only describe the changes they would like to make in the detail description text field. As such, users need to manually make the updates in the system upon approval of the change request and then update the change request to an "Applied" status. Please note that change requests of a "**General**" type are not for any specific object thus, are not a "mini" BO by definition.
- If you want to have audit logs for changes to elements defined in the mini BO, please add the audit algorithm 'W1GENCGRQLOG' to the BO's that the mini BO is added to as a BO option.
- Flush the online cache.
  - Replace the cis.jsp section of the url with flushAll.jsp (case sensitive) and refresh the url.
  - Once finished, it is traditional to close all of your browser windows and log in.

Defining Change Request Types

The **Change Request Type** portal is used to display and maintain change request types.

You can access the portal from **Admin**, select **Resource Management**, then select **Change Request Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Change Request Type List**: This zone lists all change type records. Broadcast a record to display the details of the selected record.
- **Change Request Type**: This zone provides general information about the selected change request type as well as valid approval profiles.

Refer to Understanding Change Request Types for more information.

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Enabling the Work Order and Work Request Approval Summarization Features

To enable access to the Work Order Approval Summarization and/or Work Request Approval Summarization feature, add the appropriate application service to the appropriate user groups:

- **Work Order**: Work Order Approval Summary Application Service (W1-WOAISUMAS)
- **Work Request**: Work Request Approval Summary Application Service (W1-WRAISUMAS)

> **Note**
>
> Work Order and Work Request Approval Summarization relies on generative AI models that must be deployed as part of your cloud service implementation. Please contact your Oracle Customer Success Manager if you wish to use Work Order and Work Request Approval Summarization.

Financials

- Understanding Financials
- Understanding Cost Adjustment Types
- Configuring Financial Options

Understanding Financials

Financials management involves creating and managing entities such as expense codes, distribution codes, cost centers, cost categories, tax rate schedules, accounting calendars, and so on.

Financial Transactions (FTs) are created for a variety of situations, but is most generally associated with the purchase or use of resources, such as the time cost of using labor, the invoicing or receipt of materials, and so on. There is always some system transaction record that drives the creation of the FT, which is referred to as the **Creating Sibling** record. The system also captures that sibling record on the FT. Each FT belongs to a single accounting period which must be open at the time of creation and is related to a particular currency.

Each FT consists of two or more balanced financial transaction general ledger (FT GL) lines (at least one debit and one credit). This information can be sent to your organization's general ledger. On the FT GL record, the system can capture an associated Project, Cost Center, and Expense Code, as applicable. Each transaction is booked to a particular GL Account code using a distribution code and its associated GL Account Detail. The distribution code specifies how the GL Account string is to be constructed using the **GL Construction Algorithm**. The **Financial Master Configuration** specifies which distribution code to use for particular scenarios.

Please refer to the Financials section in the **Business User Guide** for a conceptual overview of financial functionality.

Master Configuration

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Ensure that you create master configuration settings in **Financial Master Configuration**.

- Cost Category
- Cost Centers
- Business Unit
- Rate Calculation
- ERP Integration

Cost Category

Cost categories group expenses or costs into logical buckets for reporting purposes.

- Each expense code references a cost category.
- Each cost category can be assigned a specific color so that the category is represented by that color in graphs and pie charts throughout the system. Each color should only be referenced by one cost category.

Cost Centers

As costs are incurred, the system tracks them and accumulates them at different levels or cost centers within your organization. Cost centers are part of the accounting hierarchy.

Cost center records display financial statistics, such as budget amounts, year to date actual amounts, and committed amounts for the cost center. These amounts represent the fiscal year rather than the calendar year. The cost center record also contains free form account segment fields for building the general ledger (GL) account number. General ledger account numbers are a concatenation of the elements, such as company, business unit, cost center, project, and so on. There are some elements that are not available or configured within the Oracle Utilities Work and Asset Management application but are still able to make up the GL string when financial transactions (FTs) are created. A **Cost Center Monthly Statistics** zone also allows you to display more detailed information by month in a graph.

Allow User Charge

User records that result in costs or charges need to reference a cost center that has this value set to *Yes*. For example, when users create activities, the referenced cost centers must “allow user charges”. This value is set to *No* on cost centers that are specifically designated for general ledger or system generated costs. For example, an inventory cost center is referenced on storerooms to balance the debit and credit sides of the general ledger (issue materials for an activity to charge the debit side and reduce the inventory value to adjust the debit side).

Business Unit

Business units are used as cost reporting entities for timekeeping expenses.

Employees are associated with a specific business unit so that when they report time charges, the costs are charged against that business unit. Your implementation will use the business unit to indicate whether to cost timesheets by employee wage rate or craft rate.

The system uses double entry accounting. For example, when time is booked against an activity, the system debits the cost centers on the activity and credits an offset account. In this case the offset account would be the payroll cost center defined on the crew member or employee's business unit.

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Rate Calculation

Tax Rate Schedule

A Tax Rate Schedule is the first step in implementing rate calculations and defines the tax components (State tax, City tax) that are applicable at various instances in time for related resources (materials, labor, equipment, and other). The tax rate can be defined on a resource type but this can be overridden for specific storerooms if necessary..

Tax Components, Characteristic Type, and Characteristic Type Values

Each tax component should be set up as a Characteristic Type and include several associated values. For example, if the Characteristic Type is State, the associated values could include Alaska, Alabama, Arkansas, Arizona, and so on. You will also need to define the list of portals that this Characteristic Type is relevant for. (Only ones that have a Tax Information zone would really be valid) Taxes and tax rates are subject to change over time so each tax component would reference a factor that captures the effective-dated tax percentage.

Factors and Factor Values

Factors are used to calculate tax values related to anything which incurs costs that must be taxed for your organization, such as purchases and resources used to complete activities. For example, you might define different factors for city tax, state tax, and federal tax.

Factor definition references a Factor Characteristic Type and includes only those Characteristic Values that are appropriate. Factor definition also captures an Effective Date/Time and Factor Value which is used to calculate the tax and is able to be edited. The factor is then referenced on a **Tax Rate Schedule**.

Extending the Data Area

Each jurisdiction has its own applicable taxes so implementations will need to extend the system to add the taxes that are applicable for them. One way to extend the system is to use the Data Area (DA) Extension to extend the base Business Object (BO).

- You will need one DA for each business object you want to extend and the element name for every type of tax must match across all the DAs.
  - Find the Data Area that needs to be extended for the BO.
  - Drill into the Maintenance Object to discover the table the Characteristic would reside on.
  - Navigate back to the business object's **Schema** tab and copy the **Data Area** for the **Tax Information** zone.
  - Create a new custom Data Area and indicate what data it is extending (Prefix your element names with "cm" to avoid upgrade issues).
  - Return to the **Schema** tab and enter the schema to match your Fields and Factors.
  - Here is an example Schema:

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Here is the schema:

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
  <cmTaxState mdField="CM_TAXST" mapField="CHAR_VAL" uiHint:select="bs:W1-RETCHARVL"
uiHint:selectIn="characteristicType:'WD-STATE';" uiHint:selectOut="valuePath:results/value;
descPath:results/description">
    <row mapChild="W1_INVOICE_LINE_CHAR">
      <CHAR_TYPE_CD is="WD-STATE"/>
    </row>
  </cmTaxState>
   <cmTaxCity mdField="CM_TAXCT" mapField="CHAR_VAL" uiHint:select="bs:W1-RETCHARVL"
uiHint:selectIn="characteristicType:'WD-CITY';" uiHint:selectOut="valuePath:results/value;
descPath:results/description">
    <row mapChild="W1_INVOICE_LINE_CHAR">
      <CHAR_TYPE_CD is="WD-CITY"/>
    </row>
  </cmTaxCity>
</schema>
```

Please see the **Framework** section of this guide for more information on Data Areas.

ERP Integration

Integration of Oracle Utilities Work and Asset Management with an Enterprise Resource Planning (ERP) application, such as Enterprise Business Suite, can be used to manage financial functions, such as invoicing and procurement functions.

Users can define which application is the owner of the process from the ERP Integration portal . Once ownership is established, the information can either interface using the ERP connector or processed using batch processing.

Refer to the Oracle Utilities Work and Asset Management Connector for Enterprise Resource Planning documentation for more information.

Understanding Cost Adjustment Types

Cost adjustment types define the values for cost adjustments of a certain type including information such as accounting information and a default approval profile.

Cost Adjustment types are defined by:

- **Cost Adjustment Type Business Object**: The business object used for cost adjustments based on this cost adjustment type.
- **Approval Profile**: A list of approval profiles used in the approval process for this cost adjustment type are as follows:
  - Amount Based

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- Role Based
- Self Approval

> **Note**
>
> that the cost adjustment type can have one, and only one, default adjustment profile which can be selected from a list of approval profiles.

- **Offset Cost Center**: Identifies the offset cost center to use for the clearing account.
- **Offset Expense Code**: Identifies the offset expense code to use for the clearing account.
- **Distribution Code**: A list of valid distribution codes used to construct the actual GL account. Each cost adjustment can have one and only one distribution code which controls how the GL account number is constructed by the system.

Refer to Defining Cost Adjustment Types for more information about setting up cost adjustment types.

Configuring Financial Options

Follow the steps described in this section to configure financial options.

- Defining Accounting Calendars
- Defining Business Units
- Defining Cost Adjustment Types
- Defining Cost Categories
- Defining Cost Centers
- Defining Distribution Codes
- Defining Expense Codes
- Defining Factors
- Defining Tax Rate Schedules

Defining Accounting Calendars

The **Accounting Calendar** portal is used to display and maintain accounting calendars.

Refer to Understanding Financials for more information.

You can access the portal from **Admin**, select **Financial**, then select **Accounting Calendar**.

The following zones may appear as part of the portal's **Main** tab page:

- **Accounting Calendar List**: This zone lists all accounting calendar records. Broadcast a record to display the details of the selected record.
- **Accounting Calendar Display**: This zone lists accounting period information about the selected account calendar.

Defining Business Units

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The **Business Unit** portal is used to display and maintain business units.

Refer to Understanding Financials for more information.

You can access the portal from **Admin**, select **Financial**, then select **Business Unit**.

The following zones may appear as part of the portal's **Main** tab page:

- **Business Unit List**: This zone lists all business unit records. Broadcast a record to display the details of the selected record.
- **Business Unit**: This zone displays information about the selected business unit.

Defining Cost Adjustment Types

The **Cost Adjustment Type** portal is used to display and maintain cost adjustments.

Refer to Understanding Cost Adjustment Types for more information.

You can access the portal from **Admin**, select **Financial**, then select **Cost Adjustment Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Cost Adjustment Type List**: This zone lists all cost adjustment type records. Broadcast a record to display the details of the selected record.
- **Cost Adjustment Type**: This zone displays information about the selected cost adjustment.

Defining Cost Categories

The **Cost Category** portal is used to display and maintain cost categories.

Refer to Understanding Financials for more information.

You can access the portal from **Admin**, select **Financial**, then select **Cost Category**.

The following zones may appear as part of the portal's **Main** tab page:

- **Cost Category List**: This zone lists all cost category records. Broadcast a record to display the details of the selected record.
- **Cost Category**: This zone displays information about the selected cost category.

Defining Cost Centers

The **Cost Center** portal is used to display and maintain cost centers.

Refer to Understanding Financials for more information.

You can access the portal from **Admin**, select **Financial**, then select **Cost Center**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Cost Center**: This zone provides financial information for the cost center as well as account segment details used to create the general ledger account number.

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- **Cost Center Monthly Statistics**: This zone displays a graphical view of monthly statistics for the selected cost center.
- **Valid Expense Code**: This zone displays valid expense codes for the selected cost center.

Defining Distribution Codes

The **Distribution Code** portal is used to display and maintain distribution codes.

Refer to Understanding Financials for more information.

You can access the portal from **Admin**, select **Financial**, then select **Distribution Code**.

The following zones may appear as part of the portal's **Main** tab page:

- **Distribution Code List**: This zone lists all distribution code records. Broadcast a record to display the details of the selected record.
- **Distribution Code**: This zone displays information about the selected distribution code.

Defining Expense Codes

The **Expense Code** portal is used to display and maintain expense codes.

Refer to Understanding Financials for more information.

You can access the portal from **Admin**, select **Financial**, then select **Expense Code**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Expense Code**: This zone provides information about the expense code, such as resource class, cost category, and account segment values.

Defining Factors

The **Factor** portal is used to display and maintain factors.

Refer to Understanding Financials for more information.

You can access the portal from **Admin**, select **Financial**, then select **Factor**.

The following zones may appear as part of the portal's **Main** tab page:

- **Factor List**: This zone lists all factor records. Broadcast a record to display the details of the selected record.
- **Factor**: This zone displays information about the selected factor.
- **Factor Values List**: This zone displays the factor values that are applied to the factor, the date and time the factor goes into effect, and the tax component used to calculate the tax values.

Defining Tax Rate Schedules

The **Tax Rate Schedule** portal is used to display and maintain tax rate schedules.

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Refer to Understanding Financials for more information.

You can access the portal from **Admin**, select **Financial**, then select **Tax Rate Schedule**.

The following zones may appear as part of the portal's **Main** tab page:

- **Tax Rate Schedule List**: This zone lists all tax rate schedule records. Broadcast a record to display the details of the selected record.
- **Tax Rate Schedule**: This zone displays information about the selected tax rate schedule.

Integrations

- Understanding Integrations
- Understanding Web Services
- Understanding GIS Integration
- ESRI ArcGIS Server
- Upgrading from ESRI 10.x to 11.x
- Configuring GIS Integration
- Configuring Legacy GIS Integration
- Understanding Data Synchronization
- Creating an Outbound Sync Request
- Configuring Inbound Communication Options
- Enterprise Resource Planning Integration
- Creating Application Links in External Applications

Understanding Integrations

Integrations with other Oracle Utilities applications help to provide clients with a complete application solution.

Outbound and *Inbound* messages are used to communicate shared data and functions between integrated applications. The default delivery method for messages is set as *Asynchronous* and is the preferred method for message delivery as this method uses a batch process to provide more efficiency and stability in the handling of messages. Asynchronous messaging uses a deferred monitor on the Lifecycle *Pending* state of the following business objects:

- For *Outbound* Messages:
  - W1-ActivityOutboundSyncRequest and W1-OutboundIntegration
  - **Note**

    W1-OutboundIntegration is a Parent/Root BO so all the child BOs are also *Asynchronous*.
- For *Inbound* Messages:
  - W1-InboundCommunicationRoot

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> **Note**
>
> Changes to this configuration is strongly discouraged since errors occuring after the outbound message is sent will not be detected by the target system.

This section identifies the specific product integrations that include Oracle Utilities Work and Asset Management:

- **Esri ArcGIS**:
  GIS applications are widely used to manage assets, locations and other spatial data. The Oracle Utilities Work and Asset Management GIS Integration interfaces with an Esri ArcGIS Portal/Server to allow users to view asset layers on a map, and to create and view work requests and work orders on the map.

  Refer to Understanding GIS Integration for more information and configuration details.
- **Enterprise Resource Planning (ERP)**: Oracle Utilities Work and Asset Management can be integrated to an Enterprise Resource Planning (ERP) application, such as Enterprise Business Suite, to manage purchasing, financial, inventory, and human resource functional areas.
  Refer to the Oracle Utilities Work and Asset Management Connector for Enterprise Resource Planning documentation for more information.
- **Oracle Utilities Analytics**:
  Oracle Utilities Analytics Dashboards provide analysis of data from Oracle Utilities Work and Asset Management or Oracle Utilities Operational Device Management using Oracle Business Intelligence Enterprise Edition built-in metrics. Non-spatial analytics, information that is not tied to geography, is represented in a series of dashboards showing tables, bar graphs, pie charts, and gauges.

  Refer to the Oracle Utilities Analytics documentation for more information.
- **Oracle Utilities Integration for Device Operations (For ODM only)**:
  Oracle Utilities Operational Device Management integration with Oracle Utilities Meter Data Management.

  Refer to the Oracle Utilities Integration for Device Operations documentation for more information.

Understanding Web Services

This section provides a high-level description of web services and outbound messages provided by the product to support various types of integrations.

Refer to the Inbound Web Services portal for more information about each inbound service.

Refer to the Defining Outbound Message Types portal for more information about each outbound message type.

Refer to the appropriate Oracle Utilities Integration documentation for information about specific integrations.

- Purchasing and Inventory APIs (SOAP)
- Resource Management APIs (SOAP)
- Seeder Sync API (SOAP)
- Service Call APIs (SOAP)

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- Work Order APIs (SOAP)
- Defining External Systems
  You must create an **External System** record for each external system to which Oracle Utilities Work and Asset Management will communicate. Each external system defines a set of outbound message types that will be sent to that system. Refer to the documentation for your specific integration for more information.

Purchasing and Inventory APIs (SOAP)

Purchasing and Inventory APIs enable an external system to receive and exchange communications related to purchasing and inventory.

Refer to Oracle Utilities REST API for Work and Asset Management for additional information.

Purchasing and Inventory APIs involve the following *Inbound* web services:

- **W1–BlanketContractIntegInbound** (Integration Inbound Blanket Contract):
  Creates or updates a blanket contract header record which may or may not have blanket contract lines.
- **W1–FinancialTransIntegInbound** (Integration Inbound Financial Transaction):
  Creates or updates a financial transaction record.
- **W1–InvoiceIntegInbound** (Integration Inbound Invoice): Creates or updates an invoice header record and one or more Invoice Lines.
- **W1–InvoicePaymentIntegInbound** (Integration Inbound Invoice Payment):
  Creates or updates payment information for an existing invoice.
- **W1–MaterialIssueIntegInbound** (Integration Inbound Material Issue):
  Creates or updates a material issue record.
- **W1–MaterialReturnIntegInbound** (Integration Inbound Material Return):
  Creates or updates a material return record.
- **W1–IntegInboundPurchaseOrder** (Integration Inbound PO):
  Creates or updates a purchase order header record and one or more purchase order lines.
- **W1–PurchaseReturnIntegInbound** (Integration Inbound Purchase Return):
  Creates or updates a purchase return line.
- **W1–ReceiptIntegInbound** (Integration Inbound Receipt):
  Creates or updates a receipt header record and one or more receipt lines.
- **W1–StockTransIntegInbound** (Integration Inbound Stock Transaction):
  Creates or updates a stock transaction record.

Purchasing and Inventory API involves the following *Outbound* web services:

- **W1–FTIMSG** (Post Financial Transaction):
  Sends information for *Created* financial transactions.
- **W1–MATRQIMSG** (Send Material Request):
  Sends information details for *Ready for Issue* material requests.
- **W1–AMROUTMS** (Activity Material Resource Outbound):
  Sends or resends an activity material resource, including its details, to an external system.
- **W1–PREQIMSG** (Purchase Request Outbound):
  Sends information details for *Approved* purchase request header and one or more lines.
- **W1–RCPTOUTMS** (Receipt Outbound):

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Sends information details for *Completed* receipt header and line.

- **W1–RTNOUTMS** (Return Line Outbound):
  Sends information details for *Returned* return line header and line

Resource Management APIs (SOAP)

Resource Management APIs enable an external system to receive and exchange communications related to resources.

Resource Management has no SOAP APIs nor *Outbound* web services. Please refer to Oracle Utilities REST API for Work and Asset for additional information

Seeder Sync API (SOAP)

Work and Asset Management application uses the *W1-SyncRequestInbound* to create or update the following records:

- Resource Type
- Stock Item Detail
- Vendor Location
- Cost Center
- Employee
- Contact
- Asset
- Node

Service Call APIs (SOAP)

Service Call APIs enable an external system to receive and exchange communications related to service calls.

Service Call has no SOAP APIs nor *Outbound* web services. Please refer to Oracle Utilities REST API for Work and Asset Management for additional information.

Work Order APIs (SOAP)

Work Order APIs enable an external system to receive and exchange communications related to work orders.

Refer to Oracle Utilities REST API for Work and Asset Management for additional information

Work Order API involves the following *Inbound* web services:

- **W1–ActivityMaterialUsage** (Activity Material Usage):
  Enables an external system to report truck materials used for an activity.
- **W1–AssetQuery** (Asset Query):
  Returns a results list of asset locations and assets based on matching input criteria or wild card processing.
- **W1–CreateMobileWorkOrder** (Create Mobile Work Order):

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Creates a work order for a single asset when a crew member in the field creates a new order using their mobile device.

- **W1–CreMobIWR** (Create Mobile Work Request):
  Creates a work request and captures attachments, if provided, when a crew member in the field initiates a new request using their mobile device.
- **W1–ExtMobileActivityTypes** (External Mobile Activity Types):
  Retrieves activity types that may be performed by an external system. This web service also retrieves the template activities for these activity types to allow creation of pickup work.
- **W1–ExtMobileControlData** (External Mobile Control Data):
  Retrieves basic control data details needed by an external system, such as, codes and descriptions of admin entities, characteristic type valid values, and extendable lookup values, as well as resource types needed to support timesheet and resource usage reports.
- **W1GAstDtlBNo** (Get Asset Details By Badge Number):
  Verifies that an asset referenced by its badge number is allowed to be installed at a specified location or attached to an existing asset as part of the work activity.
- **W1–GetAssetLocationDetails** (Get Asset/Location Details):
  Returns asset and location information for an asset-related activity created in the field.
- **W1–IntODCDtl** (Interface Other Direct Charge Details):
  Captures equipment and other direct charges for an activity sent in from an external system.
- **W1–IntTMSDtl** (Interface Timesheet Details):
  Captures an employee time sheet details report for an activity sent in from an external system.
- **W1–MblActCom** (Mobile Activity Completion):
  Captures activity completion details sent in from an external system.
- **W1–MobileStoreroomInventory** (Mobile Storeroom Inventory):
  Retrieves stock item inventory, including tracked assets and non-tracked stock items, typically available on a truck.
- **W1–SynchronizeMobileStoreroomDetails** (Synchronize Mobile Storeroom Details):
  Returns basic information for all active mobile storerooms.
- **W1–UpdateActivityStatus** (Update Activity Status):
  Updates the status of an activity based on an assumed current status. If the activity is no longer in the assumed state the update request is ignored.
- **W1–WOActivityDetails** (Work Order Activity Details):
  Enables an external system to request the most current information on an activity already interfaced to that system.

Work Order API involves the following *Outbound* web services:

- **W1–PRJACTMSG** (Maintain WAM Project Activity):
  Sends or resends a project activity, including its details, to an external system.
- **W1–WOACTAMSG** (Maintain Work Order Activity):
  Sends or resends a work order activity, including its details, to an external system.
- **W1–WOACTFMSG** (Cancel Work Order Activity):
  Notifies the external system when an activity is finalized (canceled or completed).

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> **Note**
>
> If the activity is completed by the external system, the completion in WAM does not trigger a message.

Defining External Systems

You must create an **External System** record for each external system to which Oracle Utilities Work and Asset Management will communicate. Each external system defines a set of outbound message types that will be sent to that system. Refer to the documentation for your specific integration for more information.

Understanding GIS Integration

GIS applications are widely used to manage assets, locations, and other spatial data. Oracle Utilities Work and Asset Management supports integration with ESRI ArcGIS using either the GIS file-based integration or the Legacy GIS integration between the systems and a GIS Map Viewer that allows users to view asset layers on a map, create work related to these assets, and more.

> **Note**
>
> This integration requires several installation steps to be performed in Esri ArcGIS. Refer to the *Installation Guide* for more information.

The following sections describe concepts and configuration options related to both the GIS file-based integration and the Legacy GIS integration.

- GIS Owns Non-Tracked Assets
- Which System Owns Asset Related Details?
- A Feature's Global Identifier Is Key To Synchronization
- Asset Synchronization from GIS
- Asset Synchronization Mode
- Asset Removal
- Asset Abandonment
- Reference The Original Asset
- Configuring GIS Map Viewer

GIS Owns Non-Tracked Assets

Non-tracked assets may be loaded into the system from the GIS system and synchronized on an ongoing basis. A GIS feature defined in the GIS system is synchronized into the system as an Asset Location and an Asset installed at that location. GIS feature details that describe the location are mapped to the Asset Location entity while others that are more asset related are mapped to the Asset entity.

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> **Note**
>
> Please note that, in case of tracked assets, only asset locations are synchronized into the system from the GIS system.

Only features of specific classes configured as eligible for synchronization are considered. Each feature class that is eligible for synchronization needs to be defined in the **GIS to WAM Sync Mapping** extendable lookup. This definition controls the following:

- Exclusion of features that belong to the eligible feature class based on a specific GIS field name and value combination.
- Determining the asset location type and asset type to use for each synchronized feature based on specific GIS field name and value combinations.
- Mapping of location related feature details to corresponding elements on the asset location entity.
- Mapping of asset related feature details to corresponding elements and attributes on the asset entity.

Which System Owns Asset Related Details?

GIS is the system of record for location related details and as such these are designed to be synchronized into the system continuously, reflecting changes made to these details over time.

By default, asset related details are synchronized once from the GIS system when the asset is created and maintained internally by the product thereafter. Depending on business requirements, each asset related detail may be explicitly configured with either of the following synchronization options:

- Continuously synchronized from the GIS system. This is indicated on the **GIS to WAM Sync Mapping** extendable lookup record for the feature class.
- Continuously synchronized back to the GIS system when data changes in the system over time. This is indicated in the **WAM to GIS Sync Mapping** extendable lookup record for the asset type. Changes made to such asset details are detected using standard audit rules on the asset entity and send an update to the GIS system.

> **Note**
>
> The same asset detail cannot be continuously synchronized both ways.

A Feature's Global Identifier Is Key To Synchronization

The GIS feature's unique global identifier serves as a cross reference between the systems. When a feature is synchronized from the GIS system its global identifier is stored on the asset location entity as a unique GIS identifier. The ongoing synchronization process relies on this cross reference to uniquely identify assets to update when changes are made to their corresponding features in the GIS system.

When a user creates a new work location using the GIS Map Viewer, a corresponding new feature of "Work Location" class is created in the GIS system. The unique global identifier of the new feature is captured as a GIS identifier of the new work location entity for cross reference.

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Asset Synchronization from GIS

GIS File-based Integration

GIS file-based integration of GIS features into the system relies on a batch file upload process. WAM will pick up the file from a file path and process the records in it.

Legacy GIS Integration

Legacy GIS integration of GIS features into the system relies on Esri's Geodatabase versioning capability. The latter allows for various long-running edits and designs to use designated copies of the data concurrently with the current default version.

The ongoing data synchronization process leverages this capability as follows:

- The current default version represents features as built.
- Initially, all eligible features in the default version are synchronized into the system and a "WAM" version is created to represent the already synchronized version of the data.
- The next ongoing synchronization process does a compare between the default version and the "WAM" version to detect delta changes made in the default version since the last synchronization.
- The result of the comparison is a list of previously synchronized features that were since deleted or updated as well as newly added features that are eligible for synchronization.
- Based on this list, new assets are added to the system and changes are applied to corresponding existing assets using the predefined **GIS to WAM Sync Mapping** rules.
- With each ongoing synchronization process a new "WAM" version is created to represent the most recently synchronized version of the data.

> **Note**
>
> It is recommended to use either GIS file-based integration or Legacy GIS integration but not both in parellel.

Asset Synchronization Mode

GIS File-based Integration

GIS file-based integration is an ongoing synchronization process relying on different master data views when handling the mapping between the external and internal identifiers of an entity.

Legacy GIS Integration

Initial and ongoing synchronization processes rely on different master data views when handling the mapping between the external and internal identifiers of an entity. The system keeps track of whether or not the synchronization is at the initial mode on the **Esri WAM Integration** master configuration record. At the end of the initial synchronization process the record is updated to mark the initial step as complete, thus indicating that the synchronization is at the ongoing mode.

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Asset Removal

When a previously synchronized GIS feature is deleted in the GIS system, the next synchronization process detects this change as a **Removal** operation that results in the following changes:

- The corresponding asset location is marked inactive.
- The GIS global identifier reference on the asset location is removed since a feature with that identifier no longer exists in the GIS system.
- The corresponding asset is retired and moved to the default out of service location defined on the **Esri WAM Integration** master configuration record.

Asset Abandonment

When a previously synchronized GIS feature is marked as abandoned in the GIS system, the next synchronization process detects these changes as an **Abandonment** operation that results in the following changes:

- The corresponding asset location is marked inactive.
- The corresponding asset is retired.
- If the asset is not allowed to be left in place based on current location's type the asset is moved to the default out of service location defined on the **Esri WAM Integration** master configuration record.

> **Note**
>
> For the synchronization process to detect any change made to a previously synchronized feature the latter must retain its unique global identifier as it is the only cross reference to the corresponding entity in the system. This includes abandonment. Therefore, the abandoned feature in the GIS system must be marked as abandoned in such a way that it does not lose its unique global identifier.

The synchronization process looks for a designated "abandonment" GIS field and a corresponding "abandonment" value on the GIS feature to mark the feature as abandoned. The "abandonment" GIS field and value combination are configured on the **Esri WAM Integration** master configuration record.

Reference The Original Asset

The system provides a designated identifier on the asset location entity to track a new asset's reference to the original asset it may have been associated with in the GIS system. This reference may be useful to track references in situations like asset splits etc. If your GIS system configuration supports such an attribute you may reference it using the **GIS to WAM Sync Mapping** rules.

Populating such identifier on an asset location entity allows a user to navigate to the original asset location record online if such record exists in the system.

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Configuring GIS Map Viewer

The GIS Map Viewer interfaces with Esri ArcGIS to present assets and work information on a geographic map. Refer to GIS Map Viewer for more information.

The following describes web map related configuration aspects of the GIS Map Viewer:

- A web map consists of a base map plus optional feature layers and controls.
- The default web map defined in the **Esri Maps** master configuration is displayed when GIS Map Viewer is initially launched.
- Additional web maps may be configured in Esri, allowing the user to toggle between them.
- Once defined in Esri, register the unique identifier of each web map in the Esri Web Maps Extendable Lookup.
- Define the default projected coordinated system in the GIS Projected Coordinate Systems extendable lookup to ensure that the proper coordinate model is used in your map.
- When launched from specific portals that maintain an asset related entity, the default web map may be overridden for specific asset types. These overrides are defined in the **Esri WAM Integration** master configuration record.

The Drop Pin feature of the GIS Map Viewer allows a user to create a new work location for the purpose of creating work in that location. The work location business object to use is defined in the **Esri WAM Integration** master configuration record.

ESRI ArcGIS Server

The Legacy GIS Integration and Map Viewer uses ESRI ArcGIS server to allow users to view asset layers on a map, and to create and view work requests and work orders on the map.

Refer to the Configuring Legacy GIS Integration section of the *Oracle Utilities Work and Asset Management Administrative Guide* for configuration information after installing.

> **Note**
>
> For ESRI integration functionality, you must purchase ESRI ArcGIS Server software along with Portal for ArcGIS or ArcGIS Online cloud subscription from ESRI.

Perform the following for initial installation and importing the GIS metadata:

- Installing and Configuring the ESRI ArcGIS Desktop
- Configuring the Enterprise Geodatabase
- Importing Data to Geodatabase
- Publishing Data as Services in the AcrGIS Server
- Creating web maps using AcrcGIS Online
- Installing the ArcGIS Web Adaptor
- Installing and Configuring the ArcGIS Portal
- Creating web maps using the ArcGIS Portal
- Configuring Inbound Sync (GIS)

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- Changes to ENVIRON.INI

Notes on SSL:

- Oracle Utilities Work and Asset Management is set up with SSL (https) *enabled* as default.
- ESRI ArcGIS is set up with SSL (https) enabled as default.

- Supported ESRI ArcGIS Server Versions for Legacy GIS Integration
- Installing and Configuring ESRI ArcGIS Desktop
- Installing and Configuring ESRI ArcGIS Server
- Configuring the Enterprise Geodatabase
- Importing Data to Geodatabase
- Publishing Data as Services in the ArcGIS Server
- Creating Web Maps Using ArcGIS Online
- Installing the ArcGIS Web Adapter
- Installing and Configuring the ArcGIS Portal
- Creating Web Maps Using ArcGIS Portal
- Configuring Inbound Sync (GIS) for Legacy GIS Integration
- Changes to ENVIRON.INI

Supported ESRI ArcGIS Server Versions for Legacy GIS Integration

This section provides information on ESRI ArcGIS Server and ArcGIS Desktop compatibility with Oracle Work and Asset Management.

ArcGIS Server Version Compatibility

Oracle Utilities Work and Asset Management can potentially send outbound messages to the ArcGIS Server in either SOAP or REST formats. Please refer to the table below for certified message formats at each supported ArcGIS Server version.

ArcGIS Server Version	REST (Work Location and Asset)	SOAP (Work Location)	SOAP (Asset)
10.9.1	Yes	Yes (With TimeReference tag)	Yes

ArcGIS Server 10.9.1 should be used with ArcGIS Desktop 10.8.2.

ArcGIS Desktop Version Compatibility

The following version of ArcGIS Desktop is supported with Oracle Utilities Work and Asset Management.

- 10.8.2

Installing and Configuring ESRI ArcGIS Desktop

Make sure to install the ArcGIS Desktop V10.8.1 or V10.8.2 in the GIS environment.

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To install and configure the appropriate ArcGIS Desktop software version, refer to ESRI ArcGIS for instructions.

Installing and Configuring ESRI ArcGIS Server

To install and configure the appropriate ArcGIS Server software, refer to ESRI ArcGIS for instructions.

Make sure to select the installation steps specific to the operating system.

Configuring the Enterprise Geodatabase

> **Note**
>
> Ignore this step if the Enterprise Geodatabase is already set up and the connection is established from ArcGIS Desktop.

To set up Enterprise Geodatabase, refer to ESRI ArcGIS instructions.

Select the database accordingly. Establish a connection to the geodatabase from ArcGIS Desktop and enable the data accessible from ArcGIS Server.

Refer to ESRI ArcGIS for more information.

Importing Data to Geodatabase

After the Geodatabase is set up, make sure that the necessary customer specific datasets are imported

To import the work locations dataset:

1. Download the Oracle Utilities Work and Asset Management V25.4 ESRI Integration component from the Oracle Utilities Work and Asset Management V25.4 package.
2. Copy the file to the server where ArcGIS is installed and unzip it.
3. Navigate to the XML workspace file located at /metadata/ xmlWorkspaceDocument/ WORKLOCATIONS.XML.
4. Copy the workspace file to the relevant destination folder.
5. Select **Database Connections** in the **Catalog**.
6. To import the XML workspace document:
    a. Select Schema Only in the import options.
    b. Specify the path of the work locations XML file.
7. Once the import process is complete, the **Contents** tab displays the WorkLocationDataset imported into the Geodatabase.

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> **Note**
>
> Note that the Map Notes dataset configuration is optional. However, to display a Map Notes layer, any layer dedicated to capture notes/redlining can be used. Map Notes is a customer specific layer and Oracle Utilities Work and Asset Management does not own/manage it and is not delivered as part of base product. To create a feature class in Geodatabase, refer to ESRI ArcGIS instructions.

Register data with the ArcGIS Server using Manager. For instructions refer to ESRI ArcGIS.

Publishing Data as Services in the ArcGIS Server

After importing the datasets, publish the respective map documents as map / feature services in the ArcGIS server.

For more information about publishing a map document as a map service, refer to ESRI ArcGIS information.

For a quick reference on how to create a Work Locations Map service, please refer to the below steps:

1. Create a map document using the Work Locations dataset.
2. In ArcCatalog, right-click **Work Locations**. From the content menu, click **Share as Service**.
3. In the **Share as Service** wizard, select **Publish a Service**, and then click **Next**.
4. From the **Choose a Connection** drop-down list, select **ArcGIS Server**.
5. Enter the service name with which the service must be published. Make sure the name is updated in ESRI Integration Master Configuration portal in Oracle Utilities Work and Asset Management.
6. Click **Next** to proceed.
7. Enter the folder path and then click **Continue**.
8. In the **Service Editor** wizard, select **Feature Access Capability**.
9. Click **Publish** to publish the map document as a feature service in ArcGIS Server.

Creating Web Maps Using ArcGIS Online

Create a web map using ArcGIS Online or the ArcGIS portal.

For more information about creating web maps using ArcGIS online, refer to ESRI ArcGIS information.

The web map includes layers from the published map/feature services (Utility specific network map service, Work Locations map service, and an optional Map notes feature service) in ArcGIS server. Make sure that the web map is shared to the intended users.

Installing the ArcGIS Web Adapter

For information about installing and configuring ArcGIS web adapter, refer to:

- https://enterprise.arcgis.com/en/web-adaptor/latest/install/iis/install-arcgis-web- adaptor-portal.htm

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Installing and Configuring the ArcGIS Portal

If ArcGIS Online is set up with web maps, ArcGIS portal installation is not required. However, if the web maps are intended to set up on the ArcGIS portal, then the ArcGIS portal should be installed.

For instructions to install and configure the ArcGIS portal, refer to:

- https://enterprise.arcgis.com/en/portal/latest/install/windows/welcome-to-the-portal- for-arcgis-installation-guide.htm

Creating Web Maps Using ArcGIS Portal

Create a web map using ArcGIS Online or ArcGIS portal. For instructions to create a web map using the ArcGIS portal, refer to ESRI ArcGIS information.

The web map includes layers from the published map/feature services (Utility specific network map service, Work Locations map service, and an optional Map Notes feature service) in ArcGIS Server. Make sure that the web map is shared to the intended users.

Connecting ArcGIS Portal with Enterprise LDAP

> **Note**
>
> This step is optional.

The integration of ArcGIS portal with Enterprise LDAP ensures that the users in an organization should be created/managed on the portal page and the authentication is done using LDAP.

Configure the identity store accordingly and then import the enterprise users into the ArcGIS portal.

For more information about configuring the identity store and importing the enterprise users, refer to ESRI ArcGIS information.

Configuring Inbound Sync (GIS) for Legacy GIS Integration

This section describes the GIS server configurations to set up inbound synchronization service.

Configuring the inbound synchronization includes the following steps:

1. Deploying the jar file.
2. Configuring the property file.
3. Executing the tool.
4. Publishing the results as Geoprocessing service.

- Deploying the Jar File
- Configuring Property Files
- Executing the Tools
- Publishing the Results as Geoprocessing Service

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Deploying the Jar File

To deploy the jar file:

1. Download the GIS JAR file available as part of patch provided for the BUG 38333265.
2. Copy the file to the server where ArcGIS is installed and unzip it.
3. Navigate to the /GPService/lib/spl-w1–25.10–gis.jar file.

The deployment of this jar requires ArcGIS Desktop (to execute the jar and generate the results) and ArcGIS Server (to publish the results as Geoprocessing service).

This jar file should be placed in the following ArcGIS desktop and ArcGIS server running locations:

- ArcGIS Desktop installation folder path
  - Example: C:\Program Files (x86)\ArcGIS\Desktop10.8\java\lib\ext
- ArcGIS Server installation folder path
  - Example: C:\Program Files\ArcGIS\Server\usr\lib\ext

Configuring Property Files

The property or Config file is located where the jar file exists. Copy the Config file to the location of the jar file. Refer to the Deploying the Jar File section for information about the folder.

Configuring the property file is a one-time step by the Administrator to set up the synchronization process. The property file consists of input parameters required for the GIS Extractor program to establish a connection to the Geodatabase.

The parameters to be configured in the property file are:

- keyDBServer — Database server name
  - Example: xxxxxxxxxxxxx.us.oracle.com
- keyDBInstance — Database instance name
  - Example: sde:oracle11g:WAMV2200DEV
- keyDBName - Database name
  - Example: WAMV2200DEV
- keyDBUser - Database username
  - Example: sde
- keyDBPwd — Database user password
- keyUsername - ArcGIS Server username to generate security token
  - Example: siteadmin
- keyPassword - ArcGIS Server user password
  - siteadmin
- keyExpiration - Token Expiration duration in seconds
  - Example: 60

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Executing the Tools

To create and execute a new/custom tool:

1. Open the ArcMap or ArcCatalog application.
2. In the **Catalog** window, navigate to **Toolboxes** and then click **My Toolboxes**.
3. Right-click **My Toolboxes** and select **New** and then click **Toolbox**.
4. Enter *WAMGPTools.tbx* as the toolbox name and click **Enter**.
5. Richt-click the new toolbox and click **Add** and then click **Tool**.
6. In the **Add Tool** dialog box, select **WAMGIGPFF** and click **OK**.
7. To execute the Extract_Delta_Changes tool in ArcToolbox:
   - Select and double-click the tool.
   - View the tool's parameters.
   - Provide the respective inputs to the parameters:
     - Task_Name: QueryIDs
     - Execution_Mode: Initial
     - Feature_Class_List
       * Example: SDE.wControlValve
     - Source_Version: SDE.DEFAULT
     - Temp_Version: Temp
     - WKID: Well-known identifier for the target spatial reference
     - WAM Sync Version: The version name to be created in Geodatabase to track incremental changes
       * Example: WAMSyncVersion. Leave the remaining parameters as “NA”.
   - Click **OK** to run the tool.
8. To execute the Generate_Token tool in ArcToolbox:
   - Select and double-click the tool.
   - View the tool's parameters.
   - Provide the respective inputs to the parameters:
     - Service_URL: URL to the ArcGIS Server REST Service
     - Protocol_Type: Select W1RT for Rest Service and W1SP for SOAP Service based on the service used in above parameter
   - Click **OK** to run the tool.

Publishing the Results as Geoprocessing Service

After the configuration file is set up and the tool is executed, the results of the tool should be published as a Geoprocessing service in the ArcGIS server

To publish the Extract_Delta_Changes tool results as a Geoprocessing service:

1. In the **ArcCatalog** tool, navigate to **Geoprocessing Menu** and then click **Results**.

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- The results of the tool are displayed.

2. Right-click **Extract_Delta_Changes […]** and select **Share As** and then click **Geoprocessing Service**.
3. In the **Share as Service** window, select **Publish a Service**, and then click **Next**.
4. From the **Choose a Connection** drop-down list, select **ArcGIS Server**.
5. Enter *ExtractDeltaChanges* in the **Service Name** field and click **Next**.
6. Select **Create New Folder**.
7. Enter **GPServices** and click **Continue**.
8. In the **Service Editor** dialog box, select the required parameters in the **Extract_Delta_Changes** node. Then, provide the details in the **Description** field:
   - Task_Name: Enables the service to retrieve GUIDs of the requested feature classes. The other possible values for task are:
     - Query Specific Changes
     - Query Complete Changes
     - Query Inserts
     - Query Updates
     - Delete Version
   - Execution_Mode: Assists in retrieving all the GUIDs of the feature class or updated GUIDs of the feature class. The possible values are “Initial” and “COU” (Change Only Updates.
   - Feature_Class_List: Enables to query the GUIDs in the feature class of interest. Only one feature class name should be passed to service at a time.
   - Feature_Count_Range: The limit on the records that can be sent using QueryCompleteChanges task.
   - Fields: Helps the GP service to extract the information only for the fields of interest. Oracle Utilities Application Framework batch process reads the list of fields from extendable lookup and passes the value as a comma separated list.
   - Life_Cycle_Status: Field and its value (comma separated) to identify if a feature is Abandoned.
   - Skip_Feature: Configuration to identify features to skip while retrieving data.
   - Filter Statement: Configuration to identify features to filter while retrieving data.
   - GUIDs: The list of GUIDs should be provided to extract the attribute information for the mentioned GUIDs.
   - WKID: The WKID of the coordinate system in which the features has to be present in results.
   - Source_Version: Establishes a connection with the underlying Geodatabase.
   - Temp_Version: Creates a temporary version on top of the DEFAULT/parent version.
   - WAM_Sync_Version: Connects to WAMSync version and performs a version difference between the Temp version and the WAMSync version.
   - Response_XML: Output XML response.
9. Provide the **Summary**, **Tags**, and **Description** (Optional parameters).
10. Click **Analyze** and then click **Publish**.

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11. Click **OK**.

The service should be published in asynchronous mode. It is set by default while publishing the Geoprocessing service.

Important! If any error occurs while publishing the Geoprocessing service, modify the configuration ‘synchronous’. After the service is published, navigate to the service properties in ArcGIS server and change the configuration to ‘asynchronous’.

While publishing the Geoprocessing service, configure the service instances and client timeout configurations (using pooling option) based on the number of records that need to be in sync from GIS. The configurations can also be altered after the service is published in ArcGIS server.

To configure Geoprocessing service instances:

1. Login to ArcGIS Server Manager.
   - https://xxxxxxxxxx:6443/arcgis/manager
2. Navigate to the Geoprocessing service directory where the Extractor program is deployed.
   - For example: GPServices > Extract DeltaChanges
3. From the service options, select **Pooling**.
4. Specify the minimum and maximum number of instances per machine along with maximum time a client can use a service.
   - The configurations are based on the number of records processed by the Geoprocessing service. On an estimate, a single Geoprocessing service instance can process 90000+ records at a time. However, the number of records are tentative and is dependent on multiple factors including the number of fields for which information is requested and memory consumed by the Geoprocessing service. The number of instances should be selected accordingly.
   - Also, configure the time in seconds (example: 36000) during the initial load based on the number of records to be synchronized and the maximum time a client can use the Geoprocessing service.
5. Restart the Geoprocessing service/ArcGIS server for the configurations to reflect.

Changes to ENVIRON.INI

For On Prem release, Content Security Policies are enforced for application security. GIS Map Viewer connects to domains other than the WAM Application Domain, like CDN for ArcGIS JavaScript API and ArcGIS Portal / ArcGIS Online Servers. As per CSP restrictions, communication to other domains is blocked. Because of this, GIS Map Viewer will not work. To work with GIS Map Viewer, add the below URLs to the parameters of the ENVIRON.INI file.

Parameter	URL
CSP_CONNECT_SRC	Provide the URLs which have network status as blocked:csp
CSP_FONT_SRC	https://js.arcgis.com data: Along with the above, provide the URLs which have network status as blocked:csp
CSP_STYLE_SRC	https://js.arcgis.com data: Along with the above, provide the URLs which have network status as blocked:csp

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Parameter	URL
CSP_URL_IMG_SRC	https://js.arcgis.com data: Along with the above, provide the URLs which have network status as blocked:csp
CSP_URL_SCRIPT_SRC	https://js.arcgis.com data: Along with the above, provide the URLs which have network status as blocked:csp

For additional information, see "Menu Block 55-URL, File and URL Related Options" in the Advanced Menu Options present in Appendix B and also refer to the Server Administration Guide.

Below are the other parameter configurations in the ENVIRON.INI file:

- OWSM-PROTECTION_FOR_REST_SERVICES
- CLOUD_RESTRICTION_URLS_ENABLE

OWSM_PROTECTION_FOR_REST_SERVICES

This parameter should be configured only if Oracle Web Service Manager Protection has to be enabled for REST services.

The default parameter value is set to ‘true’ in the ENVIRON.INI file. Set it to ‘false’ if Oracle Web Service Manager is not configured. Also the WEBSERVICES_ENABLED parameter value should be set to ‘true’.

The ENVIRON.INI file is found in the *etc* folder of the environment (example: / scratch/ <environment name>/etc).

Field	Value
OWSM_PROTECTION_FOR_REST_SERVICES	false
WEBSERVICES_ENABLED	true

Important! These parameters should be configured properly to launch the GIS Viewer.

CLOUD_RESTRICTION_URLS_ENABLE

Configure this parameter only if a set of server URLs should be accessed from the **Oracle Utilities Work and Asset Management** system.

The default parameter value for this parameter is set to ‘false’. If the parameter value is set to ‘true’, the GIS server URLs that are configured in ESRI Maps Master Configuration and ESRI WAM Integration Master Configuration objects should be mentioned in the whitelist xml file configured in the CLOUD_WHITE_LIST_PATH parameter’.

Upgrading from ESRI 10.x to 11.x

Upgrading from ESRI 10.x to 11.x involves running the following batch processes to help preserve the integrity of GIS-synced assets, asset locations, and work locations. This section describes these batch processes.

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GIS Asset Location Data Export

The GIS Asset Location Data Export (W1GISALX) batch process extracts asset location records, including asset data, that have been synchronized with Esri. This batch enables customers to generate a file containing a current mapping of asset locations and their GIS global IDs before and after the Esri upgrade.

The batch job may generate the following files depending on the environment:

File Description	File Name Prefix
Asset locations with a single asset installed	SA (for Single Asset)
Asset locations with no asset installed (locations created without associated tracked assets).	NA (for No Asset)
Asset locations with multiple assets installed (not supported out of the box; provided for customers with custom solutions).	MA (for Multiple Assets)

> **Note**
>
> Access to the GIS Asset Location Data Export (W1GISALX) application service is needed to run this batch job.

Legacy GIS ID Update

ArcGIS upgrades (for example, to the Utility Network model) may replace global IDs. The Legacy GIS ID Update (W1GISIDU) batch process updates the global IDs in asset locations and work locations with the new values generated in Esri after the upgrade, ensuring these records remain accurately linked to their corresponding GIS features.

- **Format**: Create a newline-delimited JSON file (jsonl extension), where each entry maps the old global ID to the new global ID.
- **File Naming**: Use only letters, numbers, and underscores ("_") in the file name. Do not use other special characters (such as dashes "-" or spaces " ").
- **Sample File**:

{"legacyGisId":"{4BD5E074-2A00-4681-BC76-92CD4D841095}","newGisId":"{606E8A96-9FAE-443D-8899-30DA0A426658}"}

{"legacyGisId":"{041E245F-C286-4981-9839-77D691EB14F4}","newGisId":"{DBEF2B37-BB4C-4B11-A5E7-86EB5BFED5FB}"}

{"legacyGisId":"{F19EDC2E-8237-46A4-8198-3D2D8114A4B0}","newGisId":"{5CBF917B-BEA2-428C-9BDA-A112572563F4}"}

{"legacyGisId":"{0DD4FF2E-42D2-41B9-B3A3-D46D2A8619AA}","newGisId":"{E5BA0D72-DDFC-4246-AC3C-236506CC2433}"}

> **Note**
>
> Access to the Legacy GIS ID Update (W1GISIDU) application service is needed to run this batch job.

Migration Guide

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The migration guide provides detailed instructions and best practices for transitioning the Esri ArcGIS integration during the upgrade from 10.x to 11.x. The migration guide is included in the product documentation delivered with this release. The *ESRI ArcGIS Integration to Oracle Utilities Work and Asset Cloud Service Migration Guide* is available on the Oracle Utilities Integrations page on Oracle Help Center.

Configuring GIS Integration

The Inbound File-based GIS integration reads an input file containing GIS features placed at a location accessible by the **Work and Asset Management** application in order to create assets and asset locations. This is an alternative approach to the Legacy GIS integration. The GIS File Upload batch (W1GISUPL) process is used for uploading the records.

The Outbound File-based GIS Integration extracts asset information to an output file and is placed at a location accessible by the Work and Asset Management application. This is an alternative approach to the Sync Request outbound process. The GIS File Extract batch (W1GISEXT) process is used for extracting the records.

- Master Configuration Setup
- Asset Details Mapping
- Inbound Synchronization
- Outbound Synchronization

Master Configuration Setup

Configure the Esri WAM Integration Record

Esri WAM Integration master configuration objects dictates the map viewer integration with WAM application

- Esri Integration On/Off: Determines whether or not the integration is in use within your system. This required value provides a quick way to disable key features of the WAM-Esri integration.
- External System: Identifies the external system for Esri ArcGIS Server.
- Timeout Threshold Hours: Sets the number of hours after which outbound sync messages should timeout.
- Default Number of Records in Results Grid: The maximum number of results records displayed in the Asset tab and Work tab in the map viewer, when features are selected.
- Default Asset Effective Date/Time: the default value to use during creation of Assets in the GIS data sync for the Asset disposition.
- Map Notes: The name of the map layer which should be considered when the share widget is opened and markups (for example, redlining) are performed in the map viewer.
- GIS Projected Coordinate Systems: Used to hold the value of projected coordinate system. This is important to ensure the proper coordinate model is used in your map.
- Default Out of Service Location: When GIS features that were previously synchronized to WAM are deleted in the GIS system, the corresponding assets are retired and moved to this location on the next synchronization of these changes to WAM. The original location of these retired assets is inactivated. In the same way, when GIS features that were previously synchronized to WAM are marked as abandoned in the GIS system, the corresponding assets are retired and moved to this location when the asset type

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configuration does not allow such assets to be retired in place. A GIS feature is considered abandoned if it has the **Abandoned GIS Field / Value** combination specified in the GIS system.

- Abandoned Asset GIS Field / Value: A GIS feature is considered abandoned if it has the Abandoned GIS Field / Value combination specified in the GIS system. The system assumes the life cycle status or related field/value is already configured in GIS in order to identify abandoned features. The GIS Field and value are the ones that mark a GIS feature as abandoned in the GIS system. **Note:** The system assumes an abandoned GIS feature retains its GIS unique identifier as it remains key to the synchronization process between the systems.
- Outbound Process Option: Sync Request option sends updated asset data immediately using the Outbound Message Type defined in the External System. File Based option tracks updated assets in the General Process Table and generates file when the W1GISEXT batch process is executed.
- Work Location Business Object: Defines the Work Location Business Object that will be used when a pin drop is used on the GIS map viewer to specify the work location.
- Related Esri Layer: The name of the map layer which should be considered for turning on / off the Work Locations layer in the GIS map viewer.
- Outbound Message Type: Defines the outbound message type that will be used to send supplemental work locations to Esri.
- Selected Asset: The color configured here is used to select the WAM mapped assets in the GIS viewer when drawing a graphic using select options within the Asset and Work tabs.
- Highlighted Asset: The color configured here is used to highlight a particular asset feature on the GIS viewer when hovering over the record item in the results on the Asset and Work tabs.
- Assets with no Work: The color configured here is used to represent the WAM mapped assets that do not have any linked work.
- Highlight Related Assets: The color configured here is used to highlight the assets that are associated with an activity record in the Work tab. The related assets for an activity can be highlighted using the Highlight icon, which appears for each of the activity records in Work tab results.
- Specific Webmaps for Asset Types: Allows for more specific definition of Web Maps based on Asset Type, when you are using multiple webmaps. This is useful when a specific Asset Type can only be displayed on a particular Webmap.

Configure the Esri Maps Configuration Record

Esri Maps master configuration objects dictates the map and its position when the GIS viewer is launched from WAM application.

- Default Map Latitude – The latitude at which Map should be centered. If the latitude is not updated in user characteristics or when user launches the Map viewer for the first time from WAM, the “Default Map Latitude” will be considered to center the map.
- Default Map Longitude – The longitude at which Map should be centered. If the longitude is not updated in user characteristics or when user launches the Map viewer for the first time, the “Default Map Longitude” will be considered to center the map.
- Default Map Zoom Extent - The level at which Map should be zoomed to. If the parameter is not updated in user characteristics or when user launches the Map viewer for the first time, the “Default Map Zoom Extent” will be considered to zoom the map and fit the extent. (Ex: 18).

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- Selection Enabled Zoom Extent - The level at which selection will be enabled on the map viewer to select Assets / Work Requests / Activities. If the Map level is less than the number configured in “Selection Enabled Zoom Extent” parameter, the viewer displays a message that the Map selection is not enabled at this level. (Ex: 18).
- Default Esri Web Map – The web map ID that is configured in the “Esri Web Maps” extendable lookup. This web map will be considered when the embedded GIS viewer is launched from WAM application.
- Expand Layer – This configuration dictates the Layer symbology expanded on / off when “Layers” widget is clicked from embedded GIS viewer. If the option is chosen to “Yes”, the Layer symbology in the layers widget will be expanded else it will be collapsed. (Ex: Yes).

Valid Map URL Domains: Enter the URLs for Map URL Domains. Choose the Map Source from drop down and enter the URL from which map source should be considered.

- Search – The parameters defines the service it should look for when address search is initiated from the GIS viewer. Choose “Search” from the Map Source and enter the URL in the “Map URL Domain” (Ex: https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer).
- Geometry – The parameters defines the service it should look for when geometry operations are initiated from the GIS viewer. Choose “Geometry” from the Map Source and enter the URL in the “Map URL Domain”. (Ex: https:// xxxxxxxxxxxxx/arcgis/rest/services/Utilities/Geometry/GeometryServer).
- Print – The parameters defines the service it should look for when Print is initiated from the GIS viewer. Choose “Print” from the Map Source and enter the URL in the “Map URL Domain”. (Ex: https:// xxxxxxxxxxxxx/arcgis/rest/services/Utilities/PrintingTools/GPServer/Export%20Web%20Map%20Task).
- Map Default – The parameters defines the ArcGIS Online or ArcGIS Portal url that should be used for default map to be launched in GIS viewer. Choose “Map Default” from the Map Source and enter the URL in the “Map URL Domain” (Ex: https:// xxxxxxxxxxxxx/arcgis/ for ArcGIS Portal; https:// xxxxxxxxxxxxx.maps.arcgis.com/ for ArcGIS Online).

Configure the Master Data Synchronization Configuration Record

FK Reference	Initial Sync Key Reference View	Ongoing Sync Key Reference View	External System	Identifier Type
W1-ASLO	W1_INI_NODE_VW	W1_ON_NODE_VW	<GIS External System>	W1GI
W1-ASSET	W1_INI_ASSET_VW	W1_ON_ASSET_VW	<GIS External System>	W1GI
W1-NODE	W1_INI_NODE_VW	W1_ON_NODE_VW	<GIS External System>	W1GI

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Configure the Seeder Sync Request Master Config (W1) Record

External System	Maintenance Object	Initial Sync Request BO	Ongoing Sync Request BO	Ongoing Sync Key Reference View	Identifier Type
<GIS External System>	W1-ASSET	W1-InitialSyncRequestAsset	W1-OngoingSyncRequestAsset	W1_ON_ASSET_VW	W1GI
<GIS External System>	W1-NODE	W1-InitialSyncRequestLocation	W1-OngoingSyncRequestLocation	W1_ON_NODE_VW	W1GI

Asset Details Mapping

The product can be configured to support various mapping approaches between GIS features and assets. The following are high level guidelines to consider when designing such mapping:

- Analyze your GIS feature classes.
  - Determine which feature classes should be synchronized.
  - Determine which GIS fields should be synchronized in each direction.
  - Determine if value mapping is needed for some GIS values.
- Extend the base asset location business object if custom GIS location details need to be supported.
- Use asset attributes when possible, to store GIS asset related details
- Define corresponding non-tracked Asset Types and Asset Location Types.
- For each synchronized feature class define the following:
  - Custom value mapping extendable lookups for specific GIS field values that may need to be mapped to different values.
  - A **GIS to WAM** extendable lookup.
- A **WAM to GIS** extendable lookup if some asset details should be continuously synchronized back to the GIS system.

> **Note**
>
> A new admin sync was created to supply the integration with the necessary GIS to WAM Sync Mapping extendable lookup information.

Inbound Synchronization

Configure the following sections for Inbound Synchronization.

- File Format

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- Batch Processes

File Format

The file should resemble the newline-delimited GeoJSON (geojsonl) format which is a text-based format based on JSON for representing geographical data. The file is made up of lines, with each line containing a single feature and is a valid JSON object. Each line can be read and processed independently, without having to parse the entire file.

This integration supports the following geometrical types: Point, Line, and Polygon. Below is an example of how a single line for a feature should be structured:

{"geometry":{"type":"<Point | LineString | Polygon>","coordinates":[]},"properties":{"GLOBALID":""},"assetClass":"","action":""}

For example: {"geometry":{"type":"Point","coordinates":[-87.624632,42.694634]},"properties":{"GLOBALID":"{02BF666D-0F66-4FC9-A56B-378E87C37D23}"},"assetClass":"Dummy","action":"W1IS"}

Key	Type	Description
geometry	JSON Object	GeoJSON geometry object of type Point, LineString or Polygon. This is optional.
type	String	Case-sensitive string: "Point" / "LineString" / "Polygon"
Coordinates	Array	This is an array of positions where a position is an array of numbers which are longitude and latitude, or X and Y, precisely in that order and using decimal numbers. • One position in the case of a Point geometry type. (For example: [-87.624632,42.694634]) • An array of positions in the case of a LineString geometry type. (For example: [[-87.963549,41.626542],[-86.699112,42.778569],[-88.392632,41.318056]]) • An array of Linear Ring in the case of a Polygon geometry type. A linear ring is a closed LineString with four or more positions. The first and last positions are equivalent, and they MUST contain identical values; their representation should also be identical. (For example: [[[-88.921225,42.614085],[-88.911225,42.614085],[-88.911225,42.624085],[-88.921225,42.624085],[-88.921225,42.614085]]])
properties	JSON Object	List of fields and values to be used to map against asset and location BO elements in respective GIS to WAM Sync Mapping Extendable Lookup. Only the properties identified in the lookup are considered for sync. GLOBALID is a required key in this object.
GLOBALID	String	Mapped against gisId value in the sync request. This is considered as unique identifier.
assetClass	String	Mapped against the GIS Asset Class element in GIS to WAM Sync Mapping Extendable Lookup to identify which mapping to use to create sync request for the respective feature.

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Key	Type	Description
action	String	To identify if the operation is add/update/delete. Valid values are W1IS/W1UP for insert or update, W1DL for delete. • For either W1IS or W1UP, if the GLOBALID is found in WAM then the respective Asset and Asset Location will be updated. If the GLOBALID is not found, then a new Asset and Asset Location will be created. • In case of W1DL, only GLOBALID key is needed, using which the respective asset will be identified and retired. Any other properties will not be processed.

> **Note**
>
> For abandoning an asset, the action should be W1UP. The process looks for a designated “abandonment” GIS field and a corresponding “abandonment” value on the GIS feature to mark the feature as abandoned. The “abandonment” GIS field and value combination are configured on the Esri WAM Integration master configuration record.
>
> - Any other keys apart from the ones mentioned above will be ignored.
> - Every line in the file should be a valid JSON without any empty lines in the file.

Batch Processes

The following batch processes need to be run in sequence to load all data from file defined according to the format mentioned in the File Format section. The below batch sequence is the same for initial sync or delta changes.

> **Note**
>
> Before initiating the inbound synchronization, make sure that configuration is done in **Master Data Synchronization** master configuration record. Refer to Understanding Data Synchronization for more information.

Step	Batch Code	Description	Additional Parameters (if any)
1	W1GISUPL	GIS File Upload	fileName: Name of the file or files to be uploaded. For multiple files, the parameter supports the "glob" syntax for using wildcard characters. filePath: The file path where the output should be placed.
2	W1-CMSYN	Composite Sync Request	State: PENDING BO: W1-CompositeSyncReqGISAsset

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Step	Batch Code	Description	Additional Parameters (if any)
3	W1-SIOPE	Ongoing Sync Request - Pending	State: PENDING BO: W1-OngoingSyncRequestLocation
4	W1-SIOPE	Ongoing Sync Request - Pending	State: PENDING BO: W1-OngoingSyncRequestAsset

Outbound Synchronization

Asset and Work Location data can be extracted to a file through batch processing and real-time messaging respectively. These sections provide details.

- Asset
- Work Location

Asset

Batch Process

Run the GIS File Extract batch (W1GISEXT) to extract asset information to generate a file with data. Below are the important parameters that define the format and data in the extracted file. Refer to the GIS File Extract batch control parameters for additional details.

- File Integration Type: Defines the file integration type used for extraction. GIS File Extract (W1-GISFileExtract) file integration type is used here to define how the data to extract is obtained and how it is formatted.
- File Name: Name of the extract file. The file will be replaced if it already exists or created if it does not. Parameter value is defaulted to 'WACS_<assetClass>_{BN}_{RN}_{TN}.json' where the variable {BN} is the respective batch number, {RN} is re run number and {TN} is thread number. The <assetClass> variable will be replaced with the GIS asset class value followed by the file number based on the Maximum Records Per File parameter. A separate file for each GIS asset class is created if the <assetClass> variable is provided.
- **Maximum Records Per File:** Parameter value is defaulted to 300.
- **File Format:** Parameter value is defaulted to JSON.

File Format

The format of the extracted file is defined by the data area present in the File Integration Record in the W1-GISFileExtract File integration type.

- The 'assetClass' contains the GIS Asset Class element value of the respective asset.
- The 'attributes' list contains the respective asset information as 'name' and 'value' pairs. The list of the name and value pairs that are extracted is defined in the **WAM To GIS** Sync Mapping Extendable Lookup.

Work Location

Work location synchronization is performed using real-time messaging. When a work location is created in the application, an outbound message is sent to the GIS system. After the new

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work location feature is established in the GIS, the assigned global ID is returned and updated in the application.

Message Sender

A message sender is required for work location outbound messaging. Use the following configuration parameters. The values for HTTP Login User, HTTP Login Password, and HTTP URL 1 are integration-specific. If Oracle Integration Cloud (OIC) is used, provide credentials and the endpoint for OIC; otherwise, enter the details for the relevant GIS system.

Field / Context	Value
Invocation Type	Real-time
Message Class	RTJSONSNDR (Sender for real-time HTTP/JSON messages)
Active	Yes
MSG Encoding	UTF-8 message encoding
HTTP Header	application/json
HTTP Method	POST
HTTP Timeout	60
HTTP Transport Method	SendReceive
HTTP Login User	User ID for Oracle Integration Cloud (OIC), or, if not using OIC, the GIS system user ID
HTTP Login Password	Password for Oracle Integration Cloud (OIC), or, if not using OIC, the GIS system password
HTTP URL 1	Oracle Integration Cloud (OIC) endpoint URL, or, if not using OIC, the endpoint URL for the GIS system

External System

Add the Work Location Outbound Message Type (W1-WLOUTMSGT) and the defined message sender to the external system configured for the Esri ArcGIS Server.

Esri WAM Integration Master Configuration

Set the parameters in the **Supplemental WAM Location for Esri** section as follows:

Work Location Business Object: Select the appropriate Work Location Business Object that will be used when a pin is dropped on the GIS map viewer to define the work location.

Related Esri Layer: Specify the name of the Esri map layer to be used for toggling the Work Locations layer on or off in the GIS map viewer.

Outbound Message Type: Set this parameter to "Work Location Outbound Message Type (W1-WLOUTMSGT)".

Configuring Legacy GIS Integration

Follow the configuration steps described in the following sections to enable the GIS Integration functionality. Refer to Understanding GIS Integration for more information.

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> **Note**
>
> This integration requires several installation steps to be performed in Esri ArcGIS prior to the configuration steps described here. Refer to the *Installation Guide* for more information about the Esri ArcGIS integration components.

- Asset Details Mapping
- Configuring Message Senders
- Configuring Outbound Messages in External System
- Master Configuration Setup
- Asset Synchronization Batch Processes

Asset Details Mapping

The product can be configured to support various mapping approaches between GIS features and assets. The following are high level guidelines to consider when designing such mapping:

- Analyze your GIS feature classes.
  - Determine which feature classes should be synchronized.
  - Determine whether to use the Skip functionality or the Filter Statement Builder for synchronized feature classes.
  - Determine which GIS fields should be synchronized in each direction.
  - Determine if value mapping is needed for some GIS values.
- Extend the base asset location business object if custom GIS location details need to be supported.
- Use asset attributes when possible, to store GIS asset related details
- Define corresponding non-tracked Asset Types and Asset Location Types.
- For each synchronized feature class define the following:
  - Custom value mapping extendable lookups for specific GIS field values that may need to be mapped to different values.
  - A **GIS to WAM** extendable lookup.
  - A **WAM to GIS** extendable lookup if some asset details should be continuously synchronized back to the GIS system.

Configuring Message Senders

This section provides guidelines for configuring the components needed to support outbound messages to the GIS system.

> **Note**
>
> For WACS (OCI Cloud) environment, Http/https in the Message Sender URL should be replaced with the substitution variable @EXT_PUB@. And the ArcGIS Server services should be served over port 443 since only port 443 will be accepted in OCI environment.

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Define a message sender for each of the outbound message types associated with the **GIS Integration** web service category using following guidelines.

Message Sender for Work Location

Field / Context	Value
Invocation Type	Real-time
Message Class	SOAP: RHTTPSNDR (Send post messages via HTTP real-time)REST: RTJSONSNDR (Sender for real-time HTTP/JSON messages)
MSG Encoding	UTF-8 message encoding
HTTP Method	POST
Active	Yes
HTTP URL 1	The URL of the corresponding service to be provided by GIS team. WAM REST Ex: https://xxxxxxxxxxxxx:6443/arcgis/rest/services/WAM/WorkLocations/FeatureServer/0/${pathParms} WACS REST Ex: @EXT_PUB@xxxxxxxxxxxxx:443/arcgis/rest/services/WAM/WorkLocations/FeatureServer/0/${pathParms} WAM SOAP Ex: https://xxxxxxxxxxxxx:6443/arcgis/services/WAM/WorkLocations/MapServer/FeatureServer WACS SOAP Ex: @EXT_PUB@xxxxxxxxxxxxx:443/arcgis/services/WAM/WorkLocations/MapServer/FeatureServer
HTTP Header	REST: Content-Type:application/x-www-form-urlencoded
HTTP Header	REST: Accept:application/json
HTTP Form Data	REST: adds=@XMLMSG@

Message Sender for Asset Outbound Sync

Field/Context	Value
Invocation Type	Real-time
Message Class	SOAP: RHTTPSNDR (Send post messages via HTTP real-time) REST: RTJSONSNDR (Sender for real-time HTTP/JSON messages)
MSG Encoding	UTF-8 message encoding
HTTP Method	POST
Active	Yes
HTTP URL 1	The URL of the corresponding service to be provided by GIS team.

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Field/Context	Value
	WAM REST Ex: https://xxxxxxxxxxxx:6443/arcgis/rest/services/WAM/DistributionNetwork/FeatureServer/${pathParms} WACS REST Ex: @EXT_PUB@xxxxxxxxxxxxx:443/arcgis/rest/services/WAM/DistributionNetwork/FeatureServer/${pathParms} WAM SOAP Ex: https://xxxxxxxxxxxxx:6443/arcgis/services/WAM/DistributionNetwork/MapServer/FeatureServer WACS SOAP Ex: @EXT_PUB@xxxxxxxxxxxxx:443/arcgis/services/WAM/DistributionNetwork/MapServer/FeatureServer
HTTP Header	REST: Content-Type:application/x-www-form-urlencoded
HTTP Header	REST: Accept:application/json
HTTP Form Data	REST: Edits=@XMLMSG@

Message Sender for Asset Inbound Sync

> **Note**
>
> This communication supports REST protocol only.

Field / Context	Value
Invocation Type	Real-time
Message Class	RTJSONSNDR (Sender for real-time HTTP/JSON messages)
MSG Encoding	UTF-8 message encoding
HTTP Method	POST
Active	Yes
HTTP URL 1	The URL of the corresponding service to be provided by GIS team. WAM REST Ex: https://xxxxxxxxxxxx:6443/arcgis/rest/services/WAM/ExtractDeltaChanges/GPServer/${pathParms} WACS REST Ex: @EXT_PUB@xxxxxxxxxxxxx:443/arcgis/rest/services/WAM/ExtractDeltaChanges/GPServer/${pathParms}
HTTP Header	REST: Content-Type:application/x-www-form-urlencoded
HTTP Header	REST: Accept:application/json

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Message Sender for Token Generation

> **Note**
>
> This configuration is required only if the underlying map service published in ArcGIS Server are secured.This communication supports REST protocol only.

Field / Context	Value
Invocation Type	Real-time
Message Class	RTJSONSNDR (Sender for real-time HTTP/JSON messages)
MSG Encoding	UTF-8 message encoding
HTTP Method	POST
Active	Yes
HTTP URL 1	The URL of the corresponding service to be provided by GIS team. WAM REST Ex: https://xxxxxxxxxxxx:6443/arcgis/rest/services/WAM/GenerateToken/GPServer/${pathParms} WACS REST Ex: @EXT_PUB@xxxxxxxxxxxx:443/arcgis/rest/services/WAM/GenerateToken/GPServer/${pathParms}
HTTP Header	REST: Content-Type:application/x-www-form-urlencoded
HTTP Header	REST: Accept:application/json

Configuring Outbound Messages in External System

External System for Work Location and Asset Outbound Sync

Configure an external system record for the GIS system your company sends messages to. Refer to External System - Main for more information.

Provide an entry for each of the outbound message types associated with the **GIS Integration** web service category following these guidelines:

Field	Value
Outbound Message Type	The provided outbound message type
Processing Method	Real-time
Message Sender	The corresponding message sender for this type of message
Date/Time Format	XSD
JSON Conversion Method	REST: XSL Transformation
Message XSL	SOAP: W1-CommonGISRequestForSOAP.xslREST: W1-CommonGISRequestForREST.xsl

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Field	Value
Response XSL	SOAP: W1-CommonGISResponseForSOAP.xsl REST: W1- CommonGISResponseForREST.xsl (for WAM if File System is used for XSL files) REST: W1-CommonGISRespForREST.xsl (for WACS if Managed Content is used for XSL files)

External System for Asset Inbound Sync and Token Generation

Field	Value
Outbound Message Type	The provided outbound message type
Processing Method	Real-time
Message Sender	The corresponding message sender for this type of message
Date/Time Format	XSD
JSON Conversion Method	XSL Transformation
Response XSL	W1–GISAssetInbound.xsl

Master Configuration Setup

Configure the Esri WAM Integration Record

Esri WAM Integration master configuration objects dictates the map viewer integration with WAM application

- Esri Integration On/Off: Determines whether or not the integration is in use within your system. This required value provides a quick way to disable key features of the WAM-Esri integration.
- One-time Data Conversion: This is not editable. When this value is set to "Convert all Esri data", all GIS features are extracted from Esri and sent to WAM on the next batch run for the Esri Extractor. If set to "Complete", this indicates that data conversion has already occurred and only incremental data changes are extracted from Esri.
- External System: Identifies the external system for Esri ArcGIS Server.
- Timeout Threshold Hours: Sets the number of hours after which outbound sync messages should timeout.
- Default Number of Records in Results Grid: The maximum number of results records displayed in the Asset tab and Work tab in the map viewer, when features are selected.
- Default Asset Effective Date/Time: the default value to use during creation of Assets in the GIS data sync for the Asset disposition.
- Map Notes: The name of the map layer which should be considered when the share widget is opened and markups (for example, redlining) are performed in the map viewer.
- GIS Projected Coordinate Systems: Used to hold the value of projected coordinate system. This is important to ensure the proper coordinate model is used in your map.
- Default Out of Service Location: When GIS features that were previously synchronized to WAM are deleted in the GIS system, the corresponding assets are retired and moved to

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this location on the next synchronization of these changes to WAM. The original location of these retired assets is inactivated. In the same way, when GIS features that were previously synchronized to WAM are marked as abandoned in the GIS system, the corresponding assets are retired and moved to this location when the asset type configuration does not allow such assets to be retired in place.

- Abandoned Asset GIS Field / Value: A GIS feature is considered abandoned if it has the Abandoned GIS Field / Value combination specified in the GIS system. The system assumes the life cycle status or related field / value is already configured in GIS in order to identify abandoned features. The GIS Field and value are the one that marks a GIS feature as abandoned in the GIS system. Note: The system assumes an abandoned GIS feature retains its GIS unique identifier as it remains key to the synchronization process between the systems.
- Work Location Business Object: Defines the Work Location Business Object that will be used when a pin drop is used on the GIS map viewer to specify the work location.
- Related Esri Layer: The name of the map layer which should be considered for turning on / off the Work Locations layer in the GIS map viewer.
- Outbound Message Type: Defines the outbound message type that will be used to send supplemental work locations to Esri.
- Source Version Owner: The owner of the DEFAULT version in the ESRI Geodatabase that is used for sync. If blank, the value is set to DEFAULT.
- Temp WAM Version: The name of the ArcGIS Server version that is used to track WAM asset updates flowing to GIS.
- WAM Sync Version: The name of the ArcGIS Server version that is used during version comparison geoprocessing to detect changed features to be synced to WAM.
- Selected Asset: The color configured here is used to select the WAM mapped assets in the GIS viewer when drawing a graphic using select options within the Asset and Work tabs.
- Highlighted Asset: The color configured here is used to highlight a particular asset feature on the GIS viewer when hovering over the record item in the results on the Asset and Work tabs.
- Assets with no Work: The color configured here is used to represent the WAM mapped assets that do not have any linked work.
- Highlight Related Assets: The color configured here is used to highlight the assets that are associated with an activity record in the Work tab. The related assets for an activity can be highlighted using the Highlight icon, which appears for each of the activity records in Work tab results.
- Specific Webmaps for Asset Types: Allows for more specific definition of Web Maps based on Asset Type, when you are using multiple webmaps. This is useful when a specific Asset Type can only be displayed on a particular Webmap.
- Inbound Sync Data Filter Options: Used in conjunction with the GIS to WAM Sync Mapping Extendable Lookup. Controls which functionality is enabled in the extendable lookup. When *Skip* or *No Value* is selected, GIS features with matching GIS field/value combination are skipped from synchronization from the GIS system. When Filter Statement Builder is selected, GIS features with matching GIS field/value combination in the Filter Statement Builder section are synchronized to WAM.

Configure the Esri Maps Configuration Record

Esri Maps master configuration objects dictates the map and its position when the GIS viewer is launched from WAM application.

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- Default Map Latitude – The latitude at which Map should be centered. If the latitude is not updated in user characteristics or when user launches the Map viewer for the first time from WAM, the “Default Map Latitude” will be considered to center the map.
- Default Map Longitude – The longitude at which Map should be centered. If the longitude is not updated in user characteristics or when user launches the Map viewer for the first time, the “Default Map Longitude” will be considered to center the map.
- Default Map Zoom Extent - The level at which Map should be zoomed to. If the parameter is not updated in user characteristics or when user launches the Map viewer for the first time, the “Default Map Zoom Extent” will be considered to zoom the map and fit the extent. (Ex: 18).
- Selection Enabled Zoom Extent - The level at which selection will be enabled on the map viewer to select Assets / Work Requests / Activities. If the Map level is less than the number configured in “Selection Enabled Zoom Extent” parameter, the viewer displays a message that the Map selection is not enabled at this level. (Ex: 18).
- Default Esri Web Map – The web map ID that is configured in the “Esri Web Maps” extendable lookup. This web map will be considered when the embedded GIS viewer is launched from WAM application.
- Expand Layer – This configuration dictates the Layer symbology expanded on / off when “Layers” widget is clicked from embedded GIS viewer. If the option is chosen to “Yes”, the Layer symbology in the layers widget will be expanded else it will be collapsed. (Ex: Yes).

Valid Map URL Domains: Enter the URLs for Map URL Domains. Choose the Map Source from drop down and enter the URL from which map source should be considered.

- Search – The parameters defines the service it should look for when address search is initiated from the GIS viewer. Choose “Search” from the Map Source and enter the URL in the “Map URL Domain” (Ex: https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer).
- Geometry – The parameters defines the service it should look for when geometry operations are initiated from the GIS viewer. Choose “Geometry” from the Map Source and enter the URL in the “Map URL Domain”. (Ex: https:// xxxxxxxxxxxxx/arcgis/rest/services/Utilities/Geometry/GeometryServer).
- Print – The parameters defines the service it should look for when Print is initiated from the GIS viewer. Choose “Print” from the Map Source and enter the URL in the “Map URL Domain”. (Ex: https:// xxxxxxxxxxxxx/arcgis/rest/services/Utilities/PrintingTools/GPServer/Export%20Web%20Map%20Task).
- Map Default – The parameters defines the ArcGIS Online or ArcGIS Portal url that should be used for default map to be launched in GIS viewer. Choose “Map Default” from the Map Source and enter the URL in the “Map URL Domain” (Ex: https:// xxxxxxxxxxxxx/arcgis/ for ArcGIS Portal; https:// xxxxxxxxxxxxx.maps.arcgis.com/ for ArcGIS Online).

Configure the Master Data Synchronization Configuration Record

FK Reference	Initial Sync Key Reference View	Ongoing Sync Key Reference View	External System	Identifier Type
W1-ASLO	W1_INI_NODE_VW	W1_ON_NODE_VW	<GIS External System>	W1GI

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FK Reference	Initial Sync Key Reference View	Ongoing Sync Key Reference View	External System	Identifier Type
W1-ASSET	W1_INI_ASSET_VW	W1_ON_ASSET_VW	<GIS External System>	W1GI
W1-NODE	W1_INI_NODE_VW	W1_ON_NODE_VW	<GIS External System>	W1GI

Configure the Seeder Sync Request Master Config (W1) Record

External System	Maintenance Object	Initial Sync Request BO	Ongoing Sync Request BO	Ongoing Sync Key Reference View	Identifier Type
<GIS External System>	W1-ASSET	W1-InitialSyncRequestAsset	W1-OngoingSyncRequestAsset	W1_ON_ASSET_VW	W1GI
<GIS External System>	W1-NODE	W1-InitialSyncRequestLocation	W1-OngoingSyncRequestLocation	W1_ON_NODE_VW	W1GI

Asset Synchronization Batch Processes

Asset inbound synchronization can be performed for an initial synchronization or for delta updates and changes.

Synchronization request records are processed by the synch request monitor batch process, and it is at that time that the actual outbound message is prepared and sent to the external system.

No batch needs to run explicitly for outbound synchronization as the interface dynamically updates the GIS system.

The following sections describe the background processes involved in asset synchronization from the GIS system.

> **Note**
>
> Before initiating the inbound synchronization, make sure that configuration is done in **Master Data Synchronization** master configuration record. Refer to Understanding Data Synchronization for more information.

- Legacy GIS Batch Controls

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Legacy GIS Batch Controls

The following batch processes need to be run in sequence to load all data from file defined according to the format mentioned in the Configuring Legacy GIS Integration section.

Initial Synchronization

The following batch processes need to be run in sequence to complete the initial load of all eligible assets from the GIS system.

> **Note**
>
> The system keeps track of the status of the initial conversion process in the **One-time Data Conversion** field of the **Esri WAM Integration** master configuration record. Until the process is complete, the field shows *Convert all Esri data*.

Step	Batch Code	Description	Additional Parameters (if any)
1	W1–GISID	Retrieve GIS ID's	
2	W1–PRGIS	Process GIS Data	
3	W1-CMSYN	Composite Sync Request	State: PENDING BO: W1-CompositeSyncReqGISAsset
4	F1-SYSRQ	Sync Request Monitor (Deferred)	State: PENDING BO: W1-InitialSyncRequestLocation
5	F1-SAKRQ	Sync Request Allocate Keys Monitor	State: DATA-TRANSFD BO: W1-InitialSyncRequestLocation
6	W1-SIKSP	Initial Sync Request - Resolve Keys Loc	State: KEY-ALLOCATD BO: W1-InitialSyncRequestLocation
7	W1-SILSP	Initial Sync Request - Load Data Location	State: KEYS-RESOLVD BO: W1-InitialSyncRequestLocation
8	W1-SILDD	Initial Sync Request - Loaded	State: LOADED BO: W1-InitialSyncRequestLocation
9	F1-SYSRQ	Sync Request Monitor (Deferred)	State: PENDING BO: W1-InitialSyncRequestAsset

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Step	Batch Code	Description	Additional Parameters (if any)
10	F1-SAKRQ	Sync Request Allocate Keys Monitor	State: DATA-TRANSFD BO: W1-InitialSyncRequestAsset
11	W1-SIKAS	Initial Sync Request - Resolve Keys Asset	State: KEY-ALLOCATD BO: W1-InitialSyncRequestAsset
12	W1-SILAS	Initial Sync Request - Load Data Asset	State: KEYS-RESOLVD BO: W1-InitialSyncRequestAsset
13	W1-SILDD	Initial Sync Request - Loaded	State: LOADED BO: W1-InitialSyncRequestAsset
14	W1-DELVR	GIS Delete Version	

Ongoing Synchronization

After the initial conversion is complete, the following batch processes need to be run periodically and in the specified sequence to uptake ongoing delta changes to eligible assets from the GIS system.

Step	Batch Code	Description	Additional Parameters (if any)
1	W1–GISID	Retrieve GIS ID’s	
2	W1–PRGIS	Process GIS Data	
3	W1-CMSYN	Composite Sync Request	State: PENDING BO: W1-CompositeSyncReqGISAsset
4	W1-SIOPE	Ongoing Sync Request - Pending	State: PENDING BO: W1-OngoingSyncRequestLocation
5	W1-SIOPE	Ongoing Sync Request - Pending	State: PENDING BO: W1-OngoingSyncRequestAsset
6	W1-DELVR	GIS Delete Version	

Understanding Data Synchronization

Types of Synchronization Requests

Data synchronization is performed using synchronization requests sent from the external system using a middleware integration component. The application supports three types of synchronization requests:

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Initial Synchronization Requests

Initial synchronization requests are used during the initial configuration of the integration. They facilitate import of data that synchronizes service points, locations, and contact information.

Ongoing Synchronization Requests

Ongoing synchronization requests are used when updating existing data in Oracle Utilities Work and Asset Management based on changes in corresponding data in the external system. Ongoing synchronization requests can be used to update locations, assets or components and to send activity completion information.

Composite Synchronization Requests

Composite synchronization requests are requests that contain synchronization requests for multiple types of data within a single request. For example, a composite request could contain requests to update a location and complete an activity. This supports situations where multiple types of data must be updated based on a single change in the external system.

Navigate to **Admin**, click **Business Object**, and search for “W1%sync%” to locate business objects used for data synchronization.

Base Package Synchronization Request Business Objects

Navigate to **Admin**, click **Business Object**, and search for “W1%sync%” to locate these objects.

Master Configurations for Data Synchronization

Master configurations are used to define aspects of the synchronization process, including resolution of foreign keys and the type of synchronization business objects to use for each type of data being synchronized.

Navigate to **Admin** and click **Master Configuration** to review or modify master configuration settings.

Batch Controls for Data Synchronization

Batch controls perform processing for initial synchronization requests such as allocating keys to data, resolving foreign keys, and loading data (instantiating business objects representing entities such contacts, assets, and so on).

“Initial Sync Request - Resolve Keys [maintenance object]” batch controls invoke a generic maintenance object transition process to invoke the “Resolve Keys - Initial Sync” algorithm for synchronization requests of the appropriate type. Parameters used by “resolve keys” batch controls include:

- **Maintenance Object**: (Required) the maintenance object (asset, contact, and so on) to be processed. This must be set to the Sync Request maintenance object for the batch control.
- **Restrict By Batch Code**: Restricts processing to synchronization requests whose current state is linked to this batch code.
- **Restrict By Business Object**: Restricts processing to synchronization requests linked to this business object.
- **Restrict By Status Code**: Restricts processing to synchronization requests of this status (default: KEY_ALLOCATD).
- **Max Errors**: Specifies the maximum number of errors allowed before the process exits.

Refer to the Batch Controls section for a list of these synchronization batch controls.

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Batch Scheduling for Data Synchronization

The following sequence indicates the order in which the batch controls on the Initial Sync Request BO life cycle should be executed.

1. Transformation / Schema Validation Job
2. Key Allocation Job
3. Foreign Key Resolution / BO Validation Job (all key allocation jobs must finish)
4. Load Job

XAI Inbound Services for Data Synchronization

XAI inbound services are used to facilitate invoking the Sync Request Seeder business object by the middleware components upon receipt of a synchronization request.

Navigate to **Admin** and click **XAI Inbound Service** to review or modify master configuration settings.

Processing of the Synchronous Request

This section provides an overview of the processing that takes place when a synchronization request is sent. For each step in the process, the table below provides a brief description of the processing that takes place and list the specific objects involved.

1. The external system sends a synchronization request to the middleware integration layer. For example, consider a request to update information about an asset installation.
2. The middleware components transform the request from the external system to the format, to the format used by Oracle Utilities Operational Device Management (this format is based on the business object schemas of the synchronization request business objects).
3. The middleware component invoked the appropriate XAI Inbound Service, and sends the transformed request.
   XAI Inbound Service: W1-SyncRequestInbound (mapped to the W1-SyncRequestSeeder business object)
4. The XAI Inbound Service invokes the Sync Request Seeder business object, which in turn, determines which synchronization request business object to create (based on the type of data in the synchronization request and the Seeder Sync Master Configuration).
   Synchronization Request BO: W1-SyncRequestSeeder
5. For initial synchronization requests, background processing creates master data for each synchronization request, including the following steps:
   - Data Transformation / Schema Validation
   - Allocate Keys
   - Resolve Foreign Keys / Validate Business Object
   - Load Data

Creating an Outbound Sync Request

For normal outbound processing we create an outbound sync request every time a new WAM record is created or an update is made to an existing WAM record. The sync request is initially created in a *Pending* state and configured to be processed by a batch monitor. Customers have the option to specify a deferred monitor on the *Pending* state so that it requires a batch job to continue on to the next state. When the batch job monitor runs, it moves the sync

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request to the *Determine if Sync Needed* state and all extra records that apply to the same WAM record are discarded.

Once the sync request is in a *Determine if Sync Needed* state, a capture algorithm takes the WAM record reference (for example, Receipt Header ID, Purchase Request Header ID, and so on), reads the record, and populates the values into the outbound Sync Request. Based on the logic of the algorithm, a decision is made to either proceed (transition to **Send Request**) or to discontinue (transition to **Discarded**).

Discarded records are all the records that were added after the creation of the initial record and the process will not continue until incorrect references, or any other error, is resolved. A **Discard** button allows the user to transition the sync request to a *Manually Discarded* state which discontinues the processing of the sync request. The WAM record can then be updated and a new sync request created and processed.

Configuring Inbound Communication Options

Follow the steps described in this section to configure inbound communication options.

- Defining Communication Types
- Maintaining Inbound Communications

Defining Communication Types

The **Communication Type** portal is used to display and maintain communication types.

Refer to Understanding Integrations for more information.

You can access the portal from **Admin**, select **Integration**, then select **Communication Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Communication Type List**: This zone lists all communication type records. Broadcast a record to display the details of the selected record.
- **Communication Type**: This zone provides information about the selected communication type, such as attachment suppression, communication data mapping, message validation and exception handling.

Maintaining Inbound Communications

This portal is used to view and maintain inbound communications.

Refer to Understanding Integrations for more information.

You can access the portal from **Admin**, select **Integration**, and then select **Inbound Communication**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Inbound Communication**: This zone displays information, such as activity, asset, location, and event information, about the inbound communication.
- **Communication Tree**: This zone displays a tree view of communications and events for the selected inbound communication.

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Enterprise Resource Planning Integration

Oracle Utilities Work and Asset Management can be integrated with an Enterprise Resource Planning (ERP) application, such as Enterprise Business Suite to manage human resources and procurement processes.

Refer to the Oracle Utilities Work and Asset Management Connector for Enterprise Resource Planning documentation for more information.

- Configuring Fixed Assets

Configuring Fixed Assets

Fixed asset integration ensures project and non-project related activities that are created, adjusted, or retired in **Work and Asset Cloud Service** (WACS) are able to be synchronized to Oracle Fusion ERP Cloud (project-based assets) and Oracle Fusion Fixed Assets Cloud (non-project assets).

About Fixed Asset Extract

In the Work and Asset Cloud application, Construction Work Activities (CWAs) are used to create project and non-project (customer contributed, gifted, or found) related assets. When assets are tracked using capital projects, the cost of the capital assets are tracked within the capital project before being transferred to Oracle Fusion Fixed Assets. The WACS process uses a single flat file (WACS Assets Extract) to perform the transfer to the external application.

- For Project capital assets, once the asset is created and recorded in WACS the record is sent to ERP to create a project capital asset and corresponing asset assignment.
- For Non-Project assets, once the asset is created and recorded in WACS the record is sent to ERP to create the fixed asset and distribution requirements.
- When adding and retiring Project or Non-Project rolling fiscal assets such as conductors and poles, WACS creates an adjustment and the record is sent to ERP. In ERP, these types of assets are tracked as a single fixed asset however, cost and unit adjustments are created for the fixed asset.
- For Capital Spare (Inventory) Assets, once installed in WACS, the record is sent to ERP as a cost adjustment record associated with an already present fixed asset in ERP. The cost adjustment adds the installation cost to the total cost of the fixed asset.
- For Retired Assets, once an asset is retired in WACS, the retirement record is sent to ERP which directly retires the asset in the Fixed Assets table.

Oracle Fusion ERP holding project assets will have a corresponding WACS project. The WACS Project will have an External ID populated as ERP Project Number. The ERP Project Tasks will be mapped to the subproject in WACS and the WACS subproject will have an External ID populated as an ERP Task Number. WACS activities will be linked to their related subprojects.

Configuring the integration for fixed assets involve the following:

Master Configuration

This section describes how to configure the **Work Management Master Configuration** to synchronize fixed assets between the applications.

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To access the **Master Configuration** portal, select **Admin**, select **General**, and select **Master Configuration**.

Select the **Work Management** master configuration and scroll to the **Construction Work Management** zone.

- To enable synchronization of fixed assets, manually set the **Oracle Asset Integration** parameter to *Yes*. If Yes, then other rules are applied to individual business objects to accomplish the synchronization of the fixed assets.

  > **Note**
  >
  > Default setting is set to *No*. The system also considers the setting to be *No* if the parameter is left blank.

- If **Oracle Asset Integration** parameter is set to *Yes* then also define the **Fixed Asset Extract Batch Code** to send the fixed assets to the external system. Batch control W1-ERPFA is already provided to assist in this process and completes the following:
  - Sends fixed assets to the external system
  - Adds retired fixed asset entries to the general process table
  - Adds an accept or return line entry to the general ledger for fixed assets
  - Adds a cancel line entry to the general ledger for a stock item that is a capital spare

Fixed Asset Rules

This section describes various rules that must be configured once the **Oracle Asset Integration** parameter is set to *Yes*.

- Expense Code For Customer Contributed Fixed Asset is Required
- Property Unit is required if Fixed Asset Number is specified.
- Fixed Asset Number is not allowed if the Reconciliation Stock Item is a Capital Spare.
- **Owning Organization** is required when the **Property Unit** is populated and **Asset Type** is not populated. Also, Owning Organization is requred when creating an asset from the **Construction Location** tab of the CWA. Owning Organization cannot be updated.
- **Compatible Units** (CU) can be added to design elements, template construction work activities, and construction locations and MUST include a Usage Code and Cost Center. Also, if construction locations for the same activity have the same CU, the Cost Center for the CUs must also match. The same Fixed Asset Number on CUs cannot have a different Property Unit as they create a unique combination on the CU).
- Set up a file integration type for a fixed asset. See the example below:
  - **Description**: Fixed Asset Extract
  - **Class**: Extract (existing lookup value)
  - **Category**: fixed asset, this is a new value to lookup
  - **File Integration Records**:
    - **Sequence**: 10
    - **Record Type**: W1-FixedAssetExtract
    - **Description**: Fixed Asset Extract
    - **Data Area**: Fixed Asset Extract Data Area

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        * **Extract Algorithms**
            * **Sequence**: 10
            * **Algorithm**: the Fixed Asset Extract Algorithm
- Ensure **Fixed Asset Extract Data Area** includes the following data to be extracted and used by the file integration type created in the previous step:
    - Actions: A for addition; R for retirement, and C for change or adjustment
    - Asset ID (WAM Asset ID)
    - Fixed Asset Number
    - Asset Description
    - Badge Number
    - Serial Number
    - Manufacturer
    - Model
    - Owning Organization
    - Property Unit
    - Customer Contributed Flag
    - Account Segment 1 though 10
    - Quantity
    - Cost
    - Project ID (WAM Project ID)
    - ERP Project Number
    - Parent Project ID
    - Parent ERP Project Number
    - Activity ID (CWA ID)
    - Work Order ID
    - Work Order Number
    - In Service Date
    - Retirement Date
    - Transaction Date
    - GEN_PROC_ID
    - MAINT_OBJ_CD
    - PK_VALUE1

Additional rules to consider for applying **Direct Overhead** and **Indirect Overhead** cost to fixed assets:

- Set the appropriate percentages to work with your ERP Project and Fixed Asset process on the **Overhead** portal (Click **Admin**, click **Construction Work Management**, and click **Overhead**). For example, if all such cost is applied in ERP, you can set the percentages to zero in WAM or elect not to reference any Overhead on the Construction Work Order or Activity.

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- Administrative and design cost related to construction work is tracked in WAM as a separate Overhead activity and is considered a Direct Cost. This activity is included in the same work order as the construction work activity and the cost is transferred from the Overhead activity to the construction work activity when the construction work activity is closed. For this type of activity, only charge appropriate cost, as part of your business process, or don't allow this type of activity at all.
- Both *Direct* and *Indirect* overhead cost is applied to a construction work activity when it's closed. Cost is applied by an enter algorithm W1-APOVRHEAD (Apply Overhead Charges) defined on the CLOSED status of the construction work activity business object (W1-ConstructionWorkActivity). Disable or override the algorithm as needed.

Creating Application Links in External Applications

When integrating Oracle Utilities applications with other external applications, you can create links from external applications to specific portals and pages within the Oracle Utilities applications (also known as "deep linking"). These links typically leverage Business Process Assistant (BPA) scripts that direct the user to the appropriate target portal or page for a specific entity such as an account or service point. Refer to Creating Application Links in External Applications in the *Application Framework Administrative User Guide* for more information about creating links.

Note: When creating application links, the use of the following parameters will help speed up launching the target page

- **initNav=false**: skips launching the default home page for the user
- **minDashboard=true** minimizes the dashboard for the user

GoTo Portal Script

The Framework provides a generic script (F1-GoToPrtl) that can be used to navigate to the maintenance portal for a specified maintenance object and entity. Refer to Creating Application Links in External Applications in the *Application Framework Administrative User Guide* for more information about using this script.

WAM Examples

The table below provides examples of using the F1-GoToPrtl script to open specific portals used by Oracle Utilities Work and Asset Management.

Script	MO	ID	Example
F1-GoToPrtl	mo=W1-ACT	Activity ID	&script=F1-GoToPrtl&mo=W1-ACT&pkValue1={your Activity ID}
F1-GoToPrtl	mo=W1-ASSET	Asset ID	&script=F1-GoToPrtl&mo=W1-ASSET&pkValue1={your Asset ID}
F1-GoToPrtl	mo=W1-NODE	Location ID	&script=F1-GoToPrtl&mo=W1-NODE&pkValue1={your Location ID}

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Script	MO	ID	Example
F1-GoToPrtl	mo=W1-WORKORDER	Work Order ID	&script=F1-GoToPrtl&mo=W1-WORKORDER&pkValue1={your Work Order ID}

Full URL Example:

```
https://<ENV_BASE_URL>/ouaf/cis.jsp/?
minDashboard=true&initNav=false&script=F1-GoToPrtl&mo=W1-ACT&pkValue1={your
Activity ID}
```

Defining Oracle Utilities Customer Program Management Cloud Service / Customer Program Management Options

- Customer Program Management Configuration
- Customer Program Management Options
- Defining Other Related Options
- Customer Program Management Integrations

Customer Program Management Configuration

This section describes general configuration involved in implementing Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management .

General Options

Refer to the General Options section for information about configuration of general options including Installation Options, color options, and access control.

Cross Product Configuration

The Cross Product Configuration master configuration provides a single point of access for configuration information related to consolidated data maintenance, data mapping, and other master configurations used with Customer Program Management.

To open the master configuration, select **Admin**, select **General**, and select **Cross Product Configuration**. The master configuration opens in the **Cross Product Configuration** portal.

The **External System** field references the external system used for communication between functional components within the application such as data synchronization requests (for example, when a controllable asset is created the system also creates a controllable device record).

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Customer and Device Value Mapping

The **Customer and Device Mapping** section lists objects used to map data between customer-related objects and meter-related objects when synchronizing data between the applications and external applications including Oracle Utilities Customer to Meter.

SA Type Mapping references the extendable lookup used to map service agreement (SA) types to metered service types. Click **C2M SA Type Mapping Values** to view values for this extendable lookup.

The table lists fields that use Lookup Value Mapping to map values between functional components within the application. Click the Description link to view and/or edit mapping values for a specific field. A plus sign indicates that mapping values have not been defined for that field.

Click the icon to configure values for that field.

Device and Asset Value Mapping

The Device and Asset Value Mapping section lists objects used to map data between asset-related objects and meter-related objects (used when creating new controllable assets and devices).

The table lists fields that use Lookup Value Mapping to map values between functional components within the application. Click the Description link to view and/or edit mapping values for a specific field. A plus sign indicates that mapping values have not been defined for that field. Click the icon to configure values for that field.

Customer Program Management Integration Master Configuration

The Customer Program Management Integration master configuration is used to define configuration options used when integrating Oracle Utilities Customer Program Management Cloud Service or Oracle Utilities Customer Program Management with Oracle Utilities Network Management System and/or an external analytics application.

To open the master configuration, select **Admin**, select **General**, select **Master Configuration**, then click either the **Broadcast** or **Add** icon for the Customer Program Integration Master Configuration.

Refer to the **Oracle Utilities Customer Program Management Cloud Service Integration to Oracle Utilities Distributed Energy Resources Management System** documentation for more information about how this master configuration is used with these integrations.

- Customer Program Management Table Setup Sequence

Customer Program Management Table Setup Sequence

The table below provides the suggested order for the setup of administrative data used with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

Order	Entity	Description
1	Feature Configuration	These are options that can be set to impact system processing. Typically these have wide ranging impact across several modules (e.g., multi-time zone support)
1	Country	Your organization's country.

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Order	Entity	Description
1	Currency	Your organization's native currency.
1	Display Profile	Controls how dates, times, and numbers displayed.
1	Language	The language to use for this implementation.
1	Time Zone	Your organization's base time zone.
1	Work Calendar	The work calendar for your organization, which identifies your public holidays.
2	Installation Options	Control various global aspects of the system.
2	To Do Role	Used to associate users with To Do entries.
2	To Do Type	Used to define types of To Do Entries.
3	User	Defines a user's user groups, data access roles, portal preferences, default values, and To Do roles.
3	User Group	A group of users who have the same degree of security access.
3	Service Area	Defined a logical boundary of your organization's service territory.
3	Service Class	Defines different categories and types of work.
3	Service Type	Defines specific types of service for which usage can be recorded and captured (electric, gas, steam, etc.).
4	Division	Delineates between different operating companies within a large conglomerate of utilities.
4	Unit of Measure	Quantities measured and recorded by the system (CCF, KWH, KW, etc.).
4	Service Quantity Identifier	Used to further distinguish between measured quantities that have identical UOM/TOU combinations.
4	Time of Use	Modifiers for a given unit of measure that indicate a period of time during which a quantity has been used (On- Peak, Off-Peak, etc.).
4	Outbound Message	Defines messages sent to external systems.

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Order	Entity	Description
4	IMD Type	Define how initial measurements are processed using Direct Measurement Processing. **Note** The base package includes several pre-defined IMD types that can be used when processing data from different head end systems supported through Smart Grid Gateway Adapters.
5	External System	Defines External Systems with which Oracle Utilities Meter Data Management should be able to communicate.
5	Interval Price Set Types	Defines properties belonging to a class of interval price sets
6	Head End Systems	External entities that serve various roles relative to the application (head-end systems, outage management systems, etc.).
6	DER Aggregators	External systems that facilitate communication between a utility and Distributed Energy Resource (DER) devices.
6	External Applications	External entities that serve various roles relative to the application (head-end systems, outage management systems, etc.).
6	Program Contact Type	Defines properties of a class of entities (businesses, persons).
7	Activity Type	Defines properties common to a specific type of activity.
7	Communication Type	Define properties common to a specific type of communication.
7	Service Task Type	Defines specific types of enrollment and unenrollment processes
7	Program Type	Defines information common to dynamic options of a specific type.
7	Manufacturer	Individual companies that makes devices. Manufacturers also reference models.
7	Business Flag Type	Defines the business flag Standard Name and business flag business object to be used when creating business flags
7	VEE Group	Collections of VEE Rules that are applied to initial measurement data.

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Order	Entity	Description
7	Device Event Type	Defines information about a class of device events. Device events are used to capture periods of time during which customers make themselves unavailable to participate in program events.
8	Controllable Asset Type	Defines information about a class of controllable assets.
9	Controllable Device Type	Defines information about a class of controllable devices.
9	Measuring Component Type	Defines the most important properties of a measuring component.
9	Device Configuration Type	Defines properties of Device Configurations of a given type.
9	Device Type	Defines information about a class of devices.
10	Device Location Type	Defines specific types of locations at which devices are installed.
10	Metered Service Point Type	Defines specific types of points where services are provided.
10	Entity Group	Defines groups of entities, such as devices (including meters or controllable devices) or service points.
10	Weather Station	Defines specific weather stations
10	Postal Code Default	Defines postal code defaults
10	Usage Transaction Exception Types	Defines types of exceptions that may arise as part of program event settlement calculations (such as insufficient or invalid information, or an exception during calculation processsing or when retrieving data).
11	Program Calculation Group	Collections of program calculation rules used to calculate device control scores.
11	Program Settlement Calculation Group	Collections of program settlement calculation rules used to perform program settlement transaction calculations.
12	Program Calculation Rule	Defines rules that calculate device control scores
12	Program Settlement Calculation Rule	Defines rules that perform program settlement transaction calculations
13	Metered Service Type	Defines collections of properties common to a set of metered service records
13	Program Subscription Type	Defines collections of properties common to a set of Program Subscriptions.
14	Program Rules	Defines specific rules and parameters used by programs and program calculation rules.
14	Program Initiatives	Defines criteria used to determine if customers are eligible to participate in programs.
14	Customer Questions	Defines specific questions regarding customers and their service.
15	M&V Calculation Group	Collections of M&V calculation rules used to perform M&V transaction calculations.

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Order	Entity	Description
15	M&V Calculation Rule	Defines rules that perform M&V transaction calculations
15	M&V Subscription Type	Defines collections of properties common to a set of M&V Subscriptions.
16	Data Source	Defines the source of data for dynamic aggregation, such as Entity Groups for Controllable Devices or Service Points
16	Dynamic Aggregation Measuring Component Type	Define the most important properties of a measuring component used with dynamic aggregation.
16	Measuring Compoment Set	Define the dimensions and criteria by which dynamic aggregation will be performed.
16	Aggregation Group	Define the ordering of a series of related aggregations based on a set of configured measuring component Sets.
17	Service Codes	Defines sets of customer questions used with service calls.
18	Processing Methods	Control various behaviors for external applications, head end systems, and market participants within the system such as which message is sent, how an external value is translated, among others.
19	Master Configuration	Configuration that applies to series of modules that acts as a central point of configuration rather than embedding repetitive configuration throughout a set of algorithms.
20	Information Lifecycle Management	Information Lifecycle Management (ILM) is designed to address data management issues, with a combination of processes and policies so that the appropriate solution can be applied to each phase of the data's lifecycle.

> **Note**
>
> The Oracle Utilities Work and Asset Management functionality included with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Digital Asset Management uses some of the above administrative data. Refer to **Table Setup Sequence** for additional information about setting up administrative data used with Oracle Utilities Work and Asset Management.

Customer Program Management Options

- Understanding Customer Program Management
- Configuring Customer Program Management Options

Understanding Customer Program Management

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This section describes customer program management administrative options used with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

- Understanding Controllable Asset Types
- Understanding Device Location Types
- Understanding Head End Systems
- Understanding DER Aggregators
- Understanding Metered Service Types
- Understanding Metered Service Point Types
- Understanding Program Control Score Calculation Groups
- Understanding Program Control Score Calculation Rules
- Understanding Program Initiatives
- Understanding Program Contact Types
- Understanding Program Subscription Types
- Understanding Program Rules
- Understanding Program Types
- Understanding Program Settlement Calculation Groups
- Understanding Program Settlement Calculation Rules
- Understanding Usage Transaction Exception Types
- Understanding Interval Price Set Types
- Understanding Customer Questions
- Understanding Service Areas
- Understanding Service Classes
- Understanding Service Codes
- Understanding Service Types
- Understanding Units of Measure
- Understanding Time of Use Periods
- Understanding Service Quantity Identifiers
- Understanding Divisions
- Understanding Entity Groups
- Understanding Weather Stations
- Understanding Postal Code Defaults
- Understanding Bill Cycles
- Understanding Device and Measurement Options
- Understanding M&V Options
- Understanding Customer Program Service Task Types

Understanding Controllable Asset Types

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Controllable asset types define the attributes for controllable assets of a certain type, including information such as the valid location types and service history types for the assets and whether or not such assets can have attached components.

Controllable asset types have a related device type record. When a controllable asset type is created (or updated), a corresponding device type is created (or updated). See Understanding Device Types, below for more information about device types.

Controllable asset types are defined by the following:

- **Asset Business Object**: The asset business object used when creating controllable assets of this type.
- **Service Type**: The type of service (such as Electric) associated with controllable assets of this type.
- **Asset Category**: The category of assets to which controllable assets of this type belong. Controllable asset types generally belong to the “Controllable Device” category.

> **Note**
>
> The "Controllable Asset" category is used for assets owned by the customer, such as an HVAC unit, captured for informational purposes.

- **Component Relationship**: A flag that indicates if components can be installed on controllable assets of this type
- **Asset Management**:
  - **DER Processing Flag**: A flag that indicates how registration is handled for Distributed Energy Resource (DER) controllable assets of this type. This flag is required for DER assets. Options include:
    - **Interconnection and Registration**: Registrations of controllable assets of this type requires two registration requests, an interconnection request and a DER Registration request. The Interconnection request should be sent first and must be completed before the DER Registration request can be completed.
    - **Registration Only**: Registrations of controllable assets of this type requires only a DER Registration request
  - **Failure Profile**: Valid failure information (including failure types, failure modes, failure repairs, and failure components) associated with controllable assets of this type.
- **Valid Location Types**: A list of valid location types for each asset disposition. Note that the device location types for device locations where controllable asset of this type are to be installed must be specified for the "Installed" asset disposition.
- **Valid Service History Types**: A list of valid service history types for controllable assets of this type.
- **Asset Attribute Types**: A list of valid attributes that can be defined for controllable assets of this type. Ad-hoc or predefined characteristic types linked to the "Asset Attributes" characteristic entity can be defined as asset attribute types. Values for these attributes should be defined in the **Asset Attributes** zone of the **Asset** portal.
- **Engineering Specification Attribute Types**: A list of valid engineering specification attributes that can be defined for controllable assets of this type. Ad-hoc or predefined characteristic types linked to the "Specification Attributes" characteristic entity can be defined as engineering specification attribute types. Values for these attributes should be defined in the **Specification Attributes** zone on the **Specification** portal.

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- **Access Control**:
  - **Owning Organization**: The access group to which controllable assets of this type belong.
  - **Instance Organization**: Optional additional access group to which controllable assets of this type belong.

System Data

Controllable asset types are based on the system data:

Data Type	Description
Maintenance Object	Asset Type (W1-ASSETTYPE)
Business Object(s)	Controllable Asset Type (X1-ControllableAssetType)

Understanding Device Types

Device types define information about a class of controllable devices, including properties that apply to all devices of a given type.

Device types are created from corresponding controllable asset types. When a controllable asset type is created (or updated), a corresponding device type is created (or updated).

Controllable device types are defined by the following:

- **Controllable Device Business Object**: The business object used to create controllable devices of this type.
- **Device Classification**: The general class to which controllable devices of this type belong.
- **Category**: The category to which controllable devices of this type belong.
- **Service Type**: The type of service (such as Electric) associated with controllable devices of this type.
- **Track Location**: Flag that indicates if the location of controllable devices of this type is tracked.
- **Attached to**: Flag that indicates to which type of object (service point or meter) controllable devices of this type are attached.

System Data

Device types associated with controllable asset types are based on the system data:

Data Type	Description
Maintenance Object	Device Type (D1-DEVICETYP)
Business Object(s)	Item Type(D1-ItemType)

Distributed Energy Resource (DER) Device Attributes

Registration of DER devices includes populating various attributes of the device and related specifications. These DER attributes, including interconnection attributes, are captured as characteristics whose Characteristic Types are defined for the "Asset Attribute" and "Specification Attribute" characteristics entities. Characteristic types for DER attributes are defined in the DER Attribute Mapping (X1-DERAttributeMapping) extendable lookup. Values in this extendable lookup falls into one of three categories, based on the **Attribute Category**:

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- **DER Capability** attributes are read-only values established by the DER manufacturer by design or manufactured configuration. Each DER Device with the same manufacturer and model has the exact same set of DER Capability (nameplate) attributes. An example DER Capability attribute is "modesSupported" (Indicates support for each control mode function). Values for DER Capability characteristics are captured as Specification Attributes (see **Engineering Specification Attribute Types** above).
- **Device information** attributes contain identification and other information about the device that changes very infrequently typically only when updates are applied, if ever. An example Device Information attribute is "mfSerNum" (Serial Number). Values for Device Information attributes are captured as Asset Attributes (see **Asset Attribute Types** above).
- **Interconnection** attributes details define the specific DER settings for a particular customer based on the contractual agreement with the utility. An example Interconnection attribute is "interconnectionType" (Interconnection Type). Values for Interconnection attributes are captured as Asset Attributes (see **Asset Attribute Types** above).
- **Additional Information** attributes are used to capture additional information. Values for Additional Information attributes are captured as either Asset Attributes or Specification Attribute depending on whether they are defined as Asset Attribute Types or Engineering Specification Attribute Types on the asset type.

Implementations can add additional attributes to the DER Attribute Mapping (X1-DERAttributeMapping) extendable lookup if needed. Adding DER Capability and Device Information attributes also requires extending corresponding data areas as outlined in the following table:

Attribute Category	Date Area (Used to define attributes for inbound and outbound messages)
DER Capability	DER Capability attributes (X1-DERCapabilityAttributes)
Device information	DER device information attributes (X1-DERDeviceInfoAttributes)
Interconnection	N/A (Adding additional Interconnection attributes does not require extending any data areas.)
Additional Information	N/A (Adding additional Additional Information attributes does not require extending any data areas.)

Understanding Device Location Types

Device location types define the details of locations of a certain type where controllable assets can be installed.

Device location types are defined by the following:

- **Service Type**: The type of service (such as Electric) available at device locations of this type.
- **Device Location Business Object**: The business object used to create device locations of this type.
- **Divisions**: One or more divisions associated with device locations of this type.
- **Valid Controllable Device Types**: A list of one or more controllable device types considered valid to be installed at device locations of this type.

System Data

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Device location types are based on the system data:

Data Type	Description
Maintenance Object	Service Point Type (D1-SPTYPE)
Business Object(s)	Device Location Type (X1-DeviceLocationType)

Understanding Head End Systems

Head end systems represent external systems that handle the communication with controllable devices. With Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management, Oracle Utilities Network Management System can be used as a head end system to facilitate communication with and control of controllable devices.

Head end systems utilize processing methods that specify the types of messages that are processed and sent to the external system.

Head end systems are defined by the following:

- **External Reference ID**: An ID used to reference the head end system in external systems and applications.
- **External System**: The external system associated with the head end system.
- **Our Name in Their System**: The name for Oracle Utilities Customer Program Management Cloud Service or Oracle Utilities Digital Asset Management in the external system.
- **Service Provider Type**: The general type of service provider to which the head end system belongs (default is "Head End System").
- **Processing Methods**: One or more processing methods used to define the format or means by which the head end system receives or sends data from or to the application. Processing methods can also be used to define the information an external system wishes to subscribe to receive from the application.
- **Translation Methods**: One or more methods used for translating data sent between the head end system and Oracle Utilities Customer Program Management Cloud Service or Oracle Utilities Digital Asset Management.

System Data

Head End Systems are based on the system data:

Data Type	Description
Maintenance Object	Service Provider - MDM (D1-SVCPROVDR)
Business Object(s)	Controllable Device Head End System (X1-CtrlDvcHeadEndSystem)

Understanding DER Aggregators

DER (Distributed Energy Resource) aggregators are external systems that facilitate communication between a utility and Distributed Energy Resource (DER) devices and, in some cases control and manage DER devices to provide energy and other services to utilities. Based on the IEEE 2030.5 protocol, utilities typically enter into a contractual agreement with one or more aggregators such that authorized aggregators can offer contracted programs to the end customers on behalf of the utility.

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As DER Aggregators are created and updated, aggregator data is synchronized with Oracle Utilities Network Management System. DER Aggregator data synchronization includes contact and program offering information. Note that deletion of DER does **not** trigger data synchronization.

DER aggregators utilize processing methods that specify the types of messages that are processed and sent to the external system.

DER aggregators are defined by the following:

- **Service Provider Type**: The general type of service provider to which the DER aggregator belongs (default is "DER Aggregator").
- **Status**: The current status of the DER aggregator in the system.
- **Start Date**: The date on which the DER aggregator is eligible to provide service.
- **End Date**: The date after which the DER aggregator is no longer eligible to provide service.
- **Contact ID**: The program contact for the DER aggregator.
- **External Reference ID**: An ID used to reference the DER aggregator in external systems and applications.
- **External System**: The external system associated with the DER aggregator.
- **Our Name in Their System**: The name for Oracle Utilities Customer Program Management Cloud Service or Oracle Utilities Digital Customer Program in the external system.
- **Certification Status**: The IEEE 2030.5 certification status of the DER aggregator. Valid values include "Certified", "In Progress", "Not Applied", and "Rejected".
- **Energy Source**: The source of energy provided by the aggregator.
- **DER Aggregator Class**: The general class to which the DER aggregator belongs, such as "Independent System Operator", "Distribution System Operator", or "Both".
- **Program Offering**: One or more programs that the aggregator can offer to end customers on behalf of the utility
- **Processing Methods**: One or more processing methods used to define the format or means by which the DER aggregator receives or sends data from or to the application. Processing methods can also be used to define the information an external system wishes to subscribe to receive from the application.

System Data

DER Aggregators are based on the system data:

Data Type	Description
Maintenance Object	Service Provider - MDM (D1-SVCPROVDR)
Business Object(s)	DER Aggregator (X1-DERAggregator)

Understanding Metered Service Types

Metered service types a collection of properties defining a class of metered services. Metered service type records are most often created via data synchronization with Oracle Utilities Customer Cloud Service (or Oracle Utilities Customer to Meter) and corresponding to usage subscription types in those systems.

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Metered service types are defined by the following:

- **Metered Service Business Object**: The business object used when creating metered service records of this type.
- **Customer Settlement BO**: The settlement transaction business object used for customer settlements for metered service records of this type.
- **Valid Metered Service Point Types**: One or more metered service point types considered valid for metered service records of this type.
- **Attributes**: Characteristic types that may be defined for metered service records of this type.

System Data

Metered service types are based on the following system data:

Data Type	Description
Maintenance Object	Usage Subscription Type (D1-USTYPE)
Business Object(s)	Metered Service Type (X1-MeteredServiceType)

Understanding Metered Service Point Types

Metered service point types define a specific type of point at which service is delivered. Metered service point type are most often created via data synchronization with Oracle Utilities Customer Cloud Service (or Oracle Utilities Customer to Meter) and corresponding to service point types in those systems.

Metered service point types are defined by the following:

- **Service Type**: The type of service (such as Electric) available at metered service points of this type.
- **Metered Service Point Business Object**: The business object used when creating metered service points of this type.
- **SP Class**: The class of service points to which metered service points of this type belong (inherited from the business object).
- **Divisions**: One or more divisions associated with metered service points of this type.

System Data

Metered service point types are based on the following system data:

Data Type	Description
Maintenance Object	Service Point Type (D1-SPTYPE)
Business Object(s)	Metered Service Point Type (X1-MeteredServicePointType)

Understanding Program Control Score Calculation Groups

Program control score calculation groups are collections of program control score calculation rules that are used to calculate device control scores. During the program control score process, the system executes the program control score calculation rules defined in the program control score calculation group referenced on the program subscription. The rules

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within a program control score calculation group are defined in a specific sequence, allowing control over the order in which the rules are executed.

Program control score calculation groups are associated with specific program subscriptions and program subscriptions types (or both). When assigned to program subscriptions, program control score calculation groups contain the program control score calculation rules to be used to calculate device scores associated with the device locations defined for the program subscription. Program control score calculation groups associated with program subscription types are those groups considered valid for program subscriptions of that type.

Program control score calculation groups are defined by the following:

- **Division**: The division to which the calculation group belongs.
- **Calculation Group Class**: The class to which the program calculation group belongs (default is Program Calculation Group).
- **Program Control Score Calculation Rules List**: One or more program control score calculation rules belonging to the program calculation group

System Data

Program control score calculation groups are based on the following system data:

Data Type	Description
Maintenance Object	Usage Group (D1-USGGRP)
Business Object(s)	Control Score Calculation Group (X1-ProgramCalculationGroup)

Understanding Program Control Score Calculation Rules

Program control score calculation rules are rules that perform device score calculations. Program control score calculation rules are created for a specific program control score calculation group. For example, if you were configuring two program control score calculation groups and both included a specific program control scorecalculation rule, you would need to create two instances of the program control score rule, one for each group.

The base package includes the following program control score calculation rule business objects:

Program Calculation Rule	Description
Generic Control Score Calculation Rule (X1-GenericProgramCalcRule)	This is a parent business object for all Program Control Score Calculation Rule business objects, and is used to define the lifecycle and schema of child rule business objects.
Score Calculation Rule (X1-ScoreCalculationRule)	This rule is used to calculate control scores for controllable devices.

System Data

Program control scorecalculation rules are based on the following system data:

Data Type	Description
Maintenance Object	Usage Rule (D1-USGRULE)

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Data Type	Description
Business Object(s)	Generic Control Score Calculation Rule (X1-GenericProgramCalcRule) Score Calculation Rule (X1-ScoreCalculationRule)

Understanding Program Initiatives

Program initiatives define criteria used to determine if customers are eligible to participate in programs.

Program initiatives are defined by the following:

- **Status**: The current status of the initiative.
- **Initiative Eligibility Criteria**: Criteria used to determine if a customer is eligible for a program.

System Data

Program initiatives are based on the system data:

Data Type	Description
Maintenance Object	Initiative (C1-INITIATIV)
Business Object(s)	Digital Asset Initiative (X1-InitiativeDigitalAsset)

Understanding Initiative Eligibility Criteria

A program initiative's eligibility criteria are used to confirm that a customer is eligible to enroll and participate in a program. An initiative may have zero, one, or many eligibility criteria. Each customer is subjected to these criteria to determine whether they are eligible to enroll in the program. Eligibility criteria can perform comparisons with scalar values (such as, a number of days, number of kwh) or with derived values (such as, attributes of a customer).

The Metered Service Criteria (X1-MeteredServiceCrit) business object can be used to define program initiative eligibility criteria. The Derive Value Algorithm Type options on this business object define a number of algorithm types that can be used in comparison operations as part of determining eligibility. Algorithms based on these algorithm types can retrieve data from a customer's metered service or metered service points.

The base package includes the following algorithm types and algorithms for eligibility criteria comparisons:

Algorithm Type	Algorithm
Retrieve Metered Service Characteristic (X1-ICGETSCEL)	Retrieve Metered Service Characteristic - Active Service (X1-ICGETASVC)
Retrieve Metered Service Point Attribute (X1-ICGETSPEL)	Retrieve Locations Life Support / Sensitive Load (X1-ICGETLSSL)
	Retrieve Locations Division (X1-ICGETDIV)
Evaluate Rate Eligibility (X1-ICGETRATE)	Return true if rate is eligible for program (X1-ICGETRATE)
Retrieve Metered Service Attribute (X1-ICGETMSEL)	No base package algorithms

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To set up an eligibility criterion, you must define the following:

- When the eligibility criterion should be executed, known as the **Criteria Execution Point**
- The field to be compared
- The comparison method

The **Criteria Execution Point**, for program initiative eligibility is "Enrollment", meaning this criteria is used when evaluating if a customer is eligible for enrollment in a program.

For the field to be compared, a **Criteria Field Algorithm** is used to:

- Retrieve a field value or values from the customer's metered service or metered service points, such as
- Derive a value based on some data from someplace else in the system (such as whether or not the customer's rates is eligible for the program)

For the comparison method, you select the **Operator** used to compare the retrieved value to a **Comparison Value**. The result from the comparison will be TRUE, FALSE, or INSUFFICIENT DATA. Each of these results should specify the next action. The valid actions include:

- Indicate that the customer is eligible
- Indicate that the customer is not eligible
- Check the next condition
- Issue an error (this option is only available for Insufficient Data)

For example, a program's enrollment eligibility criteria might include only allowing customers who are not on life support or have what is considered to be a "sensitive load" (designated by a value of "Yes" in the **Life Support / Sensitive Load** field on the device location), and whose rate is eligible for program. In other words, if the **Life Support / Sensitive Load** field on the device location is set to "Yes" or the customer's rate is not defined as eligible for the program then the customer is not eligible, Eligibility criteria for this might look like the following:

Seq.	Description	Criteria Field Algorithm	Comparison Value	If True	If False	If Insufficient Data	Criteria Execution Point
10	Life Support	Retrieve Locations Life Support / Sensitive Load	Y	Not Eligible	Check Next Condition	Error	Enrollment
20	Eligible Rate	Return true if rate is eligible for program	true	Eligible	Not Eligible	Error	Enrollment

System Data

Initiative Eligibility Criteria are based on the system data:

Data Type	Description
Maintenance Object	Initiative Criteria (C1-INTV-CR)
Business Object(s)	Metered Service Criteria (X1-MeteredServiceCrit)

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Understanding Program Contact Types

Program contact types define the properties of a class of program contacts (such as businesses or persons).

Program contact types are defined by the following:

- **Contact Use**: Flag that indicate whether contacts of this type are the primary customer contact and point of contact ("Customer and Point of Contact") or just the point of contact ("Point of Contact Only").
- **Contact Type Business Object**: The business object used when creating program contacts of this type.

System Data

Program contact types are based on the system data:

Data Type	Description
Maintenance Object	Contact Type (D1-CONTTYPE)
Business Object(s)	Contact Type (D1-ContactType)

Understanding Program Subscription Types

Program subscription types define properties defining a class of program subscriptions. Program subscription types also control valid values for various attributes of program subscriptions.

Program subscription types are defined by the following:

- **Program Subscription Business Object**: The business object used when creating program subscriptions of this type.
- **Program Control Score Business Object**: The business object used when creating program control scores for program subscriptions of this type.
- **Program Settlement BO**: The business object used when creating program settlements for program subscriptions of this type.
- **Valid Device Location Types**: A list of one or more device location types considered valid for program subscriptions of this type.
- **Valid Transaction Calculation Groups**: A list of one or more program calculation groups considered valid for program subscriptions of this type.
- **Fallback Transaction Calculation Groups**: A list of one or more effective dated program calculation groups used if a program calculation group is not defined on the program subscription..
- **Valid Program Types**: A list of one or more program types considered valid for program subscriptions of this type.

System Data

Program subscription types are based on the system data:

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Data Type	Description
Maintenance Object	Usage Subscription Type (D1-USTYPE)
Business Object(s)	Program Subscription Type (X1-ProgramSubscriptionType)

Understanding Program Rules

Program rules are used to define specific rules and parameters used by programs and program calculation rules. A program can have one or more associated program rules. If a program has more than one rule, the system uses the rule with the latest effective date/time.

Program rules are defined by the following:

- **Rule Type**: The type of rule.
- **Effective Date**: The date on which the rule is considered to be in effect. Only rules that are currently in effect can be used for score calculations.
- **Expiration Date**: The date on which the rule expires. Expired rules cannot be used for score calculations.
- **Rule-Specific Parameters**: Parameters specific to individual program rules.

System Data

Program rules are based on the following system data:

Data Type	Description
Maintenance Object	Rule (D1-RULE)
Business Object(s)	Device Score Rule (X1-ProgramRules) Incentives and Fees Rule (X1-IncentivesFeesProgramRule)

- Device Score Rules
- Incentives and Fees Rules

Device Score Rules

Device score rules are used to calculate device control scores, and use the following parameters:

- **Common Program Rule Parameters**: See Understanding Program Rules.
- **Standard Score Parameters**: Details about device score calculation cycles, including:
  - **Cycle Frequency**: The frequency of score calculation cycle periods. Can be either "Weekly" or "Monthly".
  - **Week Start**: The day of the week on which each week is considered to start, applicable to "Weekly" cycle frequency.
  - **Participation Limit**: The maximum number of times a device can successfully participate in an event in a cycle. The **Score Calculation Factors** section should have values defined for a number of cycles equal to this.
  - **Participation Duration**: The maximum cumulative duration of a device's successfully event participation in a cycle.

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  - **Duration Between Participation**: The minimum duration between successful event participation for a device in a cycle.
  - **Max Overrides**: The maximum number of manual overrides allowed per enrolled device
  - **Max Consecutive Days**: The maximum number of days the enrolled device can be consecutively called upon
  - **Max Cumulative Event Duration**: The maximum duration of participation across all events for the enrolled device in HH:MM:SS format.
  - **Allow Event Days**: The allowed day types ("All Days", "Weekday", or "Weekend") on which the enrolled device can be called upon.
  - **Allow On Holidays**: A flag to indicates ("Yes" or "no") whether enrolled device can be called on a Holiday
  - **Holiday Calendar**: The Work Calendar used to define holidays. See **Defining Work Calendar** for more information about setting up work calendars.
  - **Start Hour From**: The earliest start hour of the day at which the event can be initiated. Applies to Programs that can only be run during certain hours of the day.
  - **Start Hour To**: The latest start hour of the day at which the event can be initiated. Applies to Programs that can only be run during certain hours of the day.
  - **End Hour From**: The earliest end hour of the day that can be assigned to an event. Applies to Programs that can only be run during certain hours of the day.
  - **End Hour To**: The latest end hour of the day that can be assigned to an event. Applies to Programs that can only be run during certain hours of the day.
  - **Start Time Offset**: Allowable delay between a scheduled event start time and the actual time at which enrolled devices initiate a response.
- **Score Calculation Factors**: Details used in score calculations, including:
  - **Cycle**: The cycle in in which a device is currently participating. Calculated as the number of the device's successful event participations plus 1. There should be a number of cycles defined equal to the value of the **Participation Limit** in the **Standard Score Parameters** section.
  - **Activation Cost**: The activation cost associated with the cycle.
  - **Burn Rate Factor**: The burn rate factor associated with the cycle.
  - **Score Factor**: The score factor associated with the cycle.

When device sore rules derive values from the **Score Calculation Factors** section, values are defined per **Cycle**, which is the number of times the device has successfully participated in an event during the current cycle (week or month), plus 1. A device's event participation is considered successful in the following circumstances:

- The Event Participation has an **Outcome** of "Successful Participation".
- The Event Participation has an **Outcome** of "Canceled". This happens when a device has been reserved but the event stopped halfway through due to reasons such as, target load control reached. It is considered as a success in customer perspective, since it is the utility that stopped the event which resulted to a cancelled outcome.
- The Event Participation has a blank **Outcome** and the device was not preemptively opted out of the event (**Preemptive Opt-Out** is "No" or blank). Posting of an event's outcome may be delayed, and until then the event participation of a reserved device is considered as a success as long as the customer did not opt out before the event transpires.

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For instance, if a device has never participated in an event, the algorithms would use the values in the Cycle 1 row. If a device has successfully participated in 3 previous events, the algorithms would use the values in the Cycle 4 row.

If a Device Score rule is added to program, or an existing Device Score Program Rule associated with a program is edited, a synchronization request and outbound message are created to update external DERMS systems such an Oracle Utilities Grid Edge DERMS.

Incentives and Fees Rules

Incentives and fees rules are used to calculate incentives and fees related to a program. Incentives include sign-up incentives for enrollments, referral rebates, and incentives for remaining enrolled during the peak season. Penalties or fees are applied in certain circumstance, for instance if they terminate their enrollments before the contracted period, or when the utility incurs charges related to device repairs, or device upgrades. Incentives and Fees rules should define parameters for all of the incentives and/or fees applicable for the program.

These use the following parameters:

- **Common Program Rule Parameters**: See Understanding Program Rules.
- **Rule Parameters**, including:
  - **Sequence**: The sequence of the rule.
  - **Category**: The category for the incentive and fee such as **Fixed Rebate, Enrollment Signup, Early Termination Fee** and others. Category values are defined using the Incentive and Fee Type Category (X1-IncentiveFeeTypeCatLookup) extendable lookup.
  - **Calculation Group**: The program settlement calculation groups that contains the program settlement calculation rules for the incentive and fee.
  - **Calculation Frequency**: The frequency of an incentive and fee category. Cyclical fixed rebates may be set as **Monthly, Quarterly or Annual**. Enrollment Signup and Installation Rebate may be set as **One Time** . Service Charge and Early Termination Fee may be set as **Ad hoc**. Frequency values are defined using the Incentive and Fee Calculation Frequency (X1-IncentiveFeeCalcFreqLookup) extendable lookup.
  - **Settlement Frequency**: This parameter is currently not used.
  - **Line External Id**: An identifier or code that can be used by the external system that receives the calculated incentive and fee line amount. These values can be mapped to the distribution code of general ledger entry for the line amount. Values are defined using the Line Identifiers (X1-LineIdentifiersLookup) extendable lookup.
  - **Seasonal**: Flag that indicates if the incentive or fee will be calculated only for a particular season.
  - **Season Start/Season End**: The start and end date of the season. This applies only if the Seasonal parameter is set to "Yes". Entered as **MM-DD** (for month and day), displayed as **MMDD** .
  - **Eligibility Algorithm**: An algorithm used to determine if the program subscription is eligible for the incentive and fee. See **Incentive and Fee Eligibility** below for more information.
  - **Minimum Days**: A number of days added to the transaction end date of the latest calculated incentive and fee type to determine if next transaction for the same category may be calculated. applies to cyclical calculation.

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Incentive and Fee Eligibility

The rules and conditions under which a program subscription is considered eligible for a given incentive or fee are implementation-specific, and can be based on information on a wide variety of records, such as the program subscription, a related device location or controllable asset or device, or the existence of work order activities for customer. The base package does not include algorithms for determining eligibility of incentives and fees. Implementations must configure their own algorithms based on their business requirements and specify those algorithms on the appropriate Rule Parameter.

Understanding Program Types

Program types define properties belonging to a class of program.

Program types are defined by the following:

- **Dynamic Option Class**: The class of program to which programs of this type belong.
- **Program Category**: The category to which programs of this type belong. Options include:
  - Control Group
  - DER Registration
  - Device Control
  - In Home Energy Assessment
  - Rate-Based
- **Device Required**: Flag that indicates (Yes or No) if programs of this type require controllable devices.
- **Location Required Source**: Flag that indicates (Yes or No) if programs of this type require a location. Most programs for which a service of some type is performed (such as installation of a device or a home energy assessment) require a location. An example of a program type that does not require a location is a Critical Peak Pricing (CPP) program. Note that some steps such as creation of a device location and device are skipped in enrollment processing for programs based on a type where this is set to "No".
- **Program Business Object**: The business object used when creating programs of this type.
- **Program Event Business Object**: The business object used when creating program events for programs of this type.
- **Event Participation**: The business object used when creating event participation records for programs of this type.
- **Time Zone**: The time zone associated with programs of this type.
- **Settlement Group Determination**: An optional algorithm used to determine the appropriate Program Settlement Calculation Group to use when calculating program settlement transactions for programs of this type. For example, the base package include the Determine Program Usage Group by Date (X1-DETPTUGRP) algorithm, which can specify whether to use an program settlement transaction's Start Date or End Date when determining which calculation group to use.
- **Event Opt Out Parameters**: Parameters that define if customers can "opt out" of events for programs of this type, including:
  - **Allow To Opt Out**: A flag that indicates (Yes or No) if if customers can "opt out" of events for programs of this type

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  - **Opt Out Threshold Minutes**: The minimum number of minutes before an event takes place by which a customer may opt out of events for programs of this type
  - **Eligible Categories**: A list of Event Categories for the types of events from which customers can opt out for programs of this type

- **Related Program Type**: A list of one or more related program types. Not applicable if "DER Registration" is selected as the **Program Category**.
- **Program Quantity Types**: A list of one or more valid program quantity types for programs of this type. Available program quantity types are based on values defined in the Program Quantity Type (X1-ProgramQuantityType) extendable lookup.

System Data

Program types are based on the system data:

Data Type	Description
Maintenance Object	Dynamic Option Type (D1-DOPTYPE)
Business Object(s)	Program Type (X1-ProgramType)

Setting up Program Quantity Types

Program quantity types available for program types and programs are defined in the Program Quantity Type (X1-ProgramQuantityType) extendable lookup.

Program quantity types are defined by the following:

- **Program Quantity Type**: A code for the program quantity type
- **Description**: A description of the program quantity type
- **Status**: The current status of the program quantity type
- **Service Type**: The type of service (such as "Electric" or 'Water") associated with the program quantity type
- **UOM**: The unit of measure for quantities of the program quantity type
- **TOU**: The time of use period for quantities of the program quantity type
- **SQI**: The service quantity identifier for quantities of the program quantity type
- **Category**: The category to which the program quantity type belongs. To add other Program Quantity Type Category values, add new Characteristic Values to the Program Quantity Type Category (X1-RCCAT) characteristic type.

Understanding Program Settlement Calculation Groups

Program settlement calculation groups are collections of program settlement calculation rules that are used to calculate program settlement transactions, which represent credits that will be applied to a customer's bill based on participation in an individual event (see About Program Settlement Transactions). The rules within an program settlement calculation group are defined in a specific sequence, allowing control over the order in which the rules are executed.

Program settlement calculation groups are associated with specific programs. When assigned to programs, program settlement calculation groups contain the program settlement calculation rules to be used to calculate settlements associated with events for the program.

Program settlement calculation groups are defined by the following:

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- **Division**: The division to which the calculation group belongs.
- **Calculation Group Class**: The class to which the program settlement calculation group belongs (default is Program Settlement Calculation Group).
- **Transaction Type**: A flag that indicates the type of transaction calculated by the program settlement calculation group. This allows configuration of multiple groups to support different types of calculations required for the same Event Settlement Method (After Event Participation or End of Season)., Values for this flag are defined as values for the Settlement Transaction Type (X1-STTRT) Characteristic Type.
- **Program Settlement Calculation Rules List**: One or more program settlement calculation rules belonging to the program calculation group

System Data

Program settlement calculation groups are based on the system data:

Data Type	Description
Maintenance Object	Usage Group (D1-USGGRP)
Business Object(s)	Calculation Group Root (D1-UsageGroupRoot) - Parent Business Object Program Settlement Calculation Group (X1-EventSettlementCalcGroup)

Understanding Program Settlement Calculation Rules

Program settlement calculation rules are rules that perform program event settlement calculations and create program event settlement transactions, which represent credits that will be applied to a customer's bill based on participation in an individual event (see About Program Event Settlement Transactions). Program settlement calculation rules are created for a specific program settlement calculation group. For example, if you were configuring two program settlement calculation groups and both included a specific program settlement calculation rule, you would need to create two instances of the program settlement calculation rule, one for each group.

The base package includes the following program calculation rule business objects:

Event Settlement Calculation Rule	Description
End of Event Program Settlement Rule (X1-EventSettlementCalcRule)	This rule is used to calculate settlement results for consumption-based ("kWh Avoided") events.
End of Season Program Settlement Rule (X1-EventSetCalcRuleDemandBased)	This rule is used to calculate settlement results for demand-based ("kW Drop") events.
Incentive and Fee Calculation Rule (X1-IncentiveCalculationRule)	This rules is used to calculate program incentives and fees.
Baseline Calculation (D2-BaselineCalc)	This rule is used to calculate estimated baseline consumption for a metered service point that represents an estimate of the customer's consumption or demand for an event period had they not participated in the event. The Apply Eligibility Criteria - Check Optional UOM/TOU/SQI (D2-UTS-AEC) can be used to deetermine if a particular UOM/TOU/SQI in the rule configuration before executing the rule.

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Event Settlement Calculation Rule	Description
Vector and Service Quantity Math (D2-Math)	This rule is designed to facilitate configuration of complex vector calculations. It is based on a series of underlying services with vectors configured as input to the calculations. This can be used to calculate reductions in consumption or demand by subtracting actual consumption from baseline consumption calculated using the Baseline Calculation rule.
Execute Usage Calculation Group (D1-UsageRuleReferredUsageGroup)	This rule is used to execute a separate usage calculation group which includes execution of all usage calculation rules within that group. For example, this can be used to group a Baseline Calculation rule and Vector and Service Quantity Math rule to calculate reductions in consumption or demand, which can then be passed to an End of Event Program Settlement Rule or End of Season Program Settlement rule.

System Data

Program settlement calculation rules are based on the following system data:

Data Type	Description
Maintenance Object	Usage Rule (D1-USGRULE)
Business Object(s)	End of Event Program Settlement Rule (X1-EventSettlementCalcRule) End of Season Program Settlement Rule (X1-EventSetCalcRuleDemandBased) Incentive and Fee Calculation Rule (X1-IncentiveCalculationRule) Baseline Calculation (D2-BaselineCalc) Vector and Service Quantity Math (D2-Math) Execute Usage Calculation Group (D1-UsageRuleReferredUsageGroup) Generic Usage Calculation Rule (D1-GenericUsageRule)

Eligibility Criteria

Eligibility criteria are user-definable conditions that could cause a given rule rule to be applied or skipped. This can involve the evaluation of some attribute of the program subscription or metered service point, or something else entirely. Prgram settlement calculation rules can have multiple eligibility criteria for determining if the rule should be applied or skipped, based on a user-defined sequence.

System Data

Eligibility criteria are based on the following system data:

Data Type	Description
Maintenance Object	Usage Calculation Rule Eligibility Criteria (D1-USGRLELIG)

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Data Type	Description
Business Object(s)	Usage Eligibility Criteria (D1-UsgRuleEligibilityCriteria) Apply Eligibility Criteria - Check Optional UOM/TOU/SQI (D2-UTS-AEC)

Understanding Usage Transaction Exception Types

Usage Transaction Exception Types define the groupings of exceptions for a Program Event Settlement Transaction based on their functional similarity. This provides a way to define Program Event Settlement Transaction Exceptions in a distinct enough way to understand the root issue that was generated from the usage calculation rule.

Understanding Interval Price Set Types

Interval price set types define properties belonging to a class of interval price sets.

Interval price set types are defined by the following:

- **Service Type**: The service type to which interval price sets and interval prices based on this type will be applied
- **Interval Size**: The size of the intervals for interval prices based on this type, represented as hours:minutes:seconds (HH:MI:SS).
- **UOM**: The unit of measure used to define interval price sets and interval prices based on this type
- **TOU**: The time of use period used to define interval price sets and interval prices based on this type
- **SQI**: The service quantity identifier used to define interval price sets and interval prices based on this type
- **Short-Hand Description**: A short-hand description used for interval price sets of this type

> **Note**
>
> Either a UOM or SQI **must** be defined when creating an interval price set type.

System Data

Interval Price Set Types are based on the following system data:

Data Type	Description
Maintenance Object	Measuring Component Type (D1-MCTYPE)
Business Object(s)	Interval Price Set Type (D1-IntervalPriceType)

Understanding Customer Questions

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Customer questions are used to capture specific information related to a customer or their service. Questions are associated with programs to help determine a customer's eligibility for that program.

Customer questions are defined by the following:

- **Question**: A name or code for the question.
- **Question Text**: The specific text of the question (such as "Do you have Internet service?").
- **Answer Style:** The data type for responses to the question (such as checkbox, radio button, date or date/time, text input, or pre-defined characteristic type). This also controls how valid answers are rendered in the user interface. Refer to the embedded help for additional details.
- **Status**: The current status of the question.
- **Valid Answers**: One or more answers to the question, including the sequence (if applicable), a code for the answer (such as "Y" or "N"), answer text (such as "Yes" or "No"), if different from the code, and status.

System Data

Customer questions are based on the system data:

Data Type	Description
Maintenance Object	Question - CCB (C1-QSTN)
Business Object(s)	Customer Question (C1-Question)

Understanding Service Areas

Service areas define a logical boundary of your organization's service territory. A service area can be specified on a metered service point to indicate the service area in which the metered service point is located.

Crew shifts are populated with a list of service areas that the crew shift is allowed to work. This is matched up with the service area indicated on the activity (from the metered service point) to help determine which crew shift can work the activity.

System Data

Service areas are based on the system data:

Data Type	Description
Maintenance Object	Service Area (W1-SVCAREA)
Business Object(s)	Service Area (W1-ServiceArea)

Understanding Service Classes

Service classes are used to categorize different types of work.

Service classes are defined by the following:

- **Service Class Type** : A broader category of the type of work, such as Maintenance, Renewal, Construction, and and so on.
- **CWIP Cost Center**: Not applicable for Customer Program Management.

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System Data

Service classes are based on the system data:

Data Type	Description
Maintenance Object	Service Class (W1-SVCCLASS)
Business Object(s)	Service Class (W1-ServiceClass)

Understanding Service Codes

Service codes are used to define sets of questions used with service calls. Service codes are referenced on service task types, and used to display customer questions on service call process flows.

Refer to Understanding Customer Questions for more information about customer questions.

Service codes are defined by the following:

- **Questions**: The sequence of questions that comprise the service code.

System Data

Service classes are based on the system data:

Data Type	Description
Maintenance Object	Service Code - CCB (C1-SVCCODE)
Business Object(s)	Program Service Call Service Code (X1-ProgramSvcCallServiceCode)

Understanding Service Types

Service types define specific types of service used by and with controllable assets, such as electric, gas, water, and so on.

System Data

Service types are based on the system data:

Data Type	Description
Maintenance Object	Service Type - MDM (D1-SVCTYPE)
Business Object(s)	Service Type (D1-ServiceType)

Understanding Units of Measure

Units of Measure (UOM) identify quantities measured and recorded, such as KWH, KW, cubic feet, degrees Celsius, etc. UOMs are based on a specific service type. When used to define interval prices, units of measure might include currency denominations such as dollars or cents.

System Data

Units of measure are based on the following system data:

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Data Type	Description
Maintenance Object	Unit Of Measure - MDM (D1-UOM)
Business Object(s)	Unit Of Measure (D1-UnitOfMeasure)

Important Unit of Measure System Events

Unit of Measure supports the following business object algorithm system events:

- Axis Conversion: this event receives a list of measurements along with a source UOM and interval size and a target UOM and interval size. It should then perform the necessary actions to convert the source UOM and interval size into the target UOM and interval size. Refer to the algorithm Axis Conversion algorithm (D1-AXIS-CONV) as an example.

  When used with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management, axis conversion is most commonly used to convert “kWh avoided” interval values to match the interval size of the interval prices used in program settlement calculations.

Understanding Time of Use Periods

Time of Use (TOU) periods are modifiers for a given unit of measure that indicate a period of time during which a quantity has been used, such as On-Peak (meaning during a time when the greatest quantity of some consumable is being used), Off-Peak (meaning during a time when the least amount of some consumable is being used), etc.

System Data

Time of use periods are based on the following system data:

Data Type	Description
Maintenance Object	Time Of Use - MDM (D1-TOU)
Business Object(s)	Time Of Use (D1-TimeOfUse)

Understanding Service Quantity Identifiers

Service Quantity Identifiers (SQI) are used to further distinguish between measured quantities that have identical UOM/TOU combinations, including situations in which the distinguishing identifier of a UOM is not accurately described as a TOU. Some examples include: Generated, Consumed, etc. When used to define interval prices, service quantity identifiers might represent things like Market Prices or Real-Time Prices.

SQIs can also be used as a stand-alone representation of a service quantity that is not measured (one that is not properly described as a UOM) within a usage service quantity collection (such as a billing determinant).

System Data

Service quantity identifiers are based on the following system data:

Data Type	Description
Maintenance Object	Service Quantity Identifier - MDM (D1-SQI)
Business Object(s)	Service Quantity Identifier (D1-ServiceQuantityIdentifier)

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Understanding Divisions

Divisions are used to delineate between different operating companies within a large conglomerate of utilities. Divisions can have one or more characteristics defined.

Divisions can be defined on several objects and entities in the system, including:

- Device Location Types
- Device Locations
- Metered Service Point Types
- Metered Service Points
- Programs
- Program Calculation Groups

System Data

Divisions are based on the system data:

Data Type	Description
Maintenance Object	Division (D1-DIV)
Business Object(s)	Division (D1-Division)

Understanding Entity Groups

Entity Groups are used to define groups of entities, such as devices (including meters or items, as well as controllable devices used with Customer Program Management Cloud Service and Customer Program Management) or service points.

An entity can belong to more than one group if they have different Group Categories. For example, a controllable device associated with a specific program and rate could belong to a group category based on the specific program as well as a group category based on the specific rate.

Entity group processing uses dynamic SQL queries to identify entities that belong to a entity group. These dynamic queries are based on configuration of the Group Category (which defines Template SQL that contains tokens) and Criteria Values (which define specific values for the tokens in the Template SQL). These queries are used by "Eligible <Entity>s for this Group" zones that identify entities eligible for but not currently assigned to a group, as well as <Entity> Group Evaluation batch processes (see **Batch Processing** in **Configuring Entity Groups** for more information).

Entity Groups are defined by the following:

- **Status**: The current status of the entity group
- **Group Category**: The category to which the entity group belongs. Group categories are defined using the Entity Group Category (D1-EntityGrpCodeCategoryLookup) extendable lookup. See below for more information.
- **Group Deactivation Option**: A flag that defines what happens to the relationship (captured in the Device Entity Group or Service Point Entity Group table, as appropriate) between the group and entities belonging to the group if or when the group is deactivated. Options include "Expire" and "Do not Expire".

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- **Group Assignment Option**: A flag indicating the manner in which groups are assigned to entities. Options include System (via batch process), User (manually), System and User (either).
- **Criteria Value**: One or more criteria values used for selecting entities for the group, based on a Criteria Source and Criteria Value.
  - **Criteria Source**: Defines the source for criteria used for selecting entities for the group (such as a Specification, Rate, or Program). Criteria sources are defined using the Entity Group Criteria Source (D1-EntityGrpCriteriaSrcLookup) extendable lookup. See below for more information.
  - **Criteria Value**: Defines specific values for the criteria that are used when selecting entities for the group. For instance, values for a **Criteria Source** of "Rate" could be rates defined in an extendable lookup.

System Data

Entity Groups are based on the following system data:

Data Type	Description
Maintenance Object	Entity Group (D1-ENTGRP)
Business Object(s)	Entity Group (D1-EntityGroup)

Entity Group Category Extendable Lookup

The Entity Group Category (D1-EntityGrpCodeCategoryLookup) extendable lookup defines categories of entity groups. These are used to define groups of entities (either devices or service points) that share the criteria and template SQL for identifying and retrieving entities but that may have different criteria values. For example, two device entity groups, "Device Group A" and "Device Group B" can reference the same "Specification and Rate" category, which uses Specification and Rate Schedule criteria to identify and retrieve devices (devices in group A are those with a unique combination of Specification and Rate Schedule, while those in group B have a different unique Specification and Rate combination). The category also defines template SQL that uses the "Specification" and "Rate" criteria when identifying and retrieving devices. The Entity Group Category Template SQL contains tokens, and an Entity Groups Criteria Values define specific values for the tokens in the Template SQL.

Values for this extendable lookup are defined by the following:

- **Status**: The current status of the entity group category.
- **Target Maintenance Object**: The maintenance object of the entities that belong to entity groups of this category. Valid options include Device (D1-DEVICE) or Service Point - MDM (D1-SP).
- **Criteria Option**: Flag that indicates whether or not the criteria source along with the SQL template and SQL builder algorithm will be recorded for the entity group in this category. Valid values are "Applicable" and "Not Applicable".
- **Template SQL**: The template SQL used to identify and retrieve entities for entity groups of this category. Applicable only when Criteria Option is set to "Applicable".
- **Entity Group Algorithm**: An algorithm that executes the template SQL, inserting the criteria values from the entity group, to identify and retrieve entities for entity groups of this category.
- **Criteria Sources**: The criteria sources used by the template SQL when identifying and retrieving entities for entity groups of this category. Criteria sources are defined using the Entity Group Criteria Source (D1-EntityGrpCriteriaSrcLookup) extendable lookup. See

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below for more information. Applicable only when Criteria Option is set to "Applicable". Each criteria source is defined by the following:

  - **Criteria Source**: The name of the criteria source (from the Entity Group Criteria Source (D1-EntityGrpCriteriaSrcLookup) extendable lookup)
  - **Is Required**: A flag that indicates if a value is required for the criteria source (Required or Optional)
  - **Marker**: The token used in the template SQL for the criteria source and value, in the format of "#xxx". For example, the marker for a Specification criteria source might be "#SPEC".
  - **Condition Operator**: The operator used in `WHERE` clauses in the template SQL to filter data based on the criteria source. Values are defined in the Condition Operator (CONDITION_OPR_FLG) lookup.

The base package includes the "SP Measurement Extract" value for this extendable lookup.

Criteria Source Extendable Lookup

The Entity Group Criteria Source (D1-EntityGrpCriteriaSrcLookup) extendable lookup defines the criteria that can be configured for an entity group. Each value defines a single criteria source, such as Specification, Rate, or Program, as well as how the user will enter criteria values for the criteria source, and the source of criteria values for the criteria source. This configuration is used in the **Criteria Value** section of an Entity Group.

Values for this extendable lookup are defined by the following:

- **Status**: The current status of the entity group criteria source
- **Presentation**: The presentation used for the criteria source. Options include:
  - **Drop down**: The user selects a the criteria value from a drop-down list.
  - **Input Text**: The user enters text.
  - **Input Text with Date Picker**: The user selects a date.
  - **Input Text with Date Time Picker**: The user selects a date and time.
- **Value Source**: The source of values for the criteria source. Options include:
  - **Characteristic Type (Pre-Defined)**: Values are from a list of pre-defined values for a characteristic type
  - **Extendable Lookup**: Values are from an extendable lookup
  - **Service Script**: Values are retrieved by a service script
  - **Standard Lookup**: Values are from a standard lookup
- **Value Retriever**: The specific value source used for the criteria source, based on the Value Source. For example, if the Value Source is "Standard Lookup", this would be the lookup code.

Example: A "Rate" criteria source where values are derived from the Customer Rate Schedule (D2-CCBRateScheduleLookup) extendable lookup could be defined as follows:

- **Criteria Source**: Rate
- **Description**: Rate
- **Status**: Active
- **Presentation**: Drop down
- **Value Source**: Extendable Lookup

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- **Value Retriever**: D2-CCBRateScheduleLookup

Understanding Weather Stations

Weather stations are facilities that measure atmospheric conditions and collect weather data such temperature, humidity, wind speed and direction, and barometric pressure.

Weather stations are defined by the following:

- **Weather Station**; An ID for the weather station.
- **Weather Meter**: The weather meter (see below) that captures weather data for the weather station.
- **Status** A flag that indicates if the weather status is Active or Inactive.
- **Geographic Longitude**: The geographic longitude of the location of the weather station.
- **Geographic Latitude**: The geographic latitude of the location of the weather station.
- **External ID**: An ID used for the weather stations in external systems, such as a distributed energy resource management (DERM) system.

System Data

Weather Stations are based on the following system data:

Data Type	Description
Maintenance Object	Weather Station (D1-WTHRSTN)
Business Object(s)	Weather Station (D1-WeatherStation)

Weather Meters

Weather meters are virtual devices used to store weather data for a weather station within the application. Weather meters can have one more interval measuring components, each configured to store a specific type of weather data (temperature, wind speed, humidity, and so on).

Weather meters are defined by the following:

- **Device Type**: The device type for the weather meter. This should be based on the Weather Meter Type (D1-WeatherMeterType) business object.
- **Status**: The current status of the weather meter (Active or Inactive)
- **Serial Number**: An identifier for the weather meter. This is based on the ID of the Weather Station.

Like other devices, weather meters require device types. Device types for weather meters are created based on the Weather Meter Type (D1-WeatherMeterType) business object. In addition, weather meters have related device configurations based on the Device Configuration (D1-DeviceConfiguration) business object, and measuring components based on the Interval Channel (D1-IntervalChannel) business object.

See Creating Weather Metersfor more information about how weather meters are created.

System Data

Weather Meters are based on the following system data:

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Data Type	Description
Maintenance Object	Device (D1-DEVICE)
Business Object(s)	Weather Meter (D1-WeatherMeter)

Understanding Postal Code Defaults

Postal Code Defaults are used to define ranges of postal codes associated with a weather station. These are used when mapping service points (including metered service points) to weather stations when the longitude and latitude of the service point is not available.

Postal code defaults are defined by the following:

- **Postal Code From**: The starting point of the range of postal codes for the postal code default.
- **Postal Code To**: The ending point of the range of postal codes for the postal code default.
- **Country**: The country in which the postal code default resides.
- **City**: The city in which the postal code default resides.
- **County**: The county in which the postal code default resides.
- **State**: The state in which the postal code default resides.
- **Version**: The version of the postal code default.
- **Time Zone**: The time zone in which the postal code default resides.
- **Weather Station**: The weather station associated with the postal code default.

System Data

Postal Code Defaults are based on the following system data:

Data Type	Description
Maintenance Object	Postal Code Default (D1-POSTAL-DF)
Business Object(s)	Postal Code Default - MDM (D1-PostalCodeDefault)

Understanding Bill Cycles

Bill cycles identify periods when a customer is going to be billed and when bill determinants and other customer-related calculations are performed. Bill cycles and schedules are often imported from a customer information system such as Oracle Utilities Customer Cloud Service or Oracle Utilities Customer to Meter. In Oracle Utilities Customer Program Management Cloud Service and Customer Program Management, bill cycles are used to define when program-related calculations, such as program incentives and program fees, are calculated.

A bill cycle has bill cycle schedules defined for it, which specify when calculations are produced for the bill cycle.

Bill cycles are defined by the following:

- **Bill Cycle Schedule Business Object**: The business object used to capture bill cycle schedules for the bill cycle.

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- **External System**: An external system associated with the bill cycle, often the system from which bill cycle data is imported.
- **External Bill Cycle**: An ID for the bill cycle the external system.
- **Bill Cycle Schedule List**: A list of bill cycle schedules for the bill cycle.

Bill cycle schedules are defined by the following:

- **Window Start Date** The date on which the system should start trying to process calculations for metered services and program subscriptions in the cycle.
- **Window End Date** The last day on which the system will process calculations for metered services and program subscriptions in the cycle.
- **Estimate Date:** Not used with Oracle Utilities Customer Program Management Cloud Service and Customer Program Management.

System Data

Bill Cycles are based on the following system data:

Data Type	Description
Maintenance Object	Bill Cycle - MDM (D1-BILLCYCLE)
Business Object(s)	Bill Cycle (D2-BillCycle)

Bill Cycle Schedules are based on the following system data:

Data Type	Description
Maintenance Object	Bill Cycle Schedule (D1-BILCYCSCH)
Business Object(s)	Bill Cycle Schedule (D2-BillCycleSchedule)

Understanding Device and Measurement Options

This section describes administrative options related to devices and measurements used with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

- Understanding Device Types
- Understanding Device Configuration Types
- Understanding Measuring Component Types
- Understanding Device Event Types
- Understanding IMD Types
- Understanding VEE Groups
- Understanding Processing Methods

Understanding Device Types

Device types define information about a class of devices, including properties that apply to all devices of a type. Properties defined for a device type can be overridden for an individual device

Specifically, device types provide information about:

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- How a device can be configured by defining the valid list of device configuration types
- How a device communicates by defining a fallback head end system and a list of valid head end systems.
- How a device records measurement data through the fallback incoming data shift which plays an important role in daylight savings processing.
- The consumption profile of an item: the unit of measure consumed and method of calculation (profile or straight line)
- Whether the device is attached to a service point or meter (used with items and device communication equipment)
- Characteristics common to all devices of this type (defined in the **Device Type Characteristics** zone).

When creating a new device type there are the following options:

Name	Details	Business Object
Smart Meter Device Type	These devices measure consumption for a given service point, support remote commands, and remote collection of measurement and event data. These devices are associated to a head end system.	D1-SmartMeterType
Manual Meter Device Type	These devices measure consumption for a given service point but require a visit to the service point to collect the measurement data. They are not associated to head end systems.	D1-ManualMeterType
Item Device Type	These devices represent various items that consume consumption at a constant rate which are not directly metered. As consumption is calculated rather than measured so there is no need for an association to a head end system. Devices of this type can either be created individually for "badged" items or can be listed directly on a service point for "unbadged items." These devices may also be configured as equipment that can be attached to a service point.	D1-ItemType
Communications Component Device Type	These devices provide remote collection of consumption data measured by a manual meter on which they are installed. These devices are associated to a head end system.	D1-CommunicationCompMeterType

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Device Communication Equipment Type	These devices provide remote collection of consumption data measured by a manual meter to which they are attached. Devices of this sort are sometimes referred to as Encoding Receiver/Transmitter (ERT) modules, or communication modules. These devices are associated to a head end system.	D1-DvcCommEquipmentType

System Data

Device Types are based on the following system data:

Data Type	Description
Maintenance Object	Device Type (D1-DEVICETYP)
Business Object(s)	Manual Meter Type (D1-ManualMeterType)
	Smart Meter Type (D1-SmartMeterType)

Valid Device Characteristic Types

The **Valid Device Characteristic Types** zone lists the valid characteristic types that may be instantiated on devices of this type. Characteristics of these types are maintained using the **Device Characteristics** zone in the **Device** portal.

Understanding Device Configuration Types

Device Configuration types define the measurements a given device can record. It should be noted that the device configuration type itself does not specify this information but rather the device configuration type will identify the valid list of measuring component types that can be referenced associated to a device.

When creating a new device configuration type there are the following options:

Name	Details	Business Object
Device Configuration Type	This represents configurations for physical meters and communication components. It identifies a list of valid measuring components types.	D1-DeviceConfigurationType
Item Configuration Type	This represents badged items that are installed at a particular service point. Given the nature of items there are no measuring component types associated to this type.	D1-ItemConfigurationType

System Data

Device Configuration Types are based on the following system data:

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Data Type	Description
Maintenance Object	Device Configuration Type (D1-DVCCONTYP)
Business Object(s)	Device Configuration Type (D1-DeviceConfigurationType)

Understanding Measuring Component Types

Measuring component types define the most important properties of a measuring component.

Measuring component types define what a measuring component measures (KWH, temperature, etc.), how regularly it measures it, and whether it should be connected to a physical device, or if it's used as a scratchpad measuring component or an aggregator measuring component. Measuring component types also specify how the measuring component's final measurements should be stored, how the measuring component's user-defined values should be calculated, and specific rules governing validation, editing, and estimation (VEE) for measuring components of the type. In addition, measuring component types define display properties and valid attribute values for measuring components belonging to the type.

The following configurable items are available for most measuring component types:

- **Anchor Time**: A time used to define the start and end time of the business day for purposes of processing measurement data and usage transactions for measuring components of this type. Applicable only to dynamic aggregation measuring component types, standalone measuring component types, and profile measuring component types.
- **Value Identifiers**: These store the values of UOM, TOU, and SQI that identify the measured amounts for measuring components of this type. Value identifiers specify the quantities stored on the measurement records for measuring components of this type. Please refer to the Measuring Component Type Value Identifiers topic later in this section for more information.
- **Valid VEE Groups**: These define the VEE groups considered valid for measuring components of this type. Each group supplied here will be available to be selected on measuring components of this type and act as an override to the Fallback VEE Groups.
- **Fallback VEE Groups**: These define default VEE groups for a specific VEE Group Role that can be used with all measuring components of this type. This alleviates the need to specify the same VEE groups on multiple measuring components of the same type. Changes made to these groups will automatically apply to all measuring components of this type unless they have specified their own VEE groups for that particular VEE Group Role. Each VEE group is designated a VEE group role that indicates when and how the VEE group is used (for initial load, manual override, estimation, etc.).
- **Enable ML Based Validation (Fallback)**: A flag that indicate (Yes or No) if initial measurements for measuring components of this type will be processed through a machine learning scoring model. IF set to "Yes", VEE processing for initial load data will only be used when data fails machine learning normalcy checks.
- **Anomaly Score Threshold (Fallback)**: The anomaly score threshold for measuring components of this type. This overrides the value set in the MDM Master Configuration. This field is only visible when the **Enable ML based Validation (Fallback)** flag is set to "Yes".
- **Eligible Profile Factors (interval only)**: These define the profile factors that are considered to be eligible for interval measuring components of this type. One profile factor

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can be identified as the default. The default profile factor will be automatically selected in system processing when a profile factor is required.

- **Valid Profile Factors for Conversion from Scalar to Interval (scalar only)**: These define the profile factors that are considered to be eligible for scalar measuring components of this type when converting scalar measurements to interval measurements. These profile factors are used to produce a curve of interval data from a scalar value. Without one of these factors defined scalar to interval conversion will use a flat line method (i.e. evenly divide the scalar value across the intervals). One profile factor can be identified as the default. The default profile factor will be automatically selected in system processing when a conversion profile factor is required.
- **Display Properties**: Defines how measurement data for measuring components of this type is displayed, including:
  - *Display Configuration*: Details related to how measurements are displayed, including the 360 chart rendering method, number of hours of data to display, the maximum days to search for measurements, the default TOU map used, the TOU by Day Profile factor used, and default measurement condition.
  - *Event Bar Profiles*: The event bar profiles used when displaying measurement data for measuring components of this type. Event bar profiles are defined as values for the 360 View Event Bar Profile extendable lookup.
  - *Final Values Overlay Profiles*: The final values overlay profiles used when displaying measurement data for measuring components of this type. Final values overlay profiles are defined as values for the Final Values Overlay Profile extendable lookup.
  - *Measurement Conditions Not Shown on Chart*: The measurement conditions that should be omitted from rendering onto 360 Degree charts. Measurements whose conditions match these values will be rendered as gaps. For example, many 360 Degree charts use the condition "No Read - System" to represent the lack of a measurement, by adding this condition to this list it a gap will be rendered instead of a line with a 0 quantity measurement and a condition of "No Read - System".

When creating a measuring component type the following options are available:

Name	Details	Business Object
Interval Channel Type - Physical	Provides the configuration for a physical interval channel (including interval size). This is recommended for measuring components that measure consumptive usage in interval sizes up to 1 hour.	D1-IntervalChannelTypePhysical
Interval Channel Type - Scratchpad	Provides the configuration for a scratchpad interval measuring component.	D1-IntervalChannelTypeScratchp

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Interval Channel Type - Physical Subtractive	Provides the configuration for a physical subtractive interval channel. In addition to standard interval configuration (including interval size) it also provides additional subtractive specific configuration (e.g. rollover validation, estimate reevaluation, etc). This is recommended for measuring components that measure subtractive usage in interval sizes up to 1 hour.	D1-IntrvlChanTypPhysSubtractiv
Interval Channel Type - External	Provide the configuration for interval measuring components that measure data not typically stored in the system, such as Amps. Incoming data for external measuring components of this type can be filtered or passed through to other systems, preventing errors generated by incoming data for measuring components that don't exist. Filtering of data for external measuring components is configured via the **IMD Handling** flag.	D1-IntervalChannelTypeExternal
Register Type	Provides the configuration for a physical register that is manually read (e.g. rollover validation). These can be either consumptive or subtractive but are expected to be read infrequently (e.g. once a month).	D1-RegisterTypePhysical
Auto-Read Register Type	Provides the configuration for a physical register that is automatically read. In addition to the standard register configuration (e.g. rollover validation) it also provides details around the schedule of expected readings (e.g. first daily measurement time and expected hours between measurements). These can either be consumptive or subtractive but are expected to be read frequently (e.g. at least once per day). Note: these measuring component types can also be used to model interval data that is received with a large interval size (24 hours and larger).	D1-AutoReadRegisterType

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Scalar Channel Type - External	Provide the configuration for scalar measuring components that measure data not typically stored in the system. Incoming data for external measuring components of this type can be filtered or passed through to other systems, preventing errors generated by incoming data for measuring components that don't exist. Filtering of data for external measuring components is configured via the **IMD Handling** flag.	D1-ScalarChannelTypeExternal
Aggregator Type	Provides the configuration for an aggregation measurement.	D2-AggregatorType

System Data

Measuring Component Types are based on the following system data:

Data Type	Description
Maintenance Object	Measuring Component Type (D1-MCTYPE)
Business Object(s)	Auto-Read Register Type (D1-AutoReadRegisterType)
	Interval Channel Type - Physical (D1-IntervalChannelTypePhysical)
	Interval Channel Type - Physical Subtractive (D1-IntrvlChanTypPhysSubtractiv)
	Register Type (D1-RegisterTypePhysical)

> **Note**
>
> For “interval” data with an interval size greater than one hour, use the D1-AutoRegisterReadType measuring component type business object and the D1-RegisterAutoRead measuring component business object. This business object is well suited to daily and sub-daily readings. Using an interval data business object can result in measurement date problems during daylights saving time.

Measuring Component Type Value Identifiers

Measuring components are configured to measure specific types of quantities this is defined by the list of value identifiers on the measuring component type. Up to eleven value identifiers can be specified. The primary measured quantity should be identified using the Value Identifier Type of Measurement. An additional ten derived values can be computed based on the primary measurement, these are identified with the Value Identifier Type of Value 01 through Value 10. Each value identifier is constructed of:

- **Unit of Measure**: The unit of measure for the quantity being recorded. Examples include kilo-watt hours (kWh), kilo-watts (kW), therms, cubic feet (CCF), temperature (Fahrenheit or Celsius), etc. Refer to Understanding Units of Measure for more information.

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- **Time of Use**: Modifiers for a given unit of measure that indicate a period of time during which a quantity has been used, such as On-Peak (meaning during a time when the greatest quantity of some consumable is being used), Off-Peak (meaning during a time when the least amount of some consumable is being used), etc. Refer to Understanding Time of Use for more information.
- **Service Quantity Identifiers**: Used to further distinguish between measured quantities that have identical UOM/TOU combinations, including situations in which the distinguishing identifier of a UOM is not accurately described as a TOU. Generally, SQI is only used when multiple measuring components measure the same thing, but in different ways. A meter that measures both generation KWH and consumption KWH could use SQIs to differentiate between the two. Refer to Understanding Service Quantity Identifiers for more information.
- **Value Derivation Algorithm**: Unlike UOM, TOU, and SQI this is not used in the identification of what is measured but rather is used to calculate a derived value based on the primary measurement. An algorithm from the list should be selected that contains the appropriate logic for calculating the derived value. This is applicable for those value identifiers with a Value Identifier Type of Value 01 through Value 10. More information on how derived values are calculated can be found in the Important Measuring Component Type System Events topic in this chapter. For more functional information about derived values please refer to About Final Measurements.

The combination of UOM, TOU and SQI define what a measuring component measures. TOU and SQI are optional, but UOM must be defined for all value identifiers. For example, consider a meter (as illustrated in the image below) with two measuring components, both measuring the same unit of measure (kWh), but each measuring component measures consumption in different time of use (TOU) periods (peak and off-peak).

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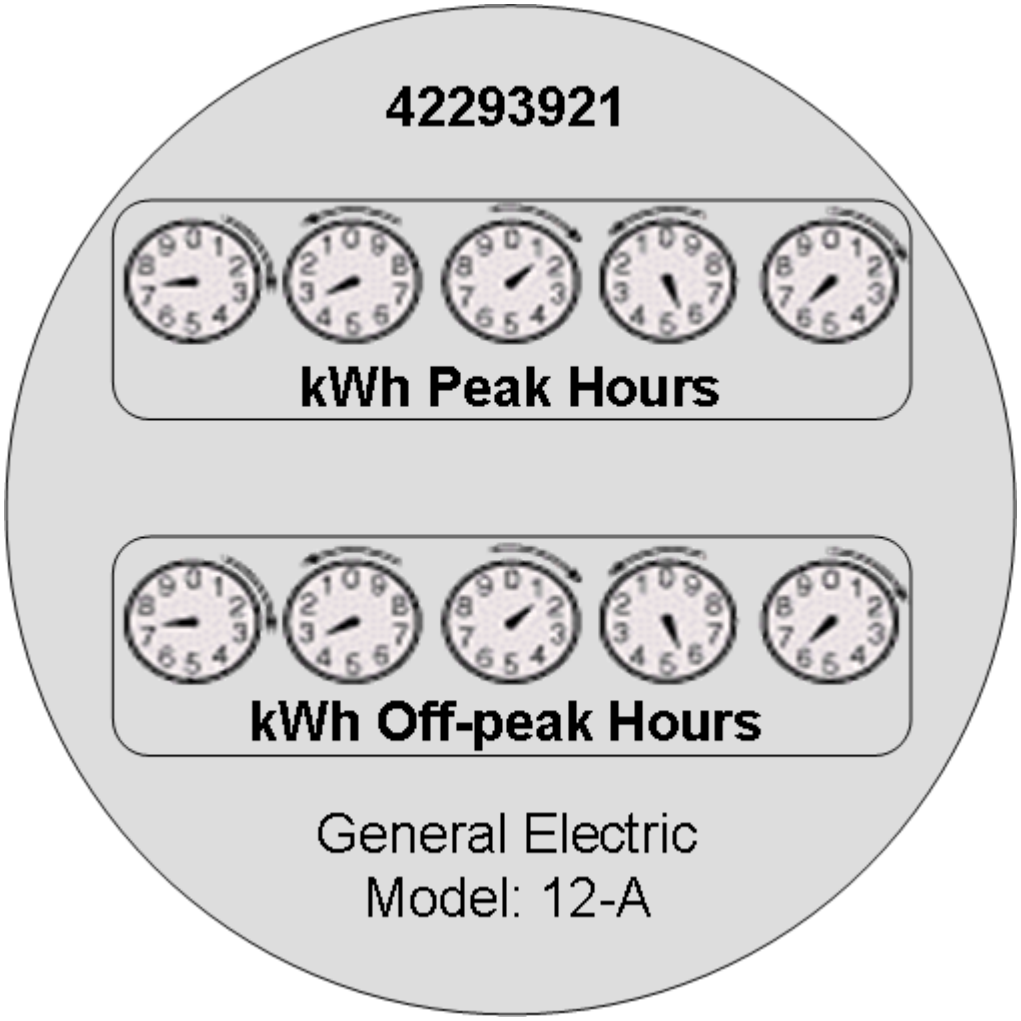

Another example might be a meter that records both generated KWH and consumed KWH. This meter would be configured to measure both UOM and SQI.

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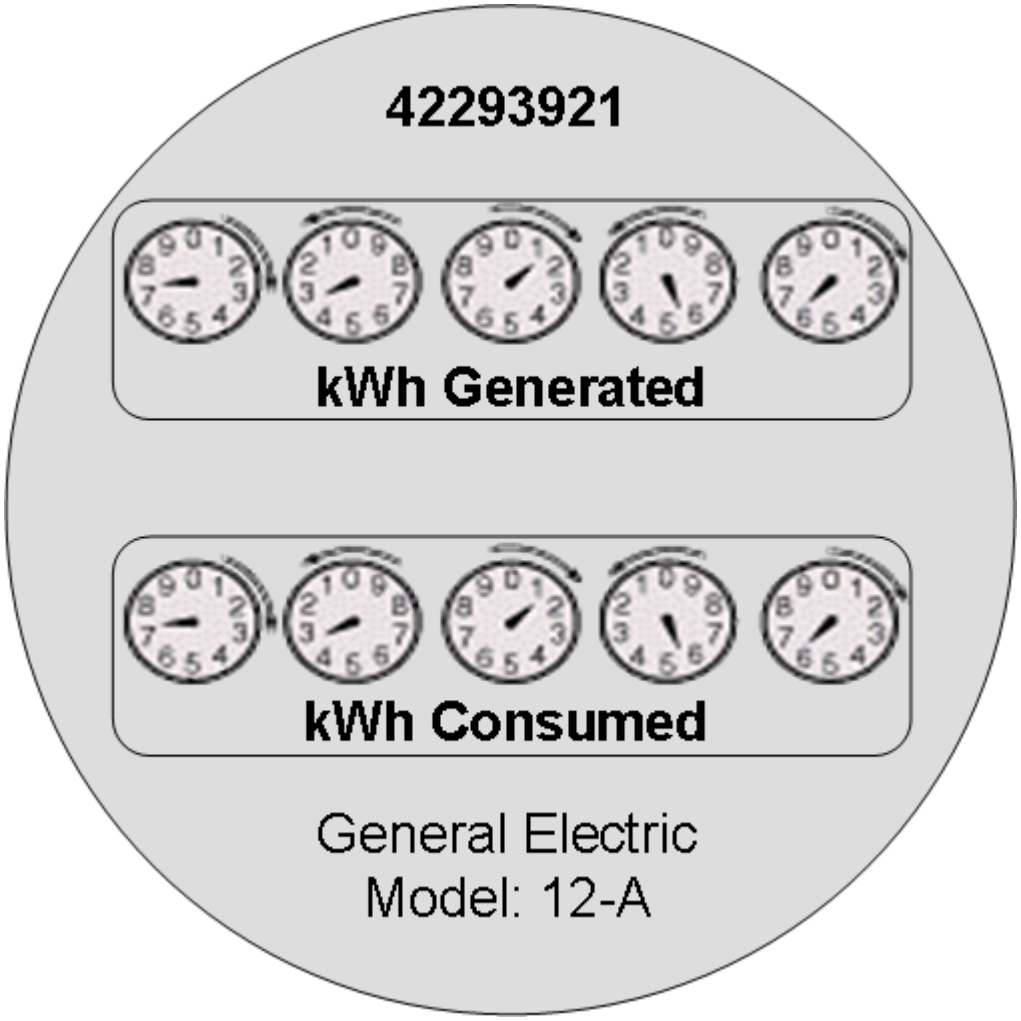

A measurement is recorded each time a measuring component is read. This means that for a meter with two measuring components that is read once a month, two measurements, one for each measuring component, would be recorded each month.

Understanding Device Event Types

Device event types define properties common to specific types of events.

> **Note**
>
> In Oracle Utilities Customer Program Management Cloud Service and Customer Program Management, device events are used to capture periods of time during which customers make themselves unavailable to participate in program events.

Device event types represent different types of events that can take place relative to a device. Examples of device events include power outages, power restoration, tampering alerts, and other events.

Device event types can be defined by the following attributes:

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- **Standard Event Name:** the "standard" name of the event type. Device vendors may have their own specific names for device events. Only a single active device event type may be mapped to a given standard name at any time.
- **Device Event Category:** a category (defined as an Extendable Lookup) used to group device event types.
- **Reporting Category:** a category used to group device event types for reporting purposes.
- **Activity Type:** the activity type for activities created for device events of this type.

System Data

Device Event Types in Oracle Utilities Customer Program Management Cloud Service and Customer Program Management are based on the following system data:

Data Type	Description
Maintenance Object	Device Event Type (D1-DVCEVTTYP)
Business Object(s)	Customer Unavailability Device Event Type (X1-CustUnavailabilityDvcEvtTyp)

Device Event Mapping

The first step to device event type configuration is defining the list of standard event names that will be processed by the system. This is done by populating the Standard Event Name extendable lookup (D1-StdEventNameLookup). More information about this extendable lookup can be found in About Device Events.

With the fully defined list of Standard Event Names each head-end specific event name (which is also called an external event name) that the system will receive from a given head-end should be mapped to a standard event name. This mapping is configured using a device event mapping extendable lookup. Each head-end system should have its own extendable lookup to define event name mapping in order to prevent possible conflicts between mappings. Each of these business objects should be defined as a child of the parent business object Device Event Mapping (D1-DeviceEventMappingLookup).

For example, head-end systems A and B might both use the same event name, such as the code "1", but this event might need to be mapped to "outage" for head-end system A but "tamper" for head-end system B.

The device event mapping extendable lookup business object is configurable. Each Oracle Utilities Smart Grid Gateway adapter includes a device event mapping lookup business object for the supported head-end system.

Lastly, each device event type is associated to a standard name. This means that as each device event that is received will go through the following mapping steps:

1. The head end specific event name is mapped to a standard event name using the head end specific device event mapping extendable lookup
2. The standard event name is mapped to a device event type
3. The device event type is used to select the appropriate device event business object

Understanding IMD Types

IMD Types are configuration records used to define how initial measurements are processed using Direct Measurement Processing.

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There are two main categories of IMD types - seeder types (based on the Seeder IMD Type (D1-IMDSeederType) business object) and specific types (based on the Specific IMD Type (D1-IMDType) business object).

- **Seeder IMD types** represents an initial measurement data (IMD) seeder, which serves as the universal input into the system for external callers or for initial measurement payload processing. The main purpose of the seeder IMD type is to determine the most appropriate specific IMD type (such as interval or scalar, or a type used with a particular Smart Grid Gateway adapter) to use for further processing and prepare the input data for that IMD type. Additionally, the seeder IMD type is used to perform critical validation (such as an interval count validation), device and channel identification, mapping of external values (such as Unit of Measure and time zone) to internal values, and time zone conversion for date/time fields.

  Note: There can only be one seeder IMD type active at any one time.

- **Specific IMD types** define the rules for processing a specific initial measurement data (IMD) record. Different specific IMD types contain rules for processing the different types of initial measurement data that can be received. For example, one IMD type defines the rules for processing a scalar measurement from the Landys+Gyr head end system while another IMD Type instance defines the rules for processing an interval initial measurement from the Sensus head end system. There are four types of algorithms supported for specific IMD types: Pre Processing, Pre-VEE, VEE, and Post-VEE. These algorithms are responsible for validating that the measurement has been correctly mapped to the IMD Type (Pre Processing), calculating consumption (Pre-VEE), performing VEE (VEE), writing to the final measurement table (Post-VEE), among other responsibilities.

IMD Types are defined for specific measuring component types in the the "Initial Measurement Creation" processing method (“How to Create MC Related Information”) for each head end system. See Creating Head End Systems for more information.

IMD Types are defined by the following:

- **Initial Measurement Data Seeder**: A flag that indicates (Yes or No) if the IMD type represents a seeder IMD type. There can only be one active IMD type designated as a seeder IMD type at the same time. Seeder IMD types only use Pre-processing Algorithms (see below).
- **IMD Business Object**: The business object to use when creating IMDs for the IMD type.
  - For seeder IMD types, this should be "IMD Seeder" (D1-IMDSeeder).
  - For non-seeder IMD types, this should be an initial load IMD business object such as "Initial Load IMD (Interval)" (D1-InitialLoadIMDInterval) or "Initial Load IMD (Scalar)" (D1-InitialLoadIMDScalar).
- **Status**: The status of the IMD type.
- **IMD Information Exception Header BO**: The bunsess to use when creating header records for "Information" exceptions. See VEE Processing and Exceptions with Direct Measurement Processing for more information.
- **Algorithms**: Algorithms used when processing initial measurement data for the IMD type, including:
  - Pre-processing Algorithms
  - Pre-VEE Algorithms
  - VEE Algorithms
  - Post-VEE Algorithms

System Data

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IMD Types are based on the following system data:

Data Type	Description
Maintenance Object	Initial Measurement Data Type (D1-IMDTYPE)
Business Object(s)	Specific IMD Type (D1-IMDType)
	Seeder IMD Seeder Type (D1-IMDSeederType)

Base Package IMD Types

The base package includes several pre-defined IMD types that can be used when processing data from different head end systems supported through Smart Grid Gateway Adapters. These IMD types use vendor-specific initial measurement business objects and algorithms when processing data. The table below lists the IMD types provided with the base package.

IMD Type	Description
IMD Seeder Type (D1-IMDSEEDERTYPE)	Used as the seeder, which determines the appropriate specific IMD type to use and to prepare the input data for that IMD type
Interval IMD Type (D1-INT-IMDTYPE)	Used when processing interval data
Interval Passthrough IMD Type D1-INT-PT-IMDTYPE)	Used with "pass through" interval external measuring components to capture errors in pass through interval measurements
Scalar IMD Type (D1-SCA-IMDTYPE)	Used when processing scalar data
Scalar Passthrough IMD Type (D1-INT-SC-IMDTYPE)	Used with "pass through" scalar external measuring components to capture errors in pass through scalar measurements
Landis+Gyr - Interval IMD Type (D3-INT-IMDTYPE)	Used when processing interval data using the Landis+Gyr Adapter
Landis+Gyr - Scalar IMD Type (D3-SCA-IMDTYPE)	Used when processing scalar data using the Landis+Gyr Adapter
MV90 - Interval IMD Type (D5-INT-IMDTYPE)	Used when processing interval data using the MV90 Adapter
MV90 - Scalar IMD Type (D5-SCA-IMDTYPE)	Used when processing scalar data using the MV90 Adapter
Sensus - Interval IMD Type (D6-INT-IMDTYPE)	Used when processing interval data using the Sensus Adapter
Sensus - Scalar IMD Type (D6-SCA-IMDTYPE)	Used when processing scalar data using the Sensus Adapter
SSN - Interval IMD Type (D7-INT-IMDTYPE)	Used when processing interval data using the Silver Spring Networks Adapter
SSN - Scalar IMD Type (D7-SCA-IMDTYPE)	Used when processing scalar data using the Silver Spring Networks Adapter
Itron - Interval IMD Type (D8-INT-IMDTYPE)	Used when processing interval data using the Itron Adapter
Itron - Scalar IMD Type (D8-SCA-IMDTYPE)	Used when processing scalar data using the Itron Adapter
ADK - Interval IMD Type (DG-INT-IMDTYPE)	Used when processing interval data using the Adapter Development Kit
ADK - Scalar IMD Type (DG-SCA-IMDTYPE)	Used when processing scalar data using the Adapter Development Kit

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Changing and Extending Base Package IMD Types

The base package IMD types can be changed and/or extended by adding new algorithms to one or more of the algorithm areas (Pre-Processing, Pre-VEE, VEE, or Post-Vee).

When adding new algorithms to a base package IMD type, we recommend creating the algorithm logic in a Groovy Library Script that can be called from an IMD type algorithm as well as from an IMD business object algorithm. See Groovy Library Scripts for more information.

Understanding VEE Groups

VEE groups are collections of VEE Rules that are applied to initial measurement data. During the VEE process, the system executes the VEE Rules defined in each VEE group. The rules within a VEE group are defined in a specific sequence, allowing control over the order in which the rules are executed.

VEE groups can be associated to a specific measuring component, or to a measuring component type (or both). VEE groups associated with a measuring component type are applied to all measuring components of that type, while those associated to a specific measuring component are applied only to that measuring component. VEE groups associated to a measuring component override those assigned to a measuring component type.

> **Note**
>
> VEE rules are not used with Oracle Utilities Customer Program Management Cloud Service and Customer Program Management, but at least one VEE Group must be created as it is required when configuring measuring components and measuring component types. This requires only a single "empty" VEE group (a VEE group with no VEE rules).

System Data

VEE Groups are based on the following system data:

Data Type	Description
Maintenance Object	VEE Group (D1-VEEGROUP)
Business Object(s)	VEE Group Root (D1-VEEGroupRoot)
	VEE Group (D1-VEEGroup)

Understanding Processing Methods

Head end systems, external applications, and market participants can have one or more associated processing methods that define the format or means by which it receives or sends data from or to the application, such as bill determinants, interval data, or meter events. Processing methods are also used to define how to create information internal to the application such as initial measurement data and usage transactions. Processing methods can also be used to define the information an external system wishes to subscribe to receive from our application.

At the lowest level processing methods are used to identify an outbound message type, business object, batch control, or message category and number.

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Each processing method is comprised of a business object that defines what is being mapped as well as how it should be mapped.

Important Processing Method System Events

The actual logic to determine the appropriate output for a given head end system, external application, or market participant and processing role for a processing method is executed by the following system event:

- **Determine Processing Method(s)**: is a business object algorithm system event that takes in a head end system, external application, or market participant, a processing role, and a list of relevant input data aka related object (e.g. a measuring component, device, etc). For the head end system or external application and the input data it will analyze the selection criteria to determine the appropriate output.

How Processing Methods Work

Processing methods perform two basic tasks:

- They define the criteria for selecting the appropriate output. This can be as simple as providing a single object in return without qualification or in more involved situations it could support determining the appropriate return object based on characteristics of the data being processed. This is accomplished through the data structure defined on the processing method business object.
- They evaluate the criteria for selecting the appropriate output given a specific head end system, external application, or market participant. This is accomplished through the Determine Processing Method system event on the processing method business object.

Each processing method business object can be associated to one or more processing roles. This is done by adding the Applicable Processing Role business object option. It is these processing roles that actually create the association between a head end system, external application, or market participant, the processing method, and the functional event that is being executed. For example, when initial measurement data is processed through the IMD Seeder the processing role Initial Measurement Creation is used to identify the processing method "How to Create MC Related Information" which maps a particular measuring component type to the appropriate initial measurement business object to be used for processing.

When system logic requires the results of a processing method the service Determine Service Providers and Methods is used. This service is available to call via Java or from within scripting through the business service of the same name. It can be called in one of two ways:

With a head end system, external application, or market participant: identifies the appropriate output for a single head end system, external application, or market participant being processed for the input processing role and related objects

Without a head end system, external application, or market participant: used to identify subscribing sysems. This will provide a list of any head end system, external application, or market participant that has the input processing role and an appropriate output given the related objects.

Processing Methods Available

There are the following processing methods provided by the base package:

Name	Details	Business Object

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How to Create OB COMM/Send OB Message	Identifies Message Number/ Category, Business Object, Outbound Message Type and allows for an override by a device type.	D1-HowToCreateActivityOBComm
How to Create MC Related Information	Identifies a business object and allows for an override by measuring component type.	D1-HowToCreateMCInformation
How to Process Device Event Related Info	Identifies a business object, outbound message type, and batch control by device event category allowing for an override by device event type.	D1-HowToProcDvcEvtsInformation
How to Process Device Related Information	Identifies a business object and allows for an override by device type.	D1-HowToProcessDeviceInfo
How to Send Activity Related Information	Identifies a batch control and business object by activity type and allows for an override by device type.	D1-HowToSendActInformation
How to Send Activity Related O\B Messages	Identifies an outbound message type, message category, and message number and allows for override by activity type.	D1-HowToSendActivityResponse
How To Create US Related Information	Identifies a business object and allows for override by usage subscription type.	D2-HowToCreateUSInformation
How To Send US Related Information	Identifies a batch control, business object, and outbound message type and allows for override by usage subscription type.	D2-HowToSendUSInformation
How to Process Service Point Related Info	Identifies a business object and allows for override by service point type.	D1-HowToProcSPRelatedInfo
How to Send Field Activity Related Info	Identifies a outbound message type and allows for an override by field task type.	D1-HowToSendFARelatedInfo
How to Send Field Activity Remark Info	Identifies an outbound message type for an activity remark type.	D1-HowToSendActivityRemarkInfo
How to Translate External Value	Identifies a business object and allows for override by identifier.	D1-HowToTranslateExternalValue
How to Request Customer Notification	Identifies a list of outbound message types.	D1-HowToRequestCustomerNotific
How to Process Business Flag Related Info	Identifies an outbound message type and allows for an override by business flag type.	D1-HowToProcessBusinessFlagInf

Understanding M&V Options

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This section describes administrative options related to M&V processing used with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

Configuration Overview

Configuring the system for M&V processing involves creating the following types of administrative data.

Configure M&V Calculation Groups & Rules

Create M&V calculation groups and rules to perform any needed calculations on regression output quantities. If different types of customers will uses different calculations, you will to create separate M&V calculation groups and rules for each. Refer to Understanding M&V Calculation Groups and Understanding M&V Calculation Rules for more information about these.

Configure M&V Subscription Types

Create M&V subscription types for each type of customer for which you'll perform regression analysis and related calculations. Reference the appropriate M&V Calculation Groups on each subscription type. Refer to Understanding M&V Subscription Types for more information about these.

Create Device Population and Control Groups

Create Device Population and Control Groups for the different types of groups of customers for which you plan to run M&V processing. Refer to Understanding Device Population and Control Groups for more information about these.

Configure Dynamic Aggregation

Configure the following objects used with Dimension Scanning and Find Constituents dynamic aggregation processing. Refer to the corresponding sections in Understanding Dynamic Aggregation Options and Configuring Dynamic Aggregation Options for more information about these objects.

- Data Sources
- Measuring Component Types
- Aggregation Groups
- Measuring Component Sets
- Understanding Device Population and Control Groups
- Understanding M&V Subscription Types
- Understanding M&V Calculation Groups
- Understanding M&V Calculation Rules
- Understanding Dynamic Aggregation Options

Understanding Device Population and Control Groups

Device Population and Control groups are entity groups that represent groupings of customers used in M&V processing. Device Population groups are "device" entity groups and are groupings of customers who participated in program events, while Control groups are "service point" entity groups that are groupings of customers that do not participate. These groups are used when aggregating data for each type of group.

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In addition to the standard attributes for entity groups, Device Population groups have a corresponding Control group.

M&V Subscriptions are created whenever a new Device Population group is created or changed. A M&V Subscription's Device Population group defines the group of customers whose data is aggregated and processed when Measurement and Verification Transactions are created.

In addition, the Dimension Scanning process creates new aggregation measuring components when new Device Population groups are created.

See Understanding Entity Groups and Defining Entity Groups for more information about the data used to define entity groups.

System Data

Device Population and Control Groups are based on the following system data:

Data Type	Description
Maintenance Object	Entity Group (D1-ENTGRP)
Business Object(s)	Entity Group (D1-EntityGroup) - Parent
	Control Group (X1-ControlGroup)
	Device Population (X1-DevicePopulation)

Device Population Synchronization

As Device Population groups are created and updated, the data is synchronized with Oracle Utilities Network Management System via an audit algorithm and outbound message. When the data is synchronized, Oracle Utilities Network Management System sends an acknowledgement and the Device Population group is updated to reflect its synchronization status. The **Sync Status** field on Device Population groups indicates if the group was not successfully synchronized. Click **Send Details** to retry the synchronization.

Enabling Device Population Synchronization

Enabling Device Population data synchronization involves the following steps:

1. Select "Device Population" in the **Entity Group Category** in the Customer Program Management Integration master configuration.
2. Configure the "Device Population" outbound message type in the **Device Population** field in the **Outbound Message Types** section of the Customer Program Management Integration master configuration.
3. Create a Message Sender for the outbound Device Population synchronization.
4. Associate the Device Population Outbound Message Type and Message Sender with the target external system, such as Edge DERMS/DRMS (See Outgoing Messages, Message Sender, and External Systems in the *Framework Administrative User Guide* for more information.

Understanding M&V Subscription Types

M&V subscription types define properties defining a class of M&V subscriptions. M&V subscription types also control valid values for various attributes of M&V subscriptions.

M&V subscription types are defined by the following:

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- **Division**: The division in which the customers in Device Population groups for M&V subscriptions of this type reside.
- **Subscription Business Object**: The business object used when creating M&V subscriptions of this type.
- **Transaction Business Object**: The business object used when creating M&V transactions for subscriptions of this type.
- **Subscription Class**: The class to which the M&V subscription belongs (default is Measurement and Verification).
- **Valid M&V Calculation Groups**: A list of one or more M&V calculation groups used when performing calculations for M&V subscriptions of this type

System Data

M&V subscription types are based on the following system data:

Data Type	Description
Maintenance Object	Usage Subscription Type (D1-USTYPE)
Business Object(s)	M&V Subscription Type (X1-MsrmtVerifSubscriptionType)

Understanding M&V Calculation Groups

M&V calculation groups are collections of M&V calculation rules that are used to calculate M&V transactions which capture the results of the regression analysis and calculations preformed on those results (see About M&V Transactions). The rules within an M&V calculation group are defined in a specific sequence, allowing control over the order in which the rules are executed.

M&V calculation groups are associated with specific M&V subscriptions. When assigned to M&V subscriptions, M&V calculation groups contain the M&V calculation rules to be used to calculate M&V transactions associated with events for the program associated with the M&V subscription.

M&V calculation groups are defined by the following:

- **Division**: The division to which the calculation group belongs.
- **Calculation Group Class**: The class to which the M&V calculation group belongs (default is Measurement and Verification Calculation Group).
- **Measurement and Verification Calculation Rules List**: One or more M&V calculation rules belonging to the M&V group

System Data

M&V calculation groups are based on the following system data:

Data Type	Description
Maintenance Object	Usage Group (D1-USGGRP)
Business Object(s)	Calculation Group Root (D1-UsageGroupRoot) - Parent Business Object
	M&V Calculation Group (X1-MsrmtVerificationCalcGroup)

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Understanding M&V Calculation Rules

M&V calculation rules are rules that perform M&V calculations and create M&V transactions, which which capture the results of the regression analysis and calculations preformed on those results (see About M&V Transactions). M&V calculation rules are created for a specific M&V calculation group. For example, if you were configuring two M&V calculation groups and both included a specific M&V calculation rule, you would need to create two instances of the M&V calculation rule, one for each group.

The base package includes the following calculation rule business objects used with M&V calculations:

M&V Calculation Rule	Description
Vector and Service Quantity Math (D2-Math)	This rule is designed to facilitate configuration of complex vector calculations. It is based on a series of underlying services with vectors configured as input to the calculations.

System Data

M&V calculation rules are based on the following system data:

Data Type	Description
Maintenance Object	Usage Rule (D1-USGRULE)
Business Object(s)	Vector and Service Quantity Math (D2-Math)
	Generic Usage Calculation Rule (D1-GenericUsageRule)

Eligibility Criteria

Eligibility criteria are user-definable conditions that could cause a rule to be applied or skipped. This can involve the evaluation of some attribute of the M&V subscription or metered service point, or something else entirely. A rule can have multiple eligibility criteria for determining if the rule should be applied or skipped, based on a user-defined sequence.

System Data

Eligibility criteria are based on the following system data:

Data Type	Description
Maintenance Object	Usage Calculation Rule Eligibility Criteria (D1-USGRLELIG)
Business Object(s)	Usage Eligibility Criteria (D1-UsgRuleEligibilityCriteria)

Understanding Dynamic Aggregation Options

This section describes administrative options related to dynamic aggregation when used with M&V processing and Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

- Dynamic Aggregation Configuration Overview

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- Aggregation Master Configuration
- Understanding Data Sources
- Understanding Dynamic Aggregation Measuring Component Types
- Understanding Aggregation Groups
- Understanding Measuring Component Sets
- Configuring Dynamic Aggregation Step-by-Step
- Extending Dynamic Aggregation

Dynamic Aggregation Configuration Overview

Standard aggregation processing uses specific algorithms configured to work with a specified set of dimensions. For example, the base package Service Type and Postal aggregation uses specific algorithms for dimension scanning and finding constituent measuring components.

In contrast, dynamic aggregation uses dynamic queries for the dimension scanning, find constituents, and aggregation processes. These dynamic queries are based on configuration of administrative data, including:

- **Data Sources** define the source of data to be aggregated, such as measurement data from usage subscriptions linked to a service point, badged or unbadged items, or other sources of data.
- **Aggregation Measuring Component Types** define the most important properties of aggregation measuring components used to store aggregated data.
- **Aggregation Groups** define the ordering of a series of related aggregations and the schedule of aggregation.
- **Measuring Component Sets** define the dimensions and criteria by which aggregation will be performed.

Aggregation Master Configuration

The Aggregation Master Configuration defines common parameters used with aggregation processing, including:

- Batch Controls used by the dimension scan and aggregation process, for both scheduled and adhoc execution.
- Details for how the system compares interval and billing data for the same set of customers in order to use only one source or other.

Understanding Data Sources

Data Sources define the source of data to be aggregated, such as measurement data from usage subscriptions linked to a service point, badged or unbadged items, or measuring component sets. Data sources also define configurations used when generating dynamic queries used by aggregation processing.

Data Source Classes

Data sources are defined by classes, each of which is based on a specific business object, and determines the type of configuration used by aggregation processing. More specifically, the data types configured on the data source are used when generating dynamic queries used by aggregation processing.

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The table below lists the data source classes and the business object and configuration options for each. Consult the embedded help for more information about the specific configuration options used by each data source class.

Data Source Class	Usage	Business Object	Configuration Options
Measurements from US Service Points	Used when aggregating data from measuring components linked to service points via a usage subscription.	D1-DataSourceMeasurements	Measuring Component Types
Badged Items	Used when aggregating data from badged items.	D1-BadgedItemsDataSource	Item Types
Billed Service Quantities	Used when aggregating data based on billed services quantities.	D1-DataSourceBilledSerQuantity	Usage Subscription Types
Measuring Component Sets	Used when aggregating data from measuring component sets. Data sources of this class are used with composite aggregation.	D1-DataSourceMCSet	Usage Subscription Types
Unbadged Items	Used when aggregating data from unbadged items.	D1-DataSourceUnbadgedItems	Item Types
Measurements from US Direct Links	Used when aggregating data from measuring components directly linked to a usage subscription.	D1-DataSourceMeasurementDirect	Measuring Component Types
Service Point Quantities	Used when aggregating data based on service point quantities.	D1-DataSourceSPQuantities	Service Point Quantity Types
Controllable Device	Used when aggregating data based on Device Population entity groups (used with Customer Program Management Cloud Service and Customer Program Management).	D1-DataSourceEntityGrpCtrlDvc	Measuring Component Types
MDM Service Points	Used when aggregating data based on Control Group entity groups (used with Customer Program Management Cloud Service and Customer Program Management).	D1-DataSourceEntityGrpMDMSP	Measuring Component Types

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Data Source Template SQL

Data sources also provide template structured query language (SQL) used when generating dynamic queries used by aggregation processing. This template SQL is used as the basis for dynamic queries, and is extended by additional SQL generated from the data source configuration as well as configuration defined for measuring component sets, measuring components, and measuring component types that reference the data source. Template SQL is provided via the Data Source SQL (D1-DataSourceSQLLookup) extendable lookup. Values for this extendable lookup are used as the **Option Value** for the following business object options on the data source business object.

- **Dimension Scanner SQL**: The template SQL used when dimension scanning. This SQL is extended by the criteria, dimensions, and individually managed items configured on the measuring component sets being processed.
- **Find Constituents SQL**: The template SQL used when finding constituents. This SQL is extended by attributes defined on the aggregator measuring components being processed.
- **Aggregation SQL**: The template SQL used when performing aggregation. This SQL is extended by the value identifiers defined on the measuring component type of the aggregator measuring components being processed.

Understanding Dynamic Aggregation Measuring Component Types

Like other measuring component types, dynamic aggregation measuring component types define the most important properties of a measuring component. In this case, they define the properties of aggregator measuring components.

Measuring component types used by dynamic aggregation use many of the same attributes as other types of measuring components, but some attributes are used differently. Some attributes used specifically by dynamic aggregation include:

Measuring Component Business Object: This should be an aggregator measuring component business object, such as one of the following:

- Aggregator Interval (D1-AggregatorInterval)
- Aggregator Scalar (D1-AggregatorScalar)
- Aggregator Customer Quantities (D1-AggregatorCustomerQuantity)
- Aggregator Items Measuring Component (D1-AggregatorItems)
- Regression Aggregator for M&V (X1-RegressionAggregatorMV)

Measurement Business Object: Aggregated measurements can be based on either the Measurement (D1-Measurement) business object or the Aggregation Measurement (D1-AggregationMeasurement) business object (based on the Aggregation Measurement maintenance object).

Data Source: The source of the data that will be aggregated and the specific type of data that should be aggregated. Note that the **Service Type** of the data source, as determined by its associated objects (e.g. Measuring Component Type, Device Type, Service Point Type), must match the **Service Type** for this measuring component type.

Anchor Time: A time used to define the start and end time of the business day for purposes of aggregation processing for aggregation measuring components of this type. In gas settlement implementations, this is used to define the start and end time for "Gas Day" calculations.

Value Identifiers: These store the values of UOM, TOU, and SQI that identify the measurements to be aggregated. For each value identifier either the **Value Calculation**

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Method or **Value Derivation Algorithm** must be defined (not both). These define how measurement values are calculated or derived during aggregation processing.

Refer to Understanding Measuring Component Types for more information about measuring component types.

Understanding Aggregation Groups

Aggregation Groups define the ordering of a series of related aggregations based on a set of configured Measuring Component Sets. Aggregation groups define the following attributes for aggregations performed for its Measuring Component Sets:

- The **Time Zone** for aggregated data
- **Aggregation Scheduling** can be based on either a Defined Lag, or a Processing Timetable.
  - **Defined Lag** scheduling uses the following parameters:
    - **Aggregation Cut Off Time**: The end time for aggregation calculations performed for Aggregation Measuring Components for Measuring Component Sets associated with the Aggregation Group. This is used to ensure a consistent end time for aggregation periods. This is especially useful when aggregating other aggregations.
    - **Aggregation Lag**: The number of days between the date on which aggregation calculations are performed and the end date of the aggregation period. This defines the time period between the aggregation calculation date and the aggregation horizon that serves to allow all measurements to arrive. This together with the Aggregation Horizon is used to determine the start and end dates of an aggregation period. For example, with an Aggregation Horizon of 5 and an Aggregation Lag of 2, aggregation calculations performed on January 9 would be for an aggregation period of January 3 through January 7. The next day (January 10), the aggregation period would shift to January 4 through January 8.
    - **Aggregation Horizon**: The number of days in the aggregation period for Aggregation Measuring Components for Measuring Component Sets associated with the Aggregation Grou. This reflects the time period during which there's a potential change in measurement data for one or more of the measuring components associated with Aggregation Measuring Components. This together with the Aggregation Lag is used to determine the start and end dates of an aggregation period.
  - **Processing Timetable** scheduling uses a Processing Timetable Type to drive aggregation schedule.

Aggregation groups can be used to perform aggregations for Analytical or Settlement purposes (defined by the Aggregation Category).

Understanding Measuring Component Sets

Measuring component sets are used to define the dimensions and criteria by which aggregation will be performed.

A measuring component set's **Measuring Component Type** defines the Measuring Component and Measurement Type to be used in capturing aggregation results, as well as the aggregation functions that will be used on the source transnational data and the Data Source that will identify where that transnational data will be retrieved from.

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Measuring component sets are associated with an **Aggregation Group**, which controls when and how aggregation is processed. This includes the sequence in which the aggregation group's measuring component sets are processed, as well as the method by which aggregation processing is initiated for each (this information can be found in the **General Processing** section).

A measuring component set's **Measuring Component Set Class** defines the way in which the measuring component set is used in the aggregation process. Measuring component set classes are based on the measuring component set's business object, and can include:

- **Aggregation Foundation** measuring component sets are used to aggregate transactional data, such as measurements from service points linked via usage subscriptions or billed service quantities.
- **Aggregation Composite** measuring component sets are used to aggregate data from a set of other aggregations (which can be based on either foundation or other composite measuring component sets).
- **Adhoc** measuring component sets are used to aggregate data based on an adhoc, user-defined set of measuring components.

See **Foundation and Composite Aggregation** in Dynamic Aggregation Processing for more information.

Dimensions, Criteria, and Individually Managed Items

The **Dimensions** and **Criteria** defined for the measuring component set are used by the dimension scanning process to identify individual aggregation measuring components that should be created. Measuring components are also created for each **Individually Managed Item** for which data matches the item's configuration.

- **Dimensions** identify the attributes by which data should be aggregated. Dimensions can include characteristics, identifiers, market participants, and values from specific tables and columns. For example, aggregating data by loss profile code, service point type and service provider would require defining dimensions for a Loss Profile Code characteristic, the Service Point Type column from the Service Point table, and the Service Provider column from the Device table.
- **Criteria** define the ways in which the dimensions are evaluated through a series of inclusions, exclusions, or both. For example, to aggregate data for the "AGG-E-COM" and "AGG-E-RES" service point types, but NOT for devices from the "ELEC" service provider, criteria could be defined to include both of service point type values and exclude the "ELEC" service provider.
- The criteria provided for **Individually Managed Items** is used to identify specific customers that should be aggregated in isolation from all other data that matches the **Dimensions** and **Criteria** defined for the measuring component set.

More specifically, the dimension scanning template SQL (derived from the data source) is extended by the **Dimensions**, **Criteria**, and **Individually Managed Items** configured on the measuring component set being processed.

Consult the embedded help for more information about the specific configuration options used by **Dimensions**, **Criteria**, and **Individually Managed Items**. The Source Type and Source Entity values are defined in the Aggregation Criteria Source Type (D1-CriteriaSourceTypeLookup) extendable lookup. Refer to Configuring Aggregation Criteria Source Types for more information about this extendable lookup.

The manner in which the criteria provided will be evaluated is defined in formulas configured in the **Criteria Processing** section. Consult the embedded help for more information about defining criteria processing formulas.

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Load Distribution

The **Load Distribution** parameters can be used to distribute the load of the transactional data derived from the associated Data Source when generating Measuring Component Set participants. Load distribution is achieved in the system by adding another dimensional attributes on the aggregator measuring component based on a defined number of digits from either the service point ID or usage subscription ID. **Load Distribution** parameters include:

- **Distribute Load**: A flag that indicates ("Yes" or "No") if if the measuring component set's transactional data should be further distributed via an additional dimensional attribute.
- **Number of Digits to Use**: The number of digits from either the service point ID or usage subscription ID to use as an additional dimensional attribute when distributing the load. For example, if **Number of Digits to Use** is 2, the last 2 digits of either the service point ID or usage subscription ID will be analyzed to determine if the transactional data should be a constituent of the aggregator measuring component.
- **Load Distribution Managed By**: Specifies which identifier, either "Service Point" or "Usage Subscription", whose last x digits will be placed as an additional dimensional attribute on the aggregator measuring component.
- **Load Distribution Formula**: Identifies if further criteria are needed when applying load distribution. For example, if "postal code" is a dimensional attribute, and we only want to distribute the load for a specific postal code where population is denser, a Criteria can be specified and this formula can be used to identify how that Criteria will be evaluated. This formula is applicable only when the **Distribute Load** parameter is set to "Yes".

Configuring Dynamic Aggregation Step-by-Step

This section outlines the steps involved when configuring dynamic aggregation.

Create Device and Service Point Administrative Data

Many of the objects used in dynamic aggregation reference other device- and service point-related administration data, such as measuring component types, service point types, usage subscription types, etc. Make sure this data is in place before configuring entities used with dynamic aggregation.

Create Data Sources

Create data sources for each source of data from which data will be aggregated. Note that implementations can have multiple data sources of each class with different data type configuration (Measuring Component Types, Item Types, Usage Subscription Types, etc.). For example, an implementation with 15 measuring component types might want to aggregate data differently based on subsets of measuring component types. In this case, each subset of measuring component types could be defined on a different data source.

If applicable, create custom Template SQL extendable lookup values and add them to Data Source business objects as appropriate.

Create Aggregation Measuring Component Types

Create the aggregation measuring component types that will be used to define the attributes of the measuring components that will be created during aggregation processing.

Aggregation measuring component types reference an appropriate Data Source. Continuing the example above, each subset of measuring component types (each defined on a separate data source) would require a separate aggregation measuring component type.

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Create Aggregation Groups

Create the aggregation groups that will be used to control aggregation processing, including aggregation groups for both foundation and composite aggregation processing.

Note: When initially creating aggregation groups, define only the basic data for each (name, category, and optional time zone). Add measuring component sets to aggregation groups when creating the latter in the next step.

Create Measuring Component Sets

Create the measuring component sets that will define the “buckets” by which the aggregated data will be grouped.

Measuring component sets reference aggregation measuring component types and aggregation groups.

Create custom Source Type records (if applicable).

Revise Aggregation Groups (if needed)

After creating measuring component sets, adjust the sequence of each within its aggregation group as appropriate. For example, this would be necessary if measuring component sets are created and added to aggregation groups in an order that differs from their intended sequence.

Extending Dynamic Aggregation

The dynamic aggregation functionality provides extensive flexibility through configuration of data sources, measuring component types, and measuring component sets to handle complex aggregation requirements. However, some implementations may require functionality and configuration options beyond that provided in the base package. For instance, an implementation may need to aggregate data of a source and type not covered by the base package data sources or use different dimensions and criteria or queries for aggregation processing.

In circumstances like these, the dynamic aggregation functionality can be extended through use of the Oracle Utilities Application Framework’s Configuration Tools (see Configuration Tools) and other options. This section outlines some of the possible approaches to extending this functionality.

Data Source Business Objects: If an implementation requires aggregation of a data type of source beyond those provided with the base package data source business objects, custom business objects can be created to support this requirement. Key considerations when creating custom data source business objects include:

- Configuration options such as “Sourced Measuring Component Types” or “Sourced Usage Subscription Types”
- Values for the “Aggregation SQL”, “Dimension Scanner SQL”, and “Find Constituents SQL” business object options from the Data Source SQL extendable lookup.
- Algorithms for the “Generate SQL For Data Source” system event that leverage the configuration options defined for the data source

Data Source SQL Extendable Lookup Values: If an implementation requires template SQL that differs from the base package, custom values for the Data Source SQL extendable lookup can be created and referenced on the data source business object. When creating custom template SQL, start from an existing extendable lookup value. Select the value that most

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closely matches the requirements and use the **Duplicate** function to create a copy, and edit the SQL as needed.

Aggregation Measuring Component Type Business Objects: If an implementation requires capturing data for measuring component types not provided in the base package, the base package aggregation measuring component type business objects can be extended as appropriate. Key considerations when creating custom measuring component type business objects include:

- Algorithms for the “Generate SQL For MC Type” system event that leverages the Value Identifiers and other information defined for the measuring component type

Aggregation Measuring Component Business Objects: If an implementation requires capturing data for measuring components not provided in the base package, the base package aggregation measuring component business objects can be extended as appropriate. Key considerations when creating custom measuring component business objects include:

- Algorithms for the “Generate SQL For Aggregator MC” system event that leverages the Value Identifiers and other information defined for the measuring component type
- Algorithms for the “Find Constituents” system event that uses the “Generate SQL for Aggregator MC” algorithm, data source configuration, and other configuration to find constituent data for aggregation
- Algorithms for the business object’s “Active” state, including data aggregation and value derivation

Measuring Component Set Business Objects: If an implementation requires capturing data for measuring component sets not provided in the base package, the base package aggregation measuring component set business objects can be extended as appropriate. Key considerations when creating custom measuring component set business objects include:

- Algorithms for the “Generate SQL For MC Set” system event
- Algorithms for the business object’s lifecycle states, as appropriate

Aggregation Criteria Source Type Extendable Lookup Values: If an implementation requires Source Type or Source Entity values for measuring component sets that differ from the base package, custom extendable lookup values can be created. When creating custom values for this extendable lookup, start from an existing extendable lookup value. Select the value that most closely matches the requirements and use the **Duplicate** function to create a copy, and edit as needed.

Understanding Customer Program Service Task Types

Customer program service task types define properties common to specific types of customer program service tasks used to manage enrollment, unenrollment, and other processes. Each process has an associated service task, which is based on a specific service task type.

Customer program service task types are defined by the following:

- **Service Task Business Object**: The business object used to create service tasks of this type.
- Other details specific to the service task type. See the sections below for more details.

System Data

Customer program service task types are based on the system data:

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Data Type	Description
Maintenance Object	Service Task Type (F1-STASKTYPE)
Business Object(s)	Customer Program Enrollment Task Type (X1-DigitalAssetEnrollTaskType) Customer Program Unenrollment Task Type (X1-DigitalAssetUnenrollTaskTyp) Program Service Call Task Type (X1-ProgramServiceCallTaskType) DER Interconnection Request Task Type (X1-DERInterconnectionTaskType) Customer Program Enroll Additional Device Task Type (X1-DAAddDeviceToEnrollTaskType)

Enrollment Service Task Type

Digital Asset Enrollment service task types include the following

- **Programs**: The programs that will use this service task type.
- **Exception Handling**: Exception handling details, including To Do Type, To Do Role, and Enrollment Expiration Days.
- **Enrollment Setup Defaults**: The Program Subscription Type and Device Location Type for the Program Subscriptions and Device Locations to be created by the enrollment process.
- **Device Setup**: The actions to perform during the enrollment device setup stage, including the following for each:
  - **Sequence**: The sequence for the device setup actions collection. Actions are evaluated in sequence order based on each unique combination of **Installation Method** and **Asset Ownership**. The setup actions whose combination of **Installation Method** and **Asset Ownership** matches that specified in the service task are used in the enrollment process.
  - **Installation Method**: The installation method for the controllable devices associated with the enrollment process. Options include:
    - **Bring Your Own**: The customer supplies their own device.
    - **Re-enroll**: The customer is re-enrolling in a program for a utility-owned device at a different location.
    - **Ship Device**: The utility will ship the device to the customer.
    - **Utility Installation**: The utility will install the device at the customer's device location.
  - **Asset Ownership**: Who owns the assets associated with the enrollment process, based on the Installation Method. Options include:
    - **Customer Owned**: The customer owns the asset/device.
    - **Utility Owned**: The utility owns the asset/device.
  - **Device Setup Actions**: The actions to be performed for installing or confirming the controllable device status at the device location, including the following for each:
    - **Sequence**: The sequence for the actions collection. Actions are processed in order based on sequence.
    - **Setup Action**: The specific action to be performed for devices with this combination of Installation Method and Asset Ownership. Options include:

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        * **Create Activity**: Used to create Service Order Management field activities to perform device installation or inspection.
        * **Create To Do**: Used to create a To Do Entry.
        * **Create Work Order**: Used to create Work and Asset Management work orders to perform device installation or inspection.

          > **Note**
          >
          > This option is not available when using Customer Program Managemeng with Customer Cloud Service.

        * **Initiate Controllable Device Command**: Used to create and send commands to the controllable device to test if it's capable of communicating with the control system.
        * **No Action Needed**: Indicates that no device setup action is needed for devices with this combination of Installation Method and Asset Ownership.
    * **Setup Action Details**: Details for the action, based on the selected **Setup Action**.
        * **Create Activity**: The **Activity Type** and **Field Task Type** for enrollment field activities.
        * **Create To Do**: The **To Do Type** and **To Do Role** for the To Do Entry to be created.
        * **Create Work Order**: The **Template Work Order Identifier** for the template work order. Template work orders can create up to two activities. This is used when a customer is enrolling in a related program, in which case an activity template can be configred for each program. Note that template work orders can have a maximum of two activity templates.

          > **Note**
          >
          > This option is not available when using Customer Program Managemeng with Customer Cloud Service.

        * **Initiate Controllable Device Command**: The **Command Activity Type** for commands. Supported commands include "Controllable Device Status Check"

Configuring Template Work Orders

When configuring template work orders, you should configure a separate template work order for each program, as well as for each unique pair of programs. Each template work order should include work activity templates appropriate for each program (or pair of programs). For example, if your implementation includes 3 programs (A, B, and C), and program C is considered a related program for programs A and B, you might configure the following template work orders:

- Program A (with a work activity template appropriate for program A)
- Program B (with a work activity template appropriate for program B)
- Program C (with a work activity template appropriate for program C)
- Programs A-C (with work activity templates appropriate for programs A and C)
- Programs B-C (with work activity templates appropriate for programs B and C)

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Refer to **Template Work Orders** for more information about configuring template work orders.

Unenrollment Service Task Type

Digital Asset Unenrollment service task types include the following

- **Programs**: The programs that will use this service task type.
- **Exception Handling**: Exception handling details, including To Do Type, To Do Role, and Unenrollment Expiration Days.
- **Device Setup**: The actions to perform during the unenrollment device setup stage, including the following for each:
  - **Sequence**: The sequence for the device setup actions collection. Actions are evaluated in sequence order based on each unique combination of **Installation Method** and **Asset Ownership**. The setup actions whose combination of **Removal Method** and **Asset Ownership** matches that specified in the service task are used in the unenrollment process.
  - **Removal Method**: . The removal method for the controllable devices associated with the unenrollment process. Options include:
    - **Keep**: The customer or utility keeps the device.
    - **Ship Device**: The customer will ship the device to the utility.
    - **Utility Removal**: The utility will remove the device from the customer's device location.
  - **Asset Ownership**: Who owns the assets associated with the unenrollment process, based on the Removal Method. Options include:
    - **Customer Owned**: The customer owns the asset/device.
    - **Utility Owned**: The utility owns the asset/device.
  - **Device Setup Actions**: The actions to be performed for removing the controllable device status at the device location, including the following for each:
    - **Sequence**: The sequence for the actions collection. Actions are processed in order based on sequence.
    - **Setup Action**: The specific action to be performed for devices with this combination of Renoval Method and Asset Ownership. Options include:
      - **Create Activity**: Used to create Service Order Management field activities to perform device removal.
      - **Create To Do**: Used to create a To Do Entry.
      - **Create Work Order**: Used to create Work and Asset Management work orders to perform device removal.

        > **Note**
        >
        > This option is not available when using Customer Program Managemeng with Customer Cloud Service.

      - **Initiate Controllable Device Command**: Used to create and send commands to the controllable device to test if it's capable of communicating with the control system.

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        * **No Action Needed**: Indicates that no device setup action is needed for devices with this combination of Removal Method and Asset Ownership.
    * **Setup Action Details**: Details for the action, based on the selected **Setup Action**.
        * **Create Activity**: The **Activity Type** and **Field Task Type** for unenrollment field activities.
        * **Create To Do**: The **To Do Type** and **To Do Role** for the To Do Entry to be created.
        * **Create Work Order**: The **Template Work Order Identifier** for the template work order.
        * **Initiate Controllable Device Command**: The **Command Activity Type** for commands. Supported commands include "Controllable Device Status Check"

Service Call Service Task Type

Digital Asset Service Call service task types include the following:

- **Escalation To Do Type**: The To Do Type used for To Do Entries created for "Escalation" service calls. The default value for this is X1-TRESC
- **Template Work Order**: A list of available template work orders used with "Create a Work Order" service calls.
- **Questionnaires**: A list of questionnaires that apply to service calls of this type. Questionnaires are maintained as service codes which contain one or more customer questions. See Understanding Service Codes for more information.
- **Exception Handling**: Exception handling details, including To Do Type, To Do Role, and Enrollment Expiration Days.

DER Interconnection Service Task Type

DER Interconnection service task types include the following

- **Device Location Type**: The Device Location Type for the Device Locations to be created by the interconnection process.
- **Specifications**: One or more specifications for assets created by the interconnection process.
- **Exception Handling**: Exception handling details, including To Do Type, and To Do Role

Enroll Additional Device Service Task Type

Enroll Additional Device service task types include the following

- **Exception Handling**: Exception handling details, including To Do Type, and To Do Role.

Configuring Customer Program Management Options

Use the information in this section when defining customer program management options.

- Defining Controllable Asset Types
- Defining Device Location Types
- Defining Head End Systems
- Defining DER Aggregators

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- Defining Metered Service Types
- Defining Metered Service Point Types
- Defining Program Control Score Calculation Groups
- Defining Program Control Score Calculation Rules
- Defining Program Initiatives
- Defining Program Rules
- Defining Program Contact Types
- Defining Program Subscription Types
- Defining Program Types
- Defining Program Settlement Calculation Groups
- Defining Program Settlement Calculation Rules
- Defining Usage Transaction Exception Types
- Defining Interval Price Set Types
- Defining Customer Questions
- Defining Service Areas
- Defining Service Classes
- Defining Service Codes
- Defining Service Types
- Defining Units of Measure
- Defining Time of Use Periods
- Defining Service Quantity Identifiers
- Defining Divisions
- Defining Entity Groups
- Defining Weather Stations
- Defining Postal Code Defaults
- Defining Bill Cycles
- Configuring Device and Measurement Processing Options
- Configuring M&V Options
- Defining Customer Program Service Task Types
- Defining Enrollment Options
- Defining Program Service Call Options
- Defining Manual Work Activity Completion Options
- Configuring the Customer Program Summary Portal
- Configuring the Program Dashboard
- Adding Custom Fields to Customer Program Process Flows

Defining Controllable Asset Types

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You use the **Asset Type** and **Controllable Asset Type** portals to search for, view, and maintain controllable asset types.

Refer to Understanding Controllable Asset Types for more information.

You can access the **Asset Type** portal by selecting **Admin**, select **Asset Management**, then select **Asset Type**. You use the **Asset Type Query** portal and **Asset Search** zone to search for the controllable asset type you wish to view. To search for controllable asset types, select "Controllable Asset" from the **Asset Business Object** drop-down list. When you select the controllable asset type you wish to view, it opens in the **Controllable Asset Type** portal.

The following zones may appear as part of the portal's **Main** tab page:

- **Asset Type**: This zone provides information about the selected controllable asset type.

The following zones may appear as part of the portal's **Device Type** tab page:

- **Device Type**: This zone provides information about the device type associated to the selected controllable asset type.
- **Device Type Characteristics**: This zone lists characteristics and values for the device type associated to the selected controllable asset type.
- **Valid Device Characteristic Types**: This zone lists valid characteristic types for the device type associated to the selected controllable asset type.

Defining Device Location Types

You use the **Device Location Type** portal to display and maintain device location types.

Refer to Understanding Device Location Types for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Device Location Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Device Location Type List**: This zone lists all device location type records. Broadcast a record to display the details of the selected record.
- **Device Location Type**: This zone provides information about the selected device location type.

Defining Head End Systems

You use the **Head End System** portal to display and maintain Head End Systems.

Refer to Understanding Head End Systems for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Head End System**.

The following zones may appear as part of the portal's **Main** tab page:

- **Head End System List**: This zone lists all head end system records. Broadcast a record to display the details of the selected record.
- **Head End System**: This zone provides information about the selected head end system.
- **Processing Method List**: This zone provides the list of processing methods defined for the head end system.

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- **Translation Methods List**: This zone provides the list of translation methods defined for the head end system.
- **Inbound BOs Send By Service Provider**: This zone lists inbound business objects that are sent by this head end system. The identification is driven by the Business Object having a Business Object Option of type "Sent By Service Provider" that references the current Head End System.

Defining DER Aggregators

You use the **DER Aggregator** portal to display and maintain Distributed Energy Resource (DER) Aggregators.

Refer to Understanding DER Aggregators for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **DER Aggregator**.

The following zones may appear as part of the portal's **Main** tab page:

- **DER Aggregator List**: This zone lists all DER aggregator records. Broadcast a record to display the details of the selected record.
- **DER Aggregator**: This zone provides information about the selected aggregator.
- **Processing Method List**: This zone provides the list of processing methods defined for the aggregator.

Defining Metered Service Types

You use the **Metered Service Type** portal to display and maintain metered service types.

Refer to Understanding Metered Service Types for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Metered Service Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Metered Service Type List**: This zone lists all metered service type records. Broadcast a record to display the details of the selected record.
- **Metered Service Type**: This zone displays the selected metered service type.
- **Attributes**: This zone displays a list of characteristic types that may be defined for metered service records of the selected metered service type.

Defining Metered Service Point Types

You use the **Metered Service Point Type** portal to view metered service point types.

Refer to Understanding Metered Service Point Types for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Metered Service Point Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Metered Service Point Type List**: This zone lists all metered service point type records. Broadcast a record to display the details of the selected record.

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- **Metered Service Point Type**: This zone provides information about the selected metered service point type.

Defining Program Control Score Calculation Groups

You use the **Program Control Score Calculation Group** portal to display and maintain program control score calculation groups.

Refer to Understanding Program Control Score Calculation Groups for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Program Control Score Calculation Group**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Control Score Calculation Group**: This zone displays basic information about program control score calculation group.
- **Program Control Score Calculation Rules List**: This zone lists the program control score calculation rules belonging to the group.

Defining Program Control Score Calculation Rules

You use the **Program Control Score Calculation Rule** portal to display and maintain program calculation rules.

Refer to Understanding Program Control Score Calculation Rules and Understanding Program Control Score Calculation Groups for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Program Control Score Calculation Rule**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Control Score Calculation Rule**: This zone displays the program control score calculation rule, including parameters used when executing the rule.

Program Control Score Calculation Calculation Rules

The following is a list of the program control score calculation program calculation rules provided as part of base product. For more information on how each rule executes and can be configured, follow the link provided on the rule.

Program Calculation Rule Name	Purpose
Score Calculation Rule	This rule is used to calculate control scores for controllable devices based on parameters and values defined in a the device's program rules. This rule uses pre-defined variables and base package algorithms to derive values from the program's rules. Multiple instances of this rule can be chained in a sequence within a program calculation group such that the first rule (or rules) sets values for a number of variables that are then used in calculations in subsequent rules.

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Variables

The Program Variables (X1-ProgramVariablesLookup) extendable lookup includes a number of pre-defined and standard variables that can be used in program calculation rules. The table below lists the variables provided with the base package.

Variable	Description
AC	Activation Cost (AC)
AV	Availability (AV)
BR	Burn Rate (BR)
BRn	Burn Rate Factor (BRn)
CA	Successful Event Participation Limit (CA)
CU	Successful Event Participation Count (CU)
DE	Days Elapsed Since Last Event Participation (DE)
DP	Days in a Cycle (DP)
SC	Score (SC)
SNn	Score Factor (SNn)

The following variables are used to populate specific values on controllable assets:

- **Score (SC)**: When Program Calculation Rules return a value for this variable (defined as the **Result Variable** on the rule), the score is saved to the controllable asset (along with the date and time at which the score was calculated).
- **Availability (AV)**: If Program Calculation Rules return a value of 0 for this variable, the **Asset Availability** flag on the controllable asset is set to "No". If Program Calculation Rules return a non-zero value for this variable or the rule doesn't return a value for this variable, the **Asset Availability** flag on the controllable asset is set to "Yes".

Algorithms

Program calculation rules can leverage base package algorithms to derive values from programs and program rules for use in calculations. Each of these is typically paired with a pre-defined variable (see Variables, above). The table below lists the base package algorithms and associated variables.

Algorithm	Associated Variable
Activation Cost (X1-GETAC)	AC
Burn Rate Factor (X1-GETBRF)	BRn
Days in a Cycle (X1-GETDCP)	DP
Days Elapsed Since Last Event Participation (X1-GETDE)	DE
Successful Event Participation Limit (X1-GETEPA)	CA
Successful Event Participation Count (X1-GETEPC)	CU
Score Factor (X1-GETSF)	SNn

- Score Calculation Rule

Score Calculation Rule

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This rule is used to calculate control scores for controllable devices based on parameters and values defined in a the device's program rules. This rule uses pre-defined variables and base package algorithms to derive values from the program's rules. Multiple instances of this rule can be chained in a sequence within a program calculation group such that the first rule (or rules) sets values for a number of variables that are then used in calculations in subsequent rules.

Calculation Details

The **Calculation Details** section is used to define the formulas used in the rule's calculations. Simple formulas support basic math operations using variables defined in the **Variables** section. Complex formulas allow for more complex operations, comparisons, and conditions upon which certain variables are set to certain values. Refer to the embedded help in this section for details about configuring formulas.

Variables

The **Variables** section is used to define one or more variables that will be used in formulas defined in the **Calculation Details** section. The variable's **Variable Type** determines how the variable is populated:

- **Algorithm**: The value is returned by a specified algorithm.
- **Transaction Value**: The value is based on a variable defined in a previous rule and stored in the program transaction's **Calculation Results**.

Variables must be defined in the Program Variables (X1-ProgramVariablesLookup) extendable lookup. In addition to the pre-defined variables provided, implementations can created their own variables using this extendable lookup.

When deriving values from the program rule's **Score Calculation Factors** section, values are defined per **Cycle**, which is the number of times the device has successfully participated in an event during the current cycle (week or month), plus 1. A device's event participation is considered successful in the following circumstances:

- The Event Participation has an **Outcome** of "Successful Participation".
- The Event Participation has an **Outcome** of "Canceled". This happens when a device has been reserved but the event stopped halfway through due to reasons such as, target load control reached. It is considered as a success in customer perspective, since it is the utility that stopped the event which resulted to a cancelled outcome.
- The Event Participation has a blank **Outcome** and the device was not preemptively opted out of the event (**Preemptive Opt-Out** is "No" or blank). Posting of an event's outcome may be delayed, and until then the event participation of a reserved device is considered as a success as long as the customer did not opt out before the event transpires.

For instance, if a device has never participated in an event, the algorithms would use the values in the Cycle 1 row. If a device has successfully participated in 3 previous events, the algorithms would use the values in the Cycle 4 row.

Results

The **Results** section is used to define result of the program calculation rule.

To save the control score to the controllable asset, set the Result Variable on the final rule in the program calculation group to "SC" (the Score variable).

To mark a device as unavailable under certain conditions (such as if specific values are missing from the Program Rule), configure the rule to return a value of "0" for the AV (Availability) variable and set the **Result Variable** to "AV" (the Availability variable).

Notes and Recommendations

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Additional detail on the logic of this rule can be found in the Detailed Description of the X1-SCRCALC Algorithm Type.

For help with the meaning of specific configuration fields, refer to the embedded help on the screen when adding or editing the rule.

Business Object

X1-ScoreCalculationRule

Example Scenarios

Below are some example scenarios that can be achieved based on configuration of this rule.

In this example, the first rule calculates a burn rate (BR) variable that is used in calculating the control score (SC) in the second rule.

Rule 1: Calculate Burn Rate

- **Sequence**: 10
- **Description**: Calculate Burn Rate
- **Calculation Details**:
  - **Formula Source**: Conditional Formula
  - **Conditional Formula**:

Seq.	Operand 1	Criteria Operator	Operand 2	True Action	True Formula	False Action	False Formula
10	CU	=	CA	Apply True Formula	99999	Check Next Condition	
20	DE	<=	DBC	Apply True Formula	99999	Apply False Formula	((CU/CA) / (DE/DP)) * BRF

- **Variables**:

Variable Name	Variable Type	Algorithm
BRF	Algorithm	Burn Rate Factor
CA	Algorithm	Event Participation Allowed
CU	Algorithm	Event Participation Count
DE	Algorithm	Days Elapsed Since Last Event Participation
DP	Algorithm	Days in a Cycle

- **Results**:
  - **Variable Name**: BR

Rule 2: Calculate Score

- **Sequence**: 20
- **Description**: Calculate Score
- **Calculation Details**:
  - **Formula Source**: Simple Formula
  - **Simple Formula**: BR * AC * SCF

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- **Variables**:

Variable Name	Variable Type	Algorithm
AC	Algorithm	Activation Cost
BR	Transaction Value	
SCF	Algorithm	Score Factor

- **Results**:
  - **Variable Name**: SC

Defining Program Initiatives

You use the **Program Initiative** portal to display and maintain program initiatives.

Refer to Understanding Program Initiatives for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Program Initiative**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Initiative**: This zone displays the selected program initiative.
- **Initiative Eligibility Criteria Overview**: This zone lists criteria used to determine a customer's eligibility in a program. Click **Add Eligibility Criteria** to add a criteria. Click the **Edit** or **Delete** icons to edit or delete (respectively) an existing criteria.

Defining Program Rules

You use the **Program Rule** portal to display and maintain program rules.

Refer to Understanding Program Rules for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Program Rule**.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Rule List**: This zone lists all program rule records. Broadcast a record to display the details of the selected record.
- **Program Rule**: This zone displays the selected program rule.

Defining Program Contact Types

You use the **Contact Type** portal to display and maintain program contact types.

Refer to Understanding Program Contact Types for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Program Contact Type**.

The following zones may appear as part of the portal's **Main** tab page:

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- **Contact Type List**: This zone lists all program contact type records. Broadcast a record to display the details of the selected record.
- **Contact Type**: This zone displays the selected program contact type.

Defining Program Subscription Types

You use the **Program Subscription Type** portal to display and maintain program subscription types.

Refer to Understanding Program Subscription Types for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Program Subscription Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Subscription Type List**: This zone lists all program subscription type records. Broadcast a record to display the details of the selected record.
- **Program Subscription Type**: This zone displays the selected program subscription type.
- **Attributes**: This zone lists haracteristics that can be defined for program subscriptions of this type.

Defining Program Types

You use the **Program Type** portal to display and maintain a program types.

Refer to Understanding Program Types for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Program Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Type List**: This zone lists all program type records. Broadcast a record to display the details of the selected record.
- **Program Type**: This zone displays the selected program type.

Defining Program Settlement Calculation Groups

You use the **Program Settlement Calculation Group** portal to display and maintain program settlement calculation groups.

Refer to Understanding Program Settlement Calculation Groups for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Program Settlement Calculation Group**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Settlement Calculation Group**: This zone displays basic information about program settlement calculation group.
- **Program Settlement Calculation Rules List**: This zone lists the program settlement calculation rules belonging to the group.

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Defining Program Settlement Calculation Rules

You use the **Program Settlement Calculation Rule** portal to display and maintain program settlement calculation rules.

Refer to Understanding Program Settlement Calculation Rules and Understanding Program Settlement Calculation Groups for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Program Settlement Calculation Rule**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Program Settlement Calculation Rule**: This zone displays the program settlement calculation rule, including parameters used when executing the rule.
- **Eligibility Criteria List**: This zone lists eligibility criteria for the current calculation rule. Eligibility criteria are configured criteria used to determine whether to execute a specific calculation rule.

Program Settlement Calculation Rules

The following is a list of the program settlement calculation rules provided as part of base product. For more information on how each rule executes and can be configured, follow the link provided on the rule.

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Program Settlement Calculation Rule Name	Purpose
End of Event Program Settlement Rule	This rule is used to calculate program event settlement transactions that represent credits that will be applied to a customer's bill based on participation in an individual event. This rule uses multiplies "kWh avoided" or "kW drop" interval values captured on program event settlement transactions by interval prices defined in an interval price set. Interval prices can be defined as specific interval price sets or can be derived from more than one interval price set by an algorithm. When program event settlement transactions are created from data received from an external analytics application, "kWh avoided" or "kW drop" interval values are populated when the transaction is created. When program event settlement transactions are created via batch processing "kWh avoided" or "kW drop" interval values are calculated via baseline calculations, performed via a combination of a Baseline Calculation rule and Vector and Service Quantity Math rule to calculate reductions in consumption or demand. **Note** The base package does not include algorithms for deriving prices for use in program settlement calculations. Implementations must configure their own algorithms if they wish to derive prices from more than one interval price set.

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Program Settlement Calculation Rule Name	Purpose
End of Season Program Settlement Rule	This rule is used to calculate "Combined kW Drop" program event settlement transactions that represent credits that will be applied to a customer's bill based on participation in an individual event. This rule averages values captured on "kW Drop" program event settlement transactions and multiplies the result by a price. Prices can be defined in the rule configuration or can be derived by an algorithm. The average "kW Drop" value (captured as the **Settlement Quantity** on the "Combined kW Drop" program event settlement transaction) is calculated from the "Max Drop" values from the "kW Drop" program event settlement transactions that fall into the "top" percentage of values defined by the **Demand Drop Percentage (%)** parameter. See About Program Event Settlement Transactions for more information about the distinction between "kW Drop" and "Combined kW Drop" program event settlement transactions. When program event settlement transactions are created from data received from an external analytics application, "kWh avoided" or "kW drop" interval values are populated when the transaction is created. When program event settlement transactions are created via batch processing "kWh avoided" or "kW drop" interval values are calculated via baseline calculations, performed via a combination of a Baseline Calculation rule and Vector and Service Quantity Math rule to calculate reductions in consumption or demand. **Note** The base package does not include algorithms for deriving prices for use in program settlement calculations. Implementations must configure their own algorithms if they wish to derive prices from more than one interval price set.
Incentive and Fee Calculation Rule	This rule is used to calculate incentive- and fee-based program event settlement transactions that represent credits or changes that will be applied to a customer's bill based on incentives and/or fees configured for a program to which the customer subscribes.

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Program Settlement Calculation Rule Name	Purpose
Baseline Calculation	This rule is used to calculate estimated baseline consumption for a metered service point that represents an estimate of the customer's consumption or demand for an event period had they not participated in the event.
Vector and Service Quantity Math	This rule is designed to facilitate configuration of complex vector calculations. It is based on a series of underlying services with vectors configured as input to the calculations. This can be used to calculate reductions in consumption or demand by subtracting actual consumption or demand from baseline consumption or demand calculated using the Baseline Calculation rule.
Execute Usage Calculation Group	This rule is used to execute a separate usage calculation group which includes execution of all usage calculation rules within that group. For example, this can be used to group a Baseline Calculation rule and Vector and Service Quantity Math rule to calculate reductions in consumption or demand, which can then be passed to an End of Event Program Settlement Rule or End of Season Program Settlement rule.

- End of Event Program Settlement Rule
- End of Season Program Settlement Rule
- Incentives and Fee Rule
- Baseline Calculation Rule
- Vector and Service Quantity Math
- Execute Usage Calculation Group

End of Event Program Settlement Rule

This rule is used to calculate program event settlement transactions that represent credits that will be applied to a customer's bill based on participation in an individual event. This rule multiplies "kWh avoided" or "kW drop" interval values captured in program event settlement transactions by interval prices defined in an interval price set. Interval prices can be defined as specific interval price sets or can be derived by an algorithm.

> **Note**
>
> The base package does not include algorithms for deriving prices for use in program settlement calculations. Implementations must configure their own algorithms if they wish to derive prices from more than one interval price set.

Calculation Details

The **Calculation Details** section is used to define the interval values and interval prices used in the rule's calculations.

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- **UOM**: The unit of measure used to define the interval values to be created in the program settlement transaction.
- **TOU**: The time of use period used to define the interval values to be created in the program settlement transaction.
- **SQI**: The service quantity identifier used to define the interval values to be created in the program settlement transaction.
- **Set Function**: The function used to calculate consumption for the program event settlement transaction. Applicable only if the select UOM is one that measures peak. Options include:
  - **Average**: Use the average value
  - **Maximum**: Use the maximum value
  - **Minimum**: Use the minimum
- **Interval Size**: The size of the interval values to be created in the program settlement transaction represented as hours:minutes:seconds (HH:MI:SS). This should be the same interval size are defined on interval price set types that will be used with the rule. See **Understanding Interval Price Set Types** for more information.
- **Line Description**: A text string that describes the program settlement transaction
- **Defer Amount Calculation**: A flag that indicates (Yes or No) whether or not calculation of the program event settlement transaction should be deferred.
- **Total Consumption UOM**: The unit of measure for the total consumption calculated by the program event settlement transaction.
- **Total Consumption TOU**: The time of user period for the total consumption calculated by the program event settlement transaction.
- **Total Consumption SQI**: The service quantity identifier for the total consumption calculated by the program event settlement transaction.
- **Price Source**: The source of interval price data used by the rule. Options include:
  - **Algorithm**: A custom algorithm that derives interval prices from a set of interval price sets
  - **Specific Price**: A specific interval price set to be used by the rule

SQ Rounding Details

The **SQ Rounding Details** section defines the manner in which service quantities are rounded. These parameters allow configuration of the **Rounding Method** by which quantities are rounded (Up, Down, or Nearest) and the number of **Decimal Positions** retained after rounding.

Notes and Recommendations

Additional detail on the logic of this rule can be found in the **Detailed Description** of the X1-EVTSETCAL Algorithm Type.

For help with the meaning of specific configuration fields, refer to the embedded help on the screen when adding or editing the rule.

Business Object

X1-EventSettlementCalcRule

Example Scenarios

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Scenario 1: Calculate program settlement for hourly interval values based on hourly market prices

- Sequence: 10
- **Description**: Thermostat Program Settlement (Hourly)
- **Calculation Details**:
  - **UOM**: Kilowatt Hours
  - **TOU**:
  - **SQI**:
  - **Interval Size**: 01:00:00
  - **Line Description**: Thermostat Program Settlement - Hourly
  - **Price Source**: Specific Price
    - **Specific Price**: Market Price - Hourly

End of Season Program Settlement Rule

This rule is used to calculate "Combined kW Drop" program event settlement transactions that represent credits that will be applied to a customer's bill based on participation in an individual event. This rule averages values captured on "kW Drop" program event settlement transactions and multiplies the result by a price. Prices can be defined in the rule configuration or can be derived by an algorithm. The average "kW Drop" value (captured as the **Settlement Quantity** on the "Combined kW Drop" program event settlement transaction) is calculated from the "Max Drop" values from the "kW Drop" program event settlement transactions that fall into the "top" percentage of values defined by the **Demand Drop Percentage (%)** parameter. See About Program Event Settlement Transactions for more information about the distinction between "kW Drop" and "Combined kW Drop" program event settlement transactions.

Note: The base package does not include algorithms for deriving prices for use in program settlement calculations. Implementations must configure their own algorithms if they wish to derive prices.

Calculation Details

The **Calculation Details** section is used to define how the average "kW Drop" value is determined and the price used in the rule's calculations.

- **UOM**: The unit of measure used to define the average value to be created in the program event settlement transaction.
- **TOU**: The time of use period used to define the average value to be created in the program event settlement transaction.
- **SQI**: The service quantity identifier used to define the average value to be created in the program event settlement transaction.
- **Interval Size**: The size of the average value to be created in the program event settlement transaction represented as hours:minutes:seconds (HH:MI:SS).
- **Line Description**: A text string that describes the program event settlement transaction. This can include the following variables:
  - %SQ = Quantity
  - %UP = Unit Price
- **Price Source**: The source of price data used by the rule. Options include:

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  - **Algorithm**: A custom algorithm that derives the price.
  - **Unit Price**: A specific price to be used by the rule
- **Price**: The price that will be multiplied by **Settlement Quantity** on the "Combined kW Drop" program event settlement transaction to determine the "Combined kW Drop" program event settlement transaction's **Settlement Amount**.
- **Demand Drop Percentage**: The top percentage of "kW Drop" program event settlement transactions that will be averaged. The rule uses this value to select the top n% of "Maximum Drop" values from the "kW Drop" program event settlement transactions. For example, if there are 10 "kW Drop" program event settlement transactions and this parameter is set to "70%", the rule would calculate the average for the top 7 values.

SQ Rounding Details

The **SQ Rounding Details** section defines the manner in which service quantities are rounded. These parameters allow configuration of the **Rounding Method** by which quantities are rounded (Up, Down, or Nearest) and the number of **Decimal Positions** retained after rounding.

Notes and Recommendations

Additional detail on the logic of this rule can be found in the **Detailed Description** of the X1_CALAVDPAP Algorithm Type.

For help with the meaning of specific configuration fields, refer to the embedded help on the screen when adding or editing the rule.

Business Object

X1-EventSetCalcRuleDemandBased

Example Scenarios

Scenario 1: Calculate program settlement for demand reductions

- **Sequence**: 10
- **Description**: Demand Program Settlement
- **Calculation Details**:
  - **UOM**: Kilowatts
  - **TOU**:
  - **SQI**:
  - **Interval Size**: 01:00:00
  - **Line Description**: Event Participation Settlement: %SQ - %UP
  - **Price Source**: Unit Price
  - **Unit Price**: $12.00
  - **Demand Drop Percentage (%)**: 70

Incentives and Fee Rule

This rule is used to calculate incentive- and fee-based program event settlement transactions that represent credits or changes that will be applied to a customer's bill based on incentives and/or fees configured for a program to which the customer subscribes.

Variables

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The **Variables** section is used to define one or more variables that will be used in formulas defined in the **Calculation Details** section. The variable's **Variable Type** determines how the variable is populated:

- **Algorithm**: The value is returned by a specified algorithm.
- **Transaction Value**: The value is based on a variable defined in a previous rule and stored in the program transaction's **Calculation Results**.

Variables must be defined in the Incentive and Fees Variables (X1-IncentiveFeeVariablesLookup) extendable lookup. In addition to the pre-defined variables provided, implementations can created their own variables using this extendable lookup.

Note: The base package does not include algorithms for deriving prices for use in incentives and fees calculations. Implementations must configure their own algorithms if they wish to derive prices and/or values from other data.

Calculation Details

The **Calculation Details** section is used to define the formulas used in the rule's calculations. Simple formulas support basic math operations using variables defined in the **Variables** section. Complex formulas allow for more complex operations, comparisons, and conditions upon which certain variables are set to certain values. Refer to the embedded help in this section for details about configuring formulas.

Results

The Results section is used to define result parameters of the incentives and fees calculation rule, including:

- **Variable Name**: The variable that holds the result of the calculation.
- **FCPO**: Checkbox that indicates if the result will be used for calculation purpose only. This is most often used with results that are prices or quantities and that will be Transaction Values passed to other rules. This checkbox should be unchecked for rules that calculates the final incentive or fee amount.
- **Line Description**:A description of the calculated value. It is relevant only to the rule that calculates the incentive or fee amount.
- **Result Container**: indicates if the result is a quantity, price or an amount.

Notes and Recommendations

For help with the meaning of specific configuration fields, refer to the embedded help on the screen when adding or editing the rule.

Business Object

X1-IncentiveCalculationRule

Example Scenario

Below is an example scenario that can be achieved based on configurations of this rule.

In this example, the first rule calculates a Service Charge variable that is used in calculating a Penalty Charge in the second rule.

Rule 1: Calculate Service Charge

- **Sequence**: 10
- **Description**: Calculate Service Charge
- **Variables**:

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Variable Name	Variable Type	Algorithm
Early Termination Fee (ET)	Derive Price Algorithm	Derive Termination Fee (custom)
Penalty Fee (PF)	Derive Quantity Algorithm	Derive Penalty (Custom)

- **Calculation Details**:
  - **Formula Source**: Conditional Formula
  - **Conditional Formula**:

Seq.	Operand 1	Criteria Operator	Operand 2	True Action	True Formula	False Action	False Formula
10	PF	>	ET	Apply True Formula	PF+ET	Apply False Formula	PF-ET

- **Results**:
  - **Variable Name**: Service Charge (SC)
  - **FCPO**: Yes (checked)
  - **Result Container**: Price

Rule 2: Calculate Penalty

- **Sequence**: 20
- **Description**: Calculate Penalty Charge
- **Variables**:

Variable Name	Variable Type	Algorithm
Service Charge (SC)	Transaction Value	

- **Calculation Details**:
  - **Formula Source**: Simple Formula
  - **Simple Formula**: SC
- **Results**:
  - **Variable Name**: Penalty (PN)
  - **FCPO**: No (unchecked)
  - **Line Description**: Penalty
  - **Result Container**: Amount

Baseline Calculation Rule

This rule is used to estimate the electric consumption a customer would have used had they not participated in a program event, which is used to calculate reductions in consumption or demand for use in program event settlement transactions that represent credits or changes that will be applied to a customer's bill based on participation in an individual event. This done by calculating a "Demand Response Customer Baseline" or baseline that represents this estimated consumption. The figure below shows a baseline compared to actual meter data and depicts how they can be compared during an event to calculate the reduction.

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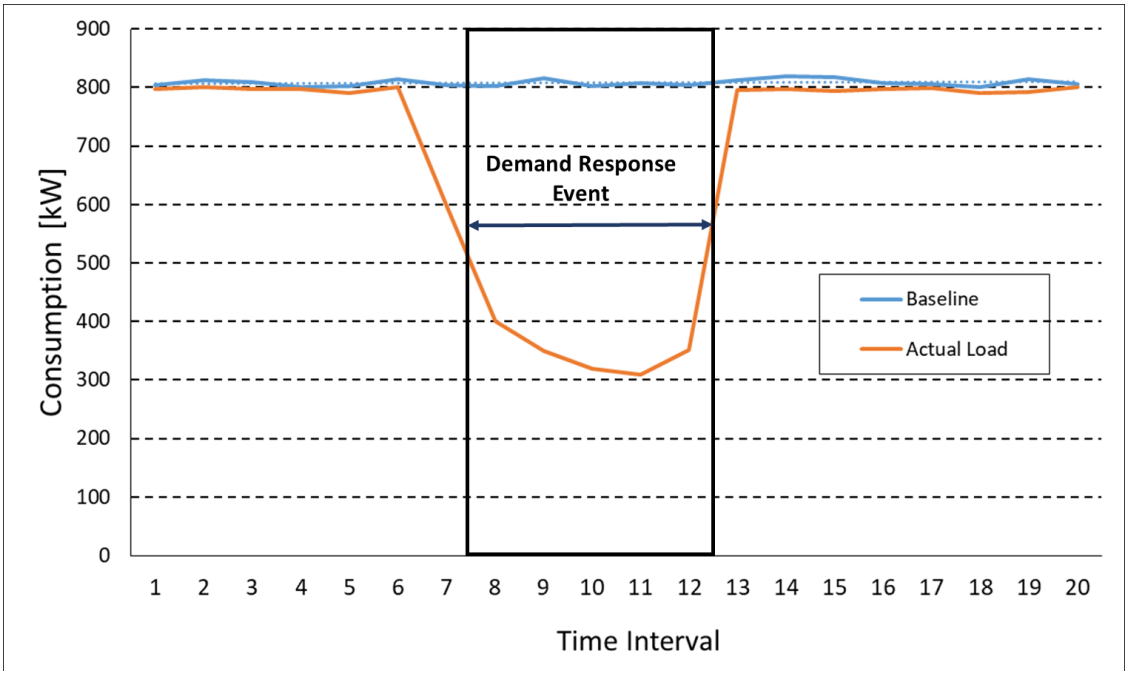

The Baseline Calculation rule uses an "X of Y Calculation Method", a statistical methodology that considers Y eligible days (referred to as "Qualified" or "Qualifying" days) and selects the X days (referred to as "Selected" days) with the load to calculate the baseline on the basis of the most recent meter readings for consumption levels within those days. Qualified and Selected days can be determined based on Load, Temperature, or Net values (Consumed - Generated). The **X Selection Parameter** defines if the rule will use Load or Temperature, and the presence of "Generated" UOM, TOU, and SQI values indicate that the rule should use Net values.

> **Note**
>
> Using "Temperature" as the **X Selection Parameter** requires weather stations be defined for metered service points.

The **Baseline Calculation Details** section is used to define how the baseline consumption is calculated.

- **UOM**: The unit of measure used to define the interval values to be created in the program event settlement transaction.
- **TOU**: The time of use period used to define the interval values to be created in the program event settlement transaction.
- **SQI**: The service quantity identifier used to define the interval values to be created in the program event settlement transaction.
- **UOM Generated**: The unit of measure used to define generated interval values used in the program event settlement transaction calculation. Used to calculate Net consumption (Consumed - Generated).
- **TOU Generated**: The time of use period used to define generated interval values used in the program event settlement transaction calculation. Used to calculate Net consumption (Consumed - Generated).

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- **SQI Generated**: The service quantity identifier used to define generated interval values used in the program event settlement transaction calculation. Used to calculate Net consumption (Consumed - Generated).
- **Work Calendar**: A work calendar used to define weekdays, weekends and holidays. See Defining Work Calendar for more information.
- **Lookback**: The number of days preceding an Event Day (the day on which a Program Event took place) to be evaluated when identifying Qualified days. Examples could include the last 10 non-holiday weekdays, the 10 most recent program-eligible non-event days, the10 most recent program-eligible days beginning 2 days before the event, last 45 calendar days, or the previous year.
- **X of Y Type**: The type of X days to be selected. Valid options include:
  - **High**: Excludes the lowest Y-X values
  - **Low**: Excludes the highest Y-X values
  - **Middle**: Uses the middle values of the Y quantities
- **X Selection Parameter**: The criteria for the selection of (X) Selected days from the (Y) Qualifying Days. Valid options include:
  - **Load**: The baseline is calculated by taking the highest/lowest/middle consumption from the X highest/lowest/middle consumption days from the Y Qualified days
  - **Temperature**: The baseline is calculated by taking the highest/lowest/middle consumption from the X highest/lowest/middle temperature days from the Y Qualified temperature days.
- **UOM Temperature**: The unit of measure used to define the temperature values used in the calculation.
- **TOU Temperature**: The time of use period used define the temperature values used in the calculation.
- **SQI Temperature**: The service quantity identifier used to define the temperature values used in the calculation.
- **Value of X**: The number of Selected Days
- **Value of Y**: The number of Qualified Days
- **Adjustment Type**: The type of adjustment applied to the baseline, used if or when conditions on the day of a Program Event may differ from the conditions over the previous days which were used for the calculation of baseline. Valid options include:
  - **Additive**: Adds or subtracts a numerical value to each hour of the event. This value is calculated by:
    * Averaging the 4 hours prior to the event excluding the hour immediately prior to the event start; and,
    * Define the difference between the average load for these three hours relative to the same 3-hour average of the CBL calculation data set.
    * The difference is then applied to each counterfactual hour of the event and is capped at both a 20% increase and a 20% decrease.

> **Note**
>
> This is modeled after the "PJM CBL Addition Adjustment" approach.

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- **Multiplicative**: Applies a multiple to each hour of the event. The multiplier is calculated by:
  - Averaging the 4 hours prior to the event excluding the hour immediately prior to the event start; and,
  - Define the ratio of the average load for these three hours relative to the same 3-hour average of the CBL calculation data set.
  - The same multiplier is then applied to each counterfactual hour of the event and is capped at both a 20% increase and a 20% decrease.

> **Note**
>
> This is modeled after the "CAISO CBL Multiplication Adjustment" approach.

- **None**: the standard X of Y method selected will be employed, utilizing the X and Y values configured to compute the baseline

- **Adjustment Window Start**: The number of (15-minute) intervals which are selected to calculate the fixed quantity for adjustment of the baseline. Typically, the adjustment window start begins no more than four hours prior to an event's start. Applicable only if the Adjustment Type is "Additive" or "Multiplicative".
- **Adjustment Window End**: The number of (15-minute) intervals which are selected to calculate the fixed quantity for adjustment of the baseline. Typically, the adjustment window end ends no more than an hour prior to the event start .Applicable only if the Adjustment Type is "Additive" or "Multiplicative".
- **Adjustment Cap**: A limit on how much the baseline can be adjusted upwards or downwards during an event, typically expressed as a percentage of the original baseline, used to prevent extreme adjustments and ensure fairness in the measurement of demand reduction. For example, if a customer's normal baseline load is 100kW and the adjustment cap is set at 20%, then the maximum adjusted baseline could only be 120kW (100kW + 20% increase) or 80kW (100kW - 20% decrease), regardless of how much their load deviates during the event. Applicable only if the Adjustment Type is "Additive" or "Multiplicative".
- **Interval Size**: The size of the interval values to be created in the program event settlement transaction represented as hours:minutes:seconds (HH:MI:SS).

Notes and Recommendations

Additional detail on the logic of this rule can be found in the **Detailed Description** of the D2-BASELINEC Algorithm Type.

For help with the meaning of specific configuration fields, refer to the embedded help on the screen when adding or editing the rule.

Business Object

D2-BaselineCalc

Example Scenarios

Scenario 1: Calculate a baseline based on the Highest 3 (X) of 5 (Y) days within 30 days prior to the program event, with no adjustment type

- **Sequence**: 10
- **Description**: Baseline - Highest 3 of 5

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- **Baseline Calculation Details**:
  - **UOM**: Kilowatt Hours
  - **TOU**:
  - **SQI**:
  - **Work Calendar**: US 2025 Work Calendar
  - **Lookback**: 30
  - **X of Y Type**: Highest
  - **X Selection Parameter**: Load
  - **Value of X**: 3
  - **Value of Y**: 5
  - **Adjustment Type**: None
  - **Interval Size**: 01:00:00
- **Results**:
  - **Qualified Baseline Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Qualified
  - **Selected Baseline Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Selected
  - **Skipped Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Skipped
  - **Pre Event Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Pre-Event
  - **Pre Event Baseline Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Pre-Event Selected
  - **Raw Baseline Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Raw

Scenario 2: Calculate a baseline based on the Highest 3 (X) of 5 (Y) days within 30 days prior to the program event using net consumption, with no adjustment type

- **Sequence**: 10
- **Description**: Baseline - Highest 3 of 5
- **Baseline Calculation Details**:
  - **UOM**: Kilowatt Hours - Consumed
  - **TOU**:

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- **SQI**:
- **UOM Generated**: Kilowatt Hours - Generated
- **TOU Generated**:
- **SQI Generated**:
- **Work Calendar**: US 2025 Work Calendar
- **Lookback**: 30
- **X of Y Type**: Highest
- **X Selection Parameter**: Load
- **Value of X**: 3
- **Value of Y**: 5
- **Adjustment Type**: None
- **Interval Size**: 01:00:00

- **Results**:
  - **Qualified Baseline Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Qualified
  - **Selected Baseline Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Selected
  - **Skipped Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Skipped
  - **Pre Event Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Pre-Event
  - **Pre Event Baseline Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Pre-Event Selected
  - **Raw Baseline Measurements**
    - **Unit of Measure**: Kilowatt Hours
    - **Service Quantity Identifier**: Baseline Raw

Vector and Service Quantity Math

This rule is designed to facilitate configuration of complex vector and scalar quantity calculations. It is based on a series of underlying services, including Axis Conversion, Apply Formula (most importantly), and Apply TOU Map. It can be configured to accept as input up to five vectors - where a single vector can represent the combination of all measuring components with linkages to the Usage Subscription with the configured UOM/SQI. It can also

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accept a list of scalar variables that can be taken in as factor values, usage transaction service quantities, set functions on a vector, or numeric values.

Vectors can be combined using a simple formula expression, or using condition formula expressions. Both interval values and interval conditions can be referenced. The result is interval-by-interval processing of the vector formula. The resulting final vector can be stored, TOU mapped, and/or subjected to a final set function (such as sum or max).

This rule stores service quantities of type "other" - meaning that the service quantities created by this rule do not have linkages to a specific Service Point or measuring component, given the potentially diverse sources of the data taken as input by this rule that lead to the final quantity.

> **Note**
>
> Additional detail on the logic of this rule can be found in the Detailed Description of the D2-MATH Algorithm Type.
>
> For help with the meaning of specific configuration fields, refer to the embedded help on the screen when adding or editing the rule.

Business Object

D2-Math

Execute Usage Calculation Group

This rule performs a call to execute a separate usage calculation group which includes execution of all usage calculation rules within that group. It is especially useful in cases where repeating the same rule over and over would be hard to maintain.

For example, you could configure a group that contains a Baseline Calculation rule and a Vector and Service Quantity Math rule to calculate reductions in consumption or demand, which can then be passed to an End of Event Program Settlement Rule or End of Season Program Settlement rule.

> **Note**
>
> Additional detail on the logic of this rule can be found in the Detailed Description of the D1-AUSGR-RFG Algorithm Type.
>
> For help with the meaning of specific configuration fields, refer to the embedded help on the screen when adding or editing the rule.

Business Object

D1-UsageRuleReferredUsageGroup

Defining Usage Transaction Exception Types

You ue the **Usage Transaction Exception Type** portal to display and maintain usage transaction exception types .

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Refer to Understanding Usage Transaction Exception Types for more information.

You can access the portal by selecting **Admin**, then **Customer Program Management**, then **Usage Transaction Exception Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Usage Transaction Exception Type List**: displays all of the Usage Transaction Exception Types so you can choose the one you want to display in more detail
- **Usage Transaction Exception Type**: shows the specific configuration for the selected Usage Transaction Exception Type

Defining Interval Price Set Types

You use the **Interval Price Set Type** portal to display and maintain interval price set types.

Refer to **Understanding Interval Price Set Types** for more information./

You can access the portal by selecting **Admin**, select **Interval Price Set**, then select **Interval Price Set Type**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Interval Price Set Type**: This zone displays basic information about interval price set type.

Defining Customer Questions

You use the **Question** portal to display and maintain customer questions.

Refer to Understanding Customer Questions for more information.

You can access the portal by selecting **Admin**, **General**, **Customer Question**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Question**: This zone displays the selected question.

Defining Service Areas

You use the **Service Area** portal to display and maintain service areas.

Refer to Understanding Service Areas for more information.

You can access the portal by selecting **Admin**, **Customer Program Management**, **Service Area**.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Area List**: This zone lists all service areas defined in the system. Broadcast a record to display the details of the selected record.
- **Service Area**: This zone displays the selected service area.

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Defining Service Classes

You use the **Service Class** portal to display and maintain service areas.

Refer to Understanding Service Classes for more information.

You can access the portal by selecting **Admin**, **Customer Program Management**, **Service Class**.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Class List**: This zone lists all service classes defined in the system. Broadcast a record to display the details of the selected record.
- **Service Class**: This zone displays the selected service class.

Defining Service Codes

You use the **Service Code - CCB** portal to display and maintain service areas.

Refer to Understanding Service Codes for more information.

To access the portal select **Admin**, select **Field Work**, then select **Service Code - CCB**.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Code List**: This zone lists all service codes defined in the system. Broadcast a record to display the details of the selected record.
- **Service Code**: This zone displays the selected service code.

Defining Service Types

You use the **Service Type** portal to display and maintain service types.

Refer to Understanding Service Types for more information.

You can access the portal by selecting **Admin**, **Customer Program Management**, **Service Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Type List**: This zone lists all service types defined in the system. Broadcast a record to display the details of the selected record.
- **Service Type**: This zone displays the selected service type.

Defining Units of Measure

You use the **Unit of Measure** portal is used to display and maintain units of measure.

Refer to **Understanding Units of Measure** for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Unit Of Measure**.

The following zones may appear as part of the portal's **Main** tab page:

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- **Unit of Measure List:** This zone lists all units of measure. Broadcast a record to display the details of the selected record.
- **Unit of Measure:** This zone provides information about the selected unit of measure.

Defining Time of Use Periods

You use the **Time of Use** portal is used to display and maintain time of Use periods.

Refer to **Understanding Time of Use Periods** for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Time Of Use**.

The following zones may appear as part of the portal's **Main** tab page:

- **Time Of Use List:** This zone lists all time of use periods records. Broadcast a record to display the details of the selected record.
- **Time Of Use:** This zone provides information about the selected time of use period.

Defining Service Quantity Identifiers

You use the **Service Quantity Identifier** portal is used to display and maintain service quantity identifiers.

Refer to **Understanding Service Quantity Identifiers** for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Service Quantity Identifier**.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Quantity Identifier List:** This zone lists all service quantity identifiers. Broadcast a record to display the details of the selected record.
- **Service Quantity Identifier:** This zone provides information about the selected service quantity identifier.

Defining Divisions

You use the **Division** portal to display and maintain divisions.

Refer to Understanding Divisions for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **Division**.

The following zones may appear as part of the portal's **Main** tab page:

- **Division List**: This zone lists all divisions defined in the system. Broadcast a record to display the details of the selected record.
- **Division**: This zone displays the selected division.

Defining Entity Groups

You use the **Entity Group** portal to display and maintain entity groups.

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Refer to Understanding Entity Groups for more information.

You can access the portal by selecting **Admin**, select **General**, then select **Entity Group**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **Entity Group**: This zone displays basic information about entity group.
- **Eligible Devices for this Group**: This zone shows a list of devices that are eligible for assignment to this entity group. The list is based on the **Template SQL** on the **Group Category** with the **Criteria Values** applied. To assign one or more devices to the group, select the devices and click **Assign**. Applicable only for "Device" entity groups.
- **Devices in this Group**: This zone shows a list of devices that have been assigned to this entity group. To delete the relationship between the device and the entity group, select the device and click **Delete**. To expire the relationship between the device and the entity group, select the device and click **Expire**. Applicable only for "Device" entity groups.
- **Eligible Service Points for this Group**: This zone shows a list of service points that are eligible for assignment to this entity group. The list is built from the **Template SQL** on the **Group Category** with the **Criteria Values** applied. To assign one or more service points to the group, select the service points and click **Assign**. Applicable only for "Service Point" entity groups.
- **Service Points in this Group**: This zone shows a list of service points that have been assigned to this entity group. To delete the relationship between the service point and the entity group, select the device and click **Delete**. To expire the relationship between the service point and the entity group, select the device and click **Expire**. Applicable only for "Service Point" entity groups.
- **Customer Address Search for Grouping**: This zone lists service points that are eligible for assignment to this entity group (and provides search parameters to filter the results). To assign one or more service points to the group, select the service points from the search results and click **Assign**. Applicable only for entity groups with a **Group Category** of "SP Measurement Extract".
- **Service Points**: This zone shows a list of service points that have been assigned to this SP Measurement Extract entity group. To unassign a service point from the entity group, select the device and click **Unassign**. To expire the relationship between the service point and the entity group, select the device and click **Expire**. To create an extract request for the group, click **Add**. Applicable only for entity groups with a **Group Category** of "SP Measurement Extract".

The following zones may appear as part of the portal's **Requests** tab page:

- **Requests**: This zone lists the requests made for the entity group, such as requests for measurement consumption extract. To a request for the entity group, click **Add** in the zone title bar.

Batch Processing

The Device Group Evaluation (D1-DGEV) and Service Point Group Evaluation (D1-SPGEV) batch controls are used to identify devices or service points (respectively) that are eligible for a particular group and assigns them to a specified group, or expires relationships between devices or service points (respectively) and a specified group.

Devices or service points that are not currently assigned to an entity group for a specified category will be assigned to an eligible group. Only one group for the category may be assigned. If the device or service point is currently assigned a group for that category, it will be evaluated for eligibility, and if the current group is no longer eligible, the group is expired. If the

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same device becomes eligible for another group, that group is assigned to the device or service point.

Parameters:

- **Group Code Category**: A group category used to identify eligible entities. Required if the **Mode** is "Evaluate Group Code Category"
- **Group Code**: A group used to identify eligible entities, Required if the **Mode** is "Expire Device Group Code", "Expire Service Point Group Code" or "Evaluate Group Code", and is optional if the **Mode** is "Evaluate Group Code Category".
- **Mode** (Required): The mode by which the process evaluates entities. Options include:
  - **Expire Device Group Code (D1ED)**: Used to expire device entity group relationships for the specified Group Code
  - **Expire Service Point Group Code (D1ES)**: Used to expire service point entity group relationships for the specified Group Code
  - **Evaluate Group Code (D1EG)**: Used to search entities based on Group Code, and assigns eligible devices or service points to the specified Group Code
  - **Evaluate Group Code Category (D1GC)**: Used to search entities based on Group Code Category (and optionally a Group Code). This mode assigns devices or service points eligible for a group of the specified category (and Group Code if provided), and expires relationships between devices or service points and groups of the specified category (and Group Code is provided).

Note that these batch controls are used with groups whose Group Assignment Option is either "System" or "System or User".

Defining Weather Stations

You use the **Weather Station** portal to display and maintain weather stations.

Refer to Understanding Weather Stations for more information.

You can access the portal by selecting **Admin**, select **Geographic**, then select **Weather Station**.

The following zones may appear as part of the portal's **Main** tab page:

- **Weather Station List**: This zone lists all weather stations defined in the system. Broadcast a record to display the details of the selected record.
- **Weather Station**: This zone displays the selected weather station.
- **Weather Station Characteristics**: This zone displays characteristics for the selected weather station.

Importing Weather Stations

Weather stations can be imported along with other facility and network location data such as transformers, feeders, and substations. Refer to Importing Facility and Network Location Data from a Distributed Energy Resource System for more information.

Creating Weather Meters

Weather meters, including device configurations and measuring components, are created automatically when a weather station is created, based on the Device Type selected when creating the weather station.

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This process requires the following data be set up prior to creating weather stations.

Measuring Component Type(s)

One or more measuring components used to capture weather data. Each should be defined as follows:

- **Business Object**: Interval Channel Type - Physical (D1-IntervalChannelTypePhysical)
- **Measuring Component Business Object**: Interval Channel (D1-IntervalChannel)
- **Measurement Business Object**: Measurement (D1-Measurement)
- **Service Type**: The service type associated with how weather data stored by measuring components of this type will be used (typically "Electric").
- **Interval /Scalar**: Interval
- **Consumptive/Subtractive**: Consumptive
- **Interval Size**: The size of the intervals for weather data values stored by measuring components of this type, represented as hours:minutes:seconds (HH:MI:SS)
- **Value Identifiers**: One or more value identifiers for the weather data captured by measuring components of this type (Degrees F, Degrees C, and so on).

Device Configuration Type

A device configuration type that defines the types of measuring components to be created for the weather meter. This should be defined as follows:

- **Business Object**: Device Configuration Type (D1-DeviceConfigurationType)
- **Device Configuration Business Object**: Device Configuration (D1-DeviceConfiguration)
- **Service Type**: The service type associated with how weather data stored by devices of this device configuration type will be used (typically "Electric") This must match the service type defined for the measuring component type.
- **Valid Measuring Component Types**: One or more measuring components (defined above) used to capture weather data. Each should be marked as "Required".

Device Type

A device type that defines the type of weather meter to be created. This should be defined as follows:

- **Business Object**: Weather Meter Type (D1-WeatherMeterType)
- **Device Business Object**: Weather Meter (D1-WeatherMeter)
- **Service Type**: The service type associated with how weather data stored by devices of this type will be used (typically "Electric"). This must match the service type defined for the device configuration type and measuring component type.
- **Valid Device Configuration Types**: A device configuration type that defines the measuring component types to be created for the weather meter.
- **Characteristics**: Characteristics that define the type of data stored by the device (such as temperature)

Batch Processing

The Map Service Points to corresponding Weather Stations (D1-MAPWS) batch process can be used to map service points (including metered service points) to weather stations when and as needed.

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The Initial Data Export D1-WTHRSTN (D1WSTNX) batch process can be used to export weather station data when and as needed.

Use the **Batch Control** portal to view the parameters used by these batch processes.

Importing Weather Data

Weather data can be imported into the system using the Adapter Development Kit (ADK) in the same manner as used for measurement data. When importing weather data, the weather station ID should be used as the Device ID (the Serial Number on Weather Meters is based on the Weather Station ID). In addition, this requires that appropriate Unit of Measure (UOM), Time of Use (TOU), and Service Quantity Identifiers (SQI) values are defined to represent the weather data used in your implementation, and corresponding UOM translation mapping values are defined in the ADK - UOM Code to Standard UOM Mapping (DG-HeadendUOMLookup) extendable lookup.

See About Measurements and Measurement Processing in the *Business User Guide*, and Configuring Payload Processing for more information.

Defining Postal Code Defaults

You use the Postal Code Default portal to display and maintain postal code defaults.

Refer to Understanding Postal Code Defaults for more information.

You can access the portal by selecting **Admin**, select **Geographic**, then select **Postal Code Default - MDM**.

The following zones may appear as part of the portal's **Main** tab page:

- **Postal Code Default List**: This zone lists all postal code defaults defined in the system. Broadcast a record to display the details of the selected record.
- **Postal Code Default**: This zone displays the selected postal code default.
- **Postal Code Default Characteristics**: This zone displays characteristics for the selected postal code default.

Batch Processing

The Data Export D1_POSTAL_DFLT (D1POSTTX) batch process can be used to export postal code default data when and as needed. Use the **Batch Control** portal to view the parameters used by this batch process.

Defining Bill Cycles

You use the **Bill Cycle** portal to display and maintain bill cycles.

Refer to Understanding Bill Cycles for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then **Bill Cycle**.

The following zones may appear as part of the portal's **Main** tab page:

- **Bill Cycle List**: displays all of the Bill Cycles so you can choose the one you want to display in more detail.
- **Bill Cycle**: shows the specific configuration for the selected Bill Cycle.

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- **Bill Cycle List**: lists the bill cycle schedules of the current bill cycle. Click **Add** to create bill cycle schedules for the bill cycle. Click the **Edit** icon to edit a schedule, click the **Duplicate** icon to duplicate a schedule, or click the **Delete** icon to delete a schedule.

Configuring Device and Measurement Processing Options

Use the information in this section when defining device and measurement options used with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

- Configuring Device Types
- Configuring Device Configuration Types
- Configuring Measuring Component Types
- Configuring Device Event Types
- Configuring IMD Types
- Configuring VEE Groups
- Configuring Direct Measurement Processing
- Configuring Payload Processing

Configuring Device Types

This portal is used to display and maintain a Device Type.

Refer to Understanding Device Types for more information.

You can access the portal by selecting **Admin**, then **Device**, then **Device Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Device Type List:** This zone lists all Device Type records. Broadcast a record to display the details of the selected record.
- **Device Type:** This zone provides information about the selected Device Type.
- **Device Type Service Quantity:** This zone displays the list of effective dated service quantities supported by the selected Device Type. This applies only to Items.
- **Device Type Characteristics**: This zone lists characteristics common to all devices of this type.
- **Valid Device Characteristic Types**: This zone lists the valid characteristic types that may be instantiated on devices of the device type. To add or edit valid characteristic types, click **Edit**.

Configuring Device Configuration Types

This portal is used to display and maintain a Device Configuration Type.

Refer to Understanding Device Configuration Types for more information.

You can access the portal by selecting **Admin**, then **Device**, then **Device Configuration Type**.

The following zones may appear as part of the portal's **Main** tab page:

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- **Device Configuration Type List:** This zone lists all Device Configuration Type records. Broadcast a record to display the details of the selected record.
- **Device Configuration Type:** This zone provides information about the selected Device Configuration Type.

Configuring Measuring Component Types

This portal is used to display and maintain a Measuring Component.

Refer to Understanding Measuring Component Types for more information.

You can access the portal by selecting **Admin**, then **Device**, then **Measuring Component**.

The following zones may appear as part of the portal's **Main** tab page:

- **Measuring Component Type:** This zone provides information about the selected Measuring Component Type.

Configuring Device Event Types

This portal is used to display and maintain a Device Event Type.

Refer to Understanding Device Event Types for more information.

You can access the portal by selecting **Admin**, then **Communication**, then **Device Event Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Device Event Type List:** This zone lists all Device Event Type records. Broadcast a record to display the details of the selected record.
- **Device Event Type:** This zone provides information about the selected Device Event Type.

Configuring IMD Types

You use the **IMD Type** portal to display and maintain IMD types.

Refer to Understanding IMD Types for more information.

You can access the portal by selecting **Admin**, then **Device**, then **IMD Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **IMD Type List**: This zone lists all division records. Broadcast a record to display the details of the selected record.
- **IMD Type**: This zone provides information about the selected division.

Configuring VEE Groups

This portal is used to display and maintain a VEE Group.

Refer to Understanding VEE Groups for more information.

You can access the portal by selecting **Admin**, then **VEE**, then **VEE Group**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

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The following zones may appear as part of the portal's **Main** tab page:

- **VEE Group**: Defines basic information about VEE group
- **VEE Rules List**: lists the VEE Rules belonging to the group
- **Referencing VEE Rules List**: lists the VEE Rules that reference the group
- **Referencing VEE Group Factors List**: lists the VEE group factors that reference the group
- **Referencing Measuring Component Type List**: lists the measuring component types that reference the group
- **Referencing Measuring Component List**: lists the measuring components that reference the group

> **Note**
>
> VEE rules are not used with Oracle Utilities Customer Program Management Cloud Service and Customer Program Management, but at least one VEE Group must be created as it is required when configuring measuring components and measuring component types (a single "empty" VEE group (a VEE group with no VEE rules).

Configuring Direct Measurement Processing

Direct Measurement Processing is a method of processing incoming initial measurement data designed to reduce the volume of initial measurement records in the database. Rather than create and update initial measurement data records, Direct Measurement Processing creates temporary staging records (in the IMD Control Staging (D1_IMD_CTRL_STAGE) table) and processes initial measurement data in memory and creates final measurements in the Measurement (D1_MSRMT) table. With Direct Measurement Processing, records in the Initial Measurement Data (D1_INIT_MSRMT_DATA) table are created only if an error is encountered during processing (including VEE processing). See Direct Measurement Processing in the *Business User Guide* for more information about Direct Measurement Processing.

Configuring the system for Direct Measurement Processing involves the following:

IMD Types

IMD Types are configuration records used to define how initial measurements are processed using Direct Measurement Processing. IMD Types are defined for specific measuring component types in the the "Initial Measurement Creation" processing method (“How to Create MC Related Information”) for each head end system. See Understanding IMD Types for more information about IMD Types.

Configure Extendable Lookups

Extendable lookups are used with Direct Measurement Processing for payload processing as well as with Measuring Component Filtering.

Payload Processing

To configure Payload Processing for use with Direct Measurement Processing, enable the **Use IMD Type** option on your SGG Payload Processing Configuration extendable lookup values. See Creating SGG Payload Processing Extendable Lookup Values for more information.

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Configure Head End System Processing Methods

To configure head end systems for use with Direct Measurement Processing, update the "Initial Measurement Creation" processing method (“How to Create MC Related Information”) to specify the IMD Types to use for your measuring component types for each head end system. See Creating Head End Systems for more information.

If your implementation uses "pass through" external measuring components, the appropriate (interval or scalar) pass through IMD type should be specified for each "pass through" external measuring component type.

Batch Processing

Batch processing is used with Direct Measurement Processing for payload processing, Measuring Component Filtering, and Measuring Component Ordering.

Payload Processing

Direct Measurement Processing receives initial measurement payloads via Payload Processing batch processes based on the following templates:

- Payload Processing Monitor Template (D1-PLPRM)
- Payload Processing Monitor Template with Export (D1-PLPSO)

See Creating Payload Processing Batch Controls for more information.

Configuring Payload Processing

Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management use the Oracle Utilities Smart Grid Gateway Adapter Development Kit to process measurement data received from a customer information system such as Oracle Utilities Customer Cloud Service or Customer to Meter. This process involves the following stages:

1. Finalized measurement data is exported from the customer information system in the Adapter Development Kit Native Format.
2. Files containing exported measurement data are uploaded to a file system location or Oracle Cloud Object Storage bucket (defined in a File Storage Extendable Lookup).
3. Payload Processing batch processes process the data based on the configuration of a SGG Payload Processing Extendable Lookup using Direct Measurement Processing to create Final Measurements.

The topics in this section provide details related to configuration of payload processing Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Digital Asset Management.

> **Note**
>
> In this section, references to "SGG Adapters" refer to the Adapter Development Kit.

- Creating Key Rings and Pairs
- Creating Object Storage Locations
- Creating File Storage Extendable Lookup Values

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- Creating Head End Systems
- Creating SGG Payload Processing Extendable Lookup Values
- Creating Payload Processing Batch Controls
- Measurement Payload File Format and Examples

Creating Key Rings and Pairs

> **Note**
>
> Key Rings and Pairs are used with cloud services **only**.

When using Smart Grid Gateway adapters with cloud services, connection between the Oracle Utilities cloud service and Oracle Object Storage requires an API signature key. See **API Key Management** in the *Oracle Utilities Cloud Services Object Storage Setup Guide* for more information.

API key rings and key pairs are maintained in the **Key Ring** portal. This portal contains the following zones:

- **Key Ring**: Displays basic information about the key ring
- **Key Pairs**: Displays a list of key pairs for the current key ring

Key rings are defined by the following:

- **Key Ring**: A unique code for the key ring
- **Key Ring Class**: Signature (default)
- **Status**: The current status of the key ring. Note: Key pairs can only be generated for Active key rings. Once a key ring has been deactivated, you can no longer create key pairs for that ring.
- **Description**: A name for the key ring (this will be referenced in the File Location extendable lookup)

Once the key ring is created, you need to generate and activate the key pair. Click **Generate Key** to generate a key pair for the key ring.

Key Pairs are defined by the following:

- **Sequence**: The sequence of the key pair (the order in which the key pair was created)
- **Creation Date/Time**: The date/time when the key pair was created
- **Key Status**: The current status of the key pair. Key pairs are inactive when first created.
- **Public Key**: Click **View** to open a dialog box containing the public key.
- **Action**: Click **Activate** to activate an inactive key pair.

Once the key ring and key pair have been created, the key should be pasted into the **User API Key** in **Oracle Identification and Access Management** (IAM) See the **User API Keys** section in the **Security and Access Management** section of the **Managing Object Storage** chapter in the *Oracle Cloud Infrastructure Services* documentation. To copy the public key click **View** in the **Actions** column in the **Key Pairs** zone, and select and copy the text in the **View Public Key** dialog box.

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The last step is to activate the key. Click **Activate** in the **Actions** column in the **Key Pairs** zone. A dialog box opens displaying the following message: “Warning(s): Activating a key assumes that you have already registered the public key with the appropriate third parties. Press Cancel to abort.” Note: Be sure to copy the public key to **Oracle Identification and Access Management** before activating it. Click **OK** to activate the key. The **Key Status** column will change to “Active”.

Creating Object Storage Locations

> **Note**
>
> Object Storage Locations are used with cloud services **only**.

When using Smart Grid Gateway adapters with cloud services, you need to create one or more buckets in Oracle Object Storage where payload files will be sent for processing. Refer to the *Oracle Utilities Cloud Services Object Storage Setup Guide* and the *Oracle Cloud Infrastructure* documentation for more information about creating buckets in Oracle Object Storage.

After creating the buckets in Oracle Object Storage, make a note of the following, as this information is needed in later configuration steps:

- Namespace
- User Oracle Cloud ID (User OCID)
- Tenancy Oracle Cloud ID (Tenancy OCID)
- Compartment Oracle Cloud ID (Compartment OCID)

Suggested Buckets for Payload Processing

This section outlined suggested sets of Object Storage buckets for each of the Smart Grid Gateway adapters.

General Guidelines

As a general rule, each adapter should have separate buckets for each of the following:

- Usage payloads
- Usage archive
- Usage errors
- Device Event payloads
- Device Event archive
- Device Event errors

If an adapter uses payloads in more than one format (such as in CSV and XML formats), you should also consider creating separate buckets for each file format type.

> **Note**
>
> If possible, archive buckets should be created in an “Archive” storage tier.

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Adapter Development Kit

The table below lists suggested Object Storage buckets for the Adapter Development Kit:

Bucket Name	Storage Tier	Smart Grid Gateway Description
adk-csv	Standard	SGG ADK Adapter - CSV input
adk-csv-arch	Archive	SGG ADK Adapter - CSV archive
adk-csv-error	Standard	SGG ADK Adapter - CSV errors
adk-seeder	Standard	SGG ADK Adapter - IMD Seeder input
adk-seeder-arch	Archive	SGG ADK Adapter - IMD Seeder archive
adk-seeder-error	Standard	SGG ADK Adapter - IMD Seeder errors
adk-xml	Standard	SGG ADK Adapter - XML input
adk-xml-arch	Archive	SGG ADK Adapter - XML archive
adk-xml-error	Standard	SGG ADK Adapter - XML errors

> **Note**
>
> The sections below do **not** apply to Oracle Utilities Customer Program Management Cloud Service or Digital Asset Management.

Adapter for Itron OpenWay

The table below lists suggested Object Storage buckets for the Adapter for Itron OpenWay:

Bucket Name	Storage Tier	Smart Grid Gateway Description
itronexception	Standard	SGG Itron OW Adapter - event input
itronexception-arch	Archive	SGG Itron OW Adapter - event archive
itronexception-error	Standard	SGG Itron OW Adapter - event errors
itronxml	Standard	SGG Itron OW Adapter - XML input
itronxml-arch	Archive	SGG Itron OW Adapter - XML archive
itronxml-error	Standard	SGG Itron OW Adapter - XML errors

MV90 Adapter for Itron

The table below lists suggested Object Storage buckets for the MV90 Adapter for Itron

Bucket Name	Storage Tier	Smart Grid Gateway Description
mv90-usage	Standard	SGG MV90 Adapter - usage input
mv90-usage-arch	Archive	SGG MV90 Adapter - usage archive
mv90-usage-error	Standard	SGG MV90 Adapter - usage errors

Adapter for Landis+Gyr

The table below lists suggested Object Storage buckets for the Adapter for Landis+Gyr:

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Bucket Name	Storage Tier	Smart Grid Gateway Description
lg-cim-event	Standard	SGG Landis+Gyr Adapter - CIM input
lg-cim-event-arch	Archive	SGG Landis+Gyr Adapter - CIM archive
lg-cim-event-error	Standard	SGG Landis+Gyr Adapter - CIM errors
lg-event	Standard	SGG Landis+Gyr Adapter - event input
lg-event-arch	Archive	SGG Landis+Gyr Adapter - events archive
lg-event-error	Standard	SGG Landis+Gyr Adapter - event errors
lg-usage	Standard	SGG Landis+Gyr Adapter - usage input
lg-usage-arch	Archive	SGG Landis+Gyr Adapter - usage archive
lg-usage-error	Standard	SGG Landis+Gyr Adapter - usage errors

Adapter for Sensus

The table below lists suggested Object Storage buckets for the Adapter for Sensus:

Bucket Name	Storage Tier	Smart Grid Gateway Description
sensus-event	Standard	SGG Sensus Adapter - event input
sensus-event-arch	Archive	SGG Sensus Adapter - events archive
sensus-event-error	Standard	SGG Sensus Adapter - event errors
sensus-usage	Standard	SGG Sensus Adapter - usage input
sensus-usage-arch	Archive	SGG Sensus Adapter - usage archive
sensus-usage-error	Standard	SGG Sensus Adapter - usage errors

Adapter for Silver Spring Networks

The table below lists suggested Object Storage buckets for the Adapter for Silver Spring Networks:

Bucket Name	Storage Tier	Smart Grid Gateway Description
ssn-csv	Standard	SGG SSN Adapter - CSV input
ssn-csv-arch	Archive	SGG SSN Adapter - CSV archive
ssn-csv-error	Standard	SGG SSN Adapter - CSV errors
ssn-ssnxml	Standard	SGG SSN Adapter - XML input
ssn-ssnxml-arch	Archive	SGG SSN Adapter - XML archive
ssn-ssnxml-error	Standard	SGG SSN Adapter - XML errors

Creating File Storage Extendable Lookup Values

Payload processing requires defining details of file storage locations. These are file system or Object Storage locations where payload files are posted for processing. File storage configuration information is captured as values for the File Storage Configuration (F1-FileStorage) extendable lookup. These records will be referenced by the batch controls that will process the payloads.

Values for this extendable lookup are defined by the following:

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- **Value**: A unique code for the extendable lookup value. This value will be referenced as a batch control parameter value.
- **Description**: A description of the extendable lookup value
- **Status**: The current status of the value. Select “Active”.
- **File Storage Details**: This section defines details for the file storage location, including:
  - **File Adapter**: The type of file adapter for the location. Options include:
    * Native File Storage: Used for on-premises implementations. Additional details for this type of adapter include:
      * **File Path**: A valid file path to the file location on the file system where payload files will be found
    * Oracle Cloud Object Storage: Used with Oracle Utilities cloud services. Additional details for this type of adapter include:
      * **User**: The user Oracle Cloud ID (ODIC) for the object storage location
      * **Tenancy**: The tenancy Oracle Cloud ID (ODIC) for the object storage location
      * **Compartment**: The compartment Oracle Cloud ID (ODIC) for the object storage location
      * **Namespace**: The namespace for the object storage location
      * **Key Ring**: The Key Ring you created earlier
      * **Region**: The region of the object storage tenancy for the connection (Values for this field are defined in the F1_REGION_FLG lookup.
      * **Bucket Name Prefix**: Prefix used by Object Storage Bucket configuration

Refer to **External File Storage** in the *Oracle Utilities Application Framework Administrative User Guide* and the *Oracle Utilities Cloud Services Object Storage Setup Guide* for more information about using Oracle Object Storage with cloud service implementations.

Creating Head End Systems

The next step is to create a record for the head end system. This record defines processing methods for the head end system.

> **Note**
>
> Payload processing head end systems used with Oracle Utilities Customer Program Management Cloud Service and Customer Program Management are the customer information systems from which measurement data will be received. For example, if your implementation is receiving measurement data from Oracle Utilities Customer to Meter, you would create a "Customer to Meter" head end system.

Processing Methods for Payload Processing

The following processing methods should be configured to support payload processing:

- **Initial Measurement Creation**: defines the business object(s) and other data used to create initial measurements. When using Legacy Measurement Processing, the IMD Seeder business object uses this processing method to determine which type of initial measurement business object to instantiate when receiving usage from a head end

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system. When using Direct Measurement Processing, specify an IMD Type(s). See Direct Measurement Processing in the *Business User Guide* for more information.

If usage payload include time of use periods or service quantity identifiers, you should also configure **SQI Translation** and **TOU Translation** processing methods.

See Understanding Head End Systems and Understanding Processing Methods in the *Administrative User Guide* for more information about creating and configuring a head end system and its processing methods.

Creating SGG Payload Processing Extendable Lookup Values

You also have to create an extendable lookup value to define how usage and event payloads will be processed.

Payload processing configuration information is captured in the SGG Payload Processing Configuration (D1-SGGPayloadProcess) extendable lookup.

Values for this extendable lookup are defined by the following:

- **Value**: A unique code for the extendable lookup value. This value will be referenced as a batch control parameter value.
- **Description**: A description of the lookup value
- **Status**: The current status of the value. Set this to “Active”.
- **Processing Details**: This section defines details for payload processing, including
  - **Payload Handler Class Name**: The Java class name for the processing handler to be used. See Payload Handler Classes and Parameters below for more information.
  - **Head-End System**: The head end system for which the configuration will apply. Select from the drop-down list.
  - **Populate Raw**: A checkbox that indicates if the payload data is populated as raw data.
  - **Payload Processing Result Type**: The type of payload to which the configuration applies. Options include:
    * Device Events
    * Initial Measurements
    * Initial Measurements and Device Events
  - **Use IMD Type**: A checkbox that indicates if payload processing should use Direct Measurement Processing and IMD Types. If checked, the **IMD Seeder BO (Interval)** and **IMD Seeder BO (Scalar)** fields are hidden. See Direct Measurement Processing in the *Business User Guide* for more information. This checkbox is enabled by default.
  - **Passthrough Date/Time Format**: The date/time format for passthrough measurements. Valid values are "OUAF" and "XSD". When XSD is selected the data will be exported in UTC. Used when using Measurement Data Filtering with Direct Measurement Processing. See Direct Measurement Processing in the *Business User Guide* for more information.
  - **Use IMD Type**: A checkbox that indicates if payload processing should use Direct Measurement Processing and IMD Types. If checked, the **IMD Seeder BO (Interval)** and **IMD Seeder BO (Scalar)** fields are hidden. See Direct Measurement Processing in the *Business User Guide* for more information..
  - **IMD Seeder BO (Interval)**: The seeder business object used to create interval initial measurements. The base package includes the “IMD Seeder” (D1-IMDSeeder)

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business object for this. Applicable only if the Payload Processing Result Type is “Initial Measurements” or “Initial Measurements and Device Events”.

- **IMD Seeder BO (Scalar)**: The seeder business object used to create scalar initial measurements. The base package includes the “IMD Seeder” (D1-IMDSeeder) business object for this. Applicable only if the Payload Processing Result Type is “Initial Measurements” or “Initial Measurements and Device Events”.
- **Device Event Seeder BO**: The seeder business object used to create device events. The base package includes the “Device Event Seeder” (D1-DeviceEventSeeder) business object for this. Applicable only if the Payload Processing Result Type is “Device Events” or “Initial Measurements and Device Events”.
- **Filter IMD**: A checkbox that indicates if initial measurements should be filtered based on unit of measure. Applicable only if the Payload Processing Result Type is “Initial Measurements” or “Initial Measurements and Device Events”. See Filtering Payloads by Unit of Measure or Device Event Mapping for more information. Note that filtering by unit of measure can be used in parallel with Measuring Component Filtering.
- **Filter Device Events**: A checkbox that indicates if device events should be filtered. Applicable only if the Payload Processing Result Type is “Device Events” or “Initial Measurements and Device Events”. See **Filtering Payloads** below for more information.

- **Dynamic Parameters**: A list of parameter names and values that support additional processing rules, based on the specified Payload Handler Class. See Payload Handler Classes and Parameters below for specific parameters supported by each adapter.
- Payload Handler Classes and Parameters

Payload Handler Classes and Parameters

This section provides valid Payload Handler Class Names and associated dynamic parameters for supported head end systems and payload types.

Adapter Development Kit

As delivered, the Adapter Development Kit supports payload processing of usage and event data exported from an AMI head end system in the “native” initial measurement and device event data formats (the format of the initial measurement and device event seeder business objects). See The Adapter Development Kit Native Format for more information.

Payload Type: ADK CSV

- **Payload Handler Class**: com.splwg.d1.domain.sgg.dg.processing.CSVPayloadHandler

Payload Type: ADK XML

- **Payload Handler Class**: com.splwg.d1.domain.sgg.dg.processing.XMLPayloadHandler

Payload Type: ADK Seeder

- **Payload Handler Class**: com.splwg.d1.domain.sgg.dg.processing.SeederPayloadHandler

Processing Custom and Non-Standard Formats

The Adapter Development Kit can be configured to support payload processing of data from AMI head end systems in custom and non-standard formats. Processing payloads of this type requires a specific **Payload Handler Class** (see below), and creation of Groovy Library Scripts to parse and transform data into the “native” format. See **Adapter Development Kit Custom Payload Processing** and **Payload Processing User Exit Interceptor Scripts** for more information.

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- **Payload Handler Class**:
  com.splwg.d1.domain.sgg.dg.processing.PayloadHandlerViaUserExits

The Adapter Development Kit also supports payload processing of data in the Common Information Model (CIM) format. See Adapter Development Kit Common Information Model (CIM) Payload Processing for more information.

Common Parameters

The following parameters can be used by all of the supported head end system adapters.

Dynamic Parameter Name	Description and Valid Values
suppressPayloadStatistics	Optional parameter. Determines if the PayloadStatistics business object will not be created while processing payload. If this set to false or not provided, then the default existing behavior when a PayloadStatistics business object is created at the start of the payload processing. Valid values are 'true' and 'false' (default).
suppressPayloadError	Optional parameter. Determines if the PayloadErrorNotification business object will not be created when an error occurs while processing payload. If this set to false or not provided, then the default existing behavior when a PayloadErrorNotification business object is created for every error occurred during the payload processing. If this set to false, the error description will be written into the application log file. Valid values are 'true' and 'false' (default).
suppressPayloadSummary	Optional parameter. Determines if the PayloadSummary business object will not be created while processing payload. If this set to false or not provided, then the default existing behavior when a PayloadSummary business object is created at the end of the payload processing. Valid values are 'true' and 'false' (default).
createFilePerCommit	Optional parameter. Determines how files are created when streaming files out to a file system or Object Storage. When set to true, streamed out files are written per commit. Valid values are 'true' and 'false' (default).
commitSizeInKB	Optional Parameter. Specifies the total amount of memory (in KB) allocated for Device Event and IMD seeders before they are committed. Seeders are kept in memory until their size exceeds the value defined for this parameter or the end of payload is reached. Default value is 100. Note: This parameter (either the default value or a specified value) is ignored when the **chunkSize** parameter is set.

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Dynamic Parameter Name	Description and Valid Values
chunkSize	Optional parameter. Specifies the size in bytes of a portion (chunk) of the payload that will be processed in a single batch “thread”. If parameter is set, the **commitSizeInKB** parameter is ignored. This parameter is supported by the following payload formats: • Landis+Gyr Usage • Landis+Gyr Events • MV90 Usage • Sensus RNI Usage • Sensus RNI Events • Silver Spring Networks Usage (CSV) • Adapter Development Kit Usage sample format (CSV) • Adapter Development Kit via User Exits (if an instance returned from the getParser method implements the `com.splwg.d1.domain.sgg.dg.processing.ChunkProcessor` interface).

Creating Payload Processing Batch Controls

The last step is to create payload processing monitor batch controls based on templates. You can create separate batch controls for each head end system or for specific payload types, or any combination of both. Creating specific batch controls allows more control when setting up batch process scheduling for payload processing. For instance, you may want to run usage payload processing every hour, but device payload processing every two hours.

The base package includes the following Payload Processing template batch controls:

- Payload Processing Monitor Template (D1-PLPRM): Used with both Legacy Measurement Processing and Direct Measurement Processing
- Payload Processing Monitor Template with Export (D1-PLPSO): Used with Direct Measurement Processing and required when using Measuring Component Filtering. When used with filtering, this batch process can also send initial measurement payloads to a file system or an object storage location.

To create a payload processing monitor batch control, search for the appropriate template batch control, click **Duplicate**, enter a unique code for the duplicate batch control and click **OK**.

This new batch control can be used to process payloads received from head end systems.

Payload Processing Batch Control Parameters

Payload processing batch processing is controlled by the following parameters:

Parameter Name	Description	Detailed Description	Required?
includeFiles	Include Files	The pattern for types of files to pick up during polling. The parameter supports the "glob" syntax for using wildcard characters.	True

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Parameter Name	Description	Detailed Description	Required?
fileLocation	File Location	The file location or Object Storage bucket to poll files from. This should be a file path or the **Value** of the File Location Extendable Lookup value for the appropriate bucket (usage or event). See Referencing URIs for more information.	True
processingConfiguration	Processing Configuration	The **Value** of the SGG Payload Processing Configuration Extendable Lookup value	True
errorLocation	Error Location	The Object Storage bucket where defected portions of payload and related rejection details are stored. This should be the **Value** of the File Location Extendable Lookup value for the appropriate “error” bucket.	True
postProcessingAction	Post Processing Action	Defines what happens to a file after it has been processed: delete (default), archive or rename. • delete: The processed file is deleted. • archive: The processed file is moved/copied to the location specified for the **archiveLocation** parameter. The file is renamed by appending the run date time value to the end of file name. The extension for archived files is .gz. If this option is selected, an archive bucket should be provided for the **archiveLocation** parameter • rename: The processed file is renamed using the extension specified for the **processedFileExtension** parameter, but the file is not moved.	False
archiveLocation	Archive Location	The Object Storage bucket where processed files are moved to. Required if the Post Processing Action is "archive". This should be the **Value** of the File Location Extendable Lookup value for the appropriate “archive” bucket.	False
processedFileExtension	Processed File Extension	The text to be appended to the file name after the file has been processed. Default is "PROCESSED".	False
maxRaiseSize	Maximum Raise Size	This parameter defines the maximum number of files that the batch program would submit for processing on each polling cycle. Default is No Maximum.	False

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Parameter Name	Description	Detailed Description	Required?
streamOutFileLocation	Stream Out File Location	The file location or Object Storage bucket where converted initial measurement are posted for distribution to external systems. This should be a file path or the **Value** of the File Location Extendable Lookup value for the appropriate bucket (usage). See Referencing URIs for more information. Used with D1-PLPSO.	True
streamOutFileNamePrefix	Stream Out File Name Prefix	The prefix for files created in the Stream Out File Location. The file format will be <Stream Out File Name Prefix><batch run>_<thread>_<thread count>_<timestamp>{<_file sequence>}.json.gz. If the Stream Out File Location is set then this parameter is required. Used with D1-PLPSO.	True
manifestOption	Manifest Option	This parameter specifies that a manifest file be created. See Manifest File for more information. Used with D1-PLPSO.	False
encryptExternalKey	Encryption External Key	The key ring used for the external key provided by the recipient of the file. If populated, the batch output file will be encrypted using a runtime generated key. The generated key will be encrypted using the active public key stored on the key ring. The recipient will use their private key to decrypt the generated key so the file may be decrypted. Only external public key rings may be used. See File Encryption and Signing Keys for more information. Used with D1-PLPSO.	False
encryptSignatureKey	Encryption Signature Key	The key ring for the internal key used to sign the file. If populated, the batch output file will be signed using the active private key stored on the key ring. The assumption is that the corresponding public key has been shared with the recipient. Only internal file encrypting / signing key rings may be used. See File Encryption and Signing Keys for more information. Used with D1-PLPSO.	False
DIST-THD-POOL	Thread Pool	Thread pool name to use if the DEFAULT thread pool is not desired.	False

> **Note**
>
> Refer to Creating Object Storage Locations for lists of suggested Object Storage buckets for each adapter.

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Measurement Payload File Format and Examples

This section provides details regarding the file format used in measurement processing with Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management.

- Adapter Development Kit Native Format Example
- Adapter Development Kit Native Format Schema

Adapter Development Kit Native Format Example

The following is an example of the ADK native format. This example contains 2 initial measurements (1 scalar and 1 interval).

```
<?xml version="1.0" encoding="UTF-8" ?>
<SGGIMDsEvents xmlns="http://oracle.com/SGGIMDsEvents">
  <D1-InitialLoadIMD dateTimeTagFormat="xsd" xmlns="">
    <preVEE>
      <imdType>D1IL</imdType>
      <mcIS>D1SC</mcIS>
      <externalId>da_164_Scalar_withMetadata.xml-2015-09-10-11-19-03-297</
externalId>
      <dvcIdN>DL_06</dvcIdN>
      <externalUOM>KWH</externalUOM>
      <enDt>2005-01-01T00:00:00Z</enDt>
      <enQty>4544</enQty>
    </preVEE>
    <serviceProviderExternalId>Itron</serviceProviderExternalId>
  </D1-InitialLoadIMD>
  <D1-InitialLoadIMD dateTimeTagFormat="xsd" xmlns="">
    <preVEE>
      <imdType>D1IL</imdType>
      <mcIS>D1IN</mcIS>
      <externalId>da_164_Multile_withMetadata_A.xml-2015-09-10-11-19-03-297</
externalId>
      <dvcIdN>ZZ-D-OSB-INT-ITRON-0002</dvcIdN>
      <spi>900</spi>
      <externalUOM>KWH</externalUOM>
      <mcm>725</mcm>
      <stDt>2003-01-01T23:45:00Z</stDt>
      <enDt>2003-01-02T00:00:00Z</enDt>
      <msrs>
        <mL>
          <s>1</s><q>4722</q>
          <sts>
            <stsL>
              <s>1</s>
              <st>CHardwareFailure</st>
            </stsL>
            <stsL>
              <s>2</s>
              <st>COverflow</st>
            </stsL>
          </sts>
```


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```
        </mL>
       </msrs>
     </preVEE>
     <serviceProviderExternalId>Itron</serviceProviderExternalId>
   </D1-InitialLoadIMD>
</SGGIMDsEvents>
```

Adapter Development Kit Native Format Schema

The following is the XML schema of the ADK native format.

```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified">
  <xsd:element name="SGGIMDsEvents">
<xsd:complexType>
      <xsd:all>
 <xsd:element name="D1-DeviceEventSeeder" minOccurs="0">
  <xsd:complexType>
   <xsd:all>
    <xsd:element name="deviceEventId" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="14" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="bo" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="30" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="boStatus" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="12" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="sender" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="30" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="externalSenderId" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="36" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="deviceEventType" minOccurs="0">
```


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```
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="30" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="externalEventName" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="254" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="eventDateTime" nillable="true" type="xsd:dateTime"
minOccurs="0"/>
    <xsd:element name="eventEndDateTime" nillable="true" type="xsd:dateTime"
minOccurs="0" />
    <xsd:element name="externalTimeZone" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="20" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="deviceId" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="12" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="deprecatedDeviceId" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="12" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="creationDateTime" nillable="true" type="xsd:dateTime"
minOccurs="0" />
    <xsd:element name="statusUpdateDateTime" nillable="true"
type="xsd:dateTime" minOccurs="0" />
    <xsd:element name="statusReason" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="30" />
      </xsd:restriction>
     </xsd:simpleType>
    </xsd:element>
    <xsd:element name="rawEventInformation" type="xsd:anyType"
minOccurs="0" />
    <xsd:element name="externalSourceIdentifier" minOccurs="0">
     <xsd:simpleType>
      <xsd:restriction base="xsd:string">
       <xsd:maxLength value="120" />
      </xsd:restriction>
```


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```
      </xsd:simpleType>
     </xsd:element>
     <xsd:element name="eventInformation" minOccurs="0">
      <xsd:complexType>
       <xsd:all>
        <xsd:element name="externalEventIdentifier" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalEventCategory" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalEventSeverity" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalDeviceType" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalServiceLocationId" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalCommunicationModuleIdentifier"
minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalGatewayIdentifier" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalStatusValue" minOccurs="0">
```


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```
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalStatusDateTime" nillable="true"
type="xsd:dateTime" minOccurs="0" />
        <xsd:element name="externalCommandId" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalEventDescription" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="60" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalEventReason" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="30" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="externalStatusReason" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="60" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="sourceTimeZone" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="10" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="timeZone" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:maxLength value="10" />
          </xsd:restriction>
         </xsd:simpleType>
        </xsd:element>
        <xsd:element name="dateTimesInStandard" minOccurs="0">
         <xsd:simpleType>
          <xsd:restriction base="xsd:string">
           <xsd:enumeration value="D1NO" />
           <xsd:enumeration value="D1YS" />
          </xsd:restriction>
```


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```
          </xsd:simpleType>
         </xsd:element>
        </xsd:all>
       </xsd:complexType>
      </xsd:element>
      <xsd:element name="version" minOccurs="0">
       <xsd:simpleType>
        <xsd:restriction base="xsd:decimal">
         <xsd:minExclusive value="-99999" />
         <xsd:maxExclusive value="99999" />
        </xsd:restriction>
       </xsd:simpleType>
      </xsd:element>
      <xsd:element name="deviceIdentifierNumber" minOccurs="0">
       <xsd:simpleType>
        <xsd:restriction base="xsd:string">
         <xsd:maxLength value="60" />
        </xsd:restriction>
       </xsd:simpleType>
      </xsd:element>
      <xsd:element name="newDeviceEvent" minOccurs="0">
       <xsd:simpleType>
        <xsd:restriction base="xsd:string">
         <xsd:maxLength value="14" />
        </xsd:restriction>
       </xsd:simpleType>
      </xsd:element>
      <xsd:element name="nextRetryDateTime" nillable="true" type="xsd:dateTime"
minOccurs="0" />
      <xsd:element name="retryUntilDateTime" nillable="true"
type="xsd:dateTime" minOccurs="0" />
      <xsd:element name="processData" minOccurs="0">
       <xsd:complexType>
        <xsd:all>
         <xsd:element name="errorEncountered" minOccurs="0">
          <xsd:simpleType>
           <xsd:restriction base="xsd:string">
            <xsd:enumeration value="D1NO" />
            <xsd:enumeration value="D1YS" />
           </xsd:restriction>
          </xsd:simpleType>
         </xsd:element>
         <xsd:element name="dateTimesInStandard" minOccurs="0">
          <xsd:simpleType>
           <xsd:restriction base="xsd:string">
            <xsd:enumeration value="D1NO" />
            <xsd:enumeration value="D1YS" />
           </xsd:restriction>
          </xsd:simpleType>
         </xsd:element>
         <xsd:element name="logs" minOccurs="0">
          <xsd:complexType>
           <xsd:all>
            <xsd:element name="logsList" minOccurs="0" >
             <xsd:complexType>
              <xsd:all>
```


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```
<xsd:element name="logsEntry" minOccurs="0">
 <xsd:complexType>
  <xsd:all>
   <xsd:element name="sequence" minOccurs="0">
    <xsd:simpleType>
     <xsd:restriction base="xsd:decimal">
      <xsd:minExclusive value="-999" />
      <xsd:maxExclusive value="999" />
     </xsd:restriction>
    </xsd:simpleType>
   </xsd:element>
   <xsd:element name="mo" minOccurs="0">
    <xsd:simpleType>
     <xsd:restriction base="xsd:string">
      <xsd:maxLength value="12" />
     </xsd:restriction>
    </xsd:simpleType>
   </xsd:element>
   <xsd:element name="pkValue1" minOccurs="0">
    <xsd:simpleType>
     <xsd:restriction base="xsd:string">
      <xsd:maxLength value="50" />
     </xsd:restriction>
    </xsd:simpleType>
   </xsd:element>
   <xsd:element name="pkValue2" minOccurs="0">
    <xsd:simpleType>
     <xsd:restriction base="xsd:string">
      <xsd:maxLength value="50" />
     </xsd:restriction>
    </xsd:simpleType>
   </xsd:element>
   <xsd:element name="pkValue3" minOccurs="0">
    <xsd:simpleType>
     <xsd:restriction base="xsd:string">
      <xsd:maxLength value="50" />
     </xsd:restriction>
    </xsd:simpleType>
   </xsd:element>
   <xsd:element name="pkValue4" minOccurs="0">
    <xsd:simpleType>
     <xsd:restriction base="xsd:string">
      <xsd:maxLength value="50" />
     </xsd:restriction>
    </xsd:simpleType>
   </xsd:element>
   <xsd:element name="pkValue5" minOccurs="0">
    <xsd:simpleType>
     <xsd:restriction base="xsd:string">
      <xsd:maxLength value="50" />
     </xsd:restriction>
    </xsd:simpleType>
   </xsd:element>
   <xsd:element name="logEntryType" minOccurs="0">
    <xsd:simpleType>
     <xsd:restriction base="xsd:string">
```


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```
                        <xsd:enumeration value="D1TD" />
                        <xsd:enumeration value="F1CR" />
                        <xsd:enumeration value="F1ER" />
                        <xsd:enumeration value="F1EX" />
                        <xsd:enumeration value="F1ST" />
                        <xsd:enumeration value="F1SY" />
                        <xsd:enumeration value="F1TD" />
                        <xsd:enumeration value="F1US" />
                       </xsd:restriction>
                      </xsd:simpleType>
                     </xsd:element>
                     <xsd:element name="logDateTime" nillable="true"
type="xsd:dateTime" minOccurs="0" />
                     <xsd:element name="boStatus" minOccurs="0">
                      <xsd:simpleType>
                       <xsd:restriction base="xsd:string">
                        <xsd:maxLength value="12" />
                       </xsd:restriction>
                      </xsd:simpleType>
                     </xsd:element>
                     <xsd:element name="description" minOccurs="0">
                      <xsd:simpleType>
                       <xsd:restriction base="xsd:string">
                        <xsd:maxLength value="60" />
                       </xsd:restriction>
                      </xsd:simpleType>
                     </xsd:element>
                     <xsd:element name="user" minOccurs="0">
                      <xsd:simpleType>
                       <xsd:restriction base="xsd:string">
                        <xsd:maxLength value="8" />
                       </xsd:restriction>
                      </xsd:simpleType>
                     </xsd:element>
                     <xsd:element name="logMessage" minOccurs="0">
                      <xsd:simpleType>
                       <xsd:restriction base="xsd:string">
                        <xsd:maxLength value="4000" />
                       </xsd:restriction>
                      </xsd:simpleType>
                     </xsd:element>
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                     <xsd:element name="adhocValue" minOccurs="0">
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```
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   <xsd:maxLength value="254" />
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   <xsd:maxLength value="50" />
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</xsd:element>
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</xsd:element>
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</xsd:element>
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   <xsd:maxLength value="50" />
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 </xsd:simpleType>
</xsd:element>
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   <xsd:maxLength value="50" />
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 </xsd:simpleType>
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  <xsd:restriction base="xsd:decimal">
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   <xsd:maxExclusive value="99999" />
  </xsd:restriction>
 </xsd:simpleType>
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  <xsd:restriction base="xsd:decimal">
   <xsd:minExclusive value="-99999" />
   <xsd:maxExclusive value="99999" />
  </xsd:restriction>
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```


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```
</xsd:element>
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   <xsd:maxLength value="30" />
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</xsd:element>
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```
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                 </xsd:element>
                </xsd:all>
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             </xsd:all>
            </xsd:complexType>
           </xsd:element>
          </xsd:all>
         </xsd:complexType>
        </xsd:element>
       </xsd:all>
      </xsd:complexType>
     </xsd:element>
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                <xsd:restriction base="xsd:string">
                  <xsd:maxLength value="14"/>
                </xsd:restriction>
              </xsd:simpleType>
            </xsd:element>
            <xsd:element name="bo" minOccurs="0">
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                <xsd:restriction base="xsd:string">
                  <xsd:maxLength value="30"/>
                </xsd:restriction>
              </xsd:simpleType>
            </xsd:element>
            <xsd:element name="fromDateTime" nillable="true" type="xsd:dateTime"
minOccurs="0"/>
            <xsd:element name="toDateTime" nillable="true" type="xsd:dateTime"
minOccurs="0"/>
            <xsd:element name="boStatus" minOccurs="0">
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                <xsd:restriction base="xsd:string">
                  <xsd:maxLength value="12"/>
                </xsd:restriction>
              </xsd:simpleType>
            </xsd:element>
            <xsd:element name="statusReason" minOccurs="0">
              <xsd:simpleType>
                <xsd:restriction base="xsd:string">
                  <xsd:maxLength value="30"/>
```


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```
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        </xsd:element>
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              <xsd:enumeration value="D1ST"/>
            </xsd:restriction>
          </xsd:simpleType>
        </xsd:element>
        <xsd:element name="timeZone" minOccurs="0">
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              <xsd:maxLength value="10"/>
            </xsd:restriction>
          </xsd:simpleType>
        </xsd:element>
        <xsd:element name="creationDateTime" nillable="true"
type="xsd:dateTime" minOccurs="0"/>
        <xsd:element name="comments" minOccurs="0">
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            <xsd:restriction base="xsd:string">
              <xsd:maxLength value="254"/>
            </xsd:restriction>
          </xsd:simpleType>
        </xsd:element>
        <xsd:element name="isTraceOn" minOccurs="0">
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            <xsd:restriction base="xsd:string">
              <xsd:enumeration value="D1NO"/>
              <xsd:enumeration value="D1YS"/>
            </xsd:restriction>
          </xsd:simpleType>
        </xsd:element>
        <xsd:element name="isIntervalDateTimePopulated" minOccurs="0">
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            <xsd:restriction base="xsd:string">
              <xsd:enumeration value="D1NO"/>
              <xsd:enumeration value="D1YS"/>
            </xsd:restriction>
          </xsd:simpleType>
        </xsd:element>
        <xsd:element name="serviceProvider" minOccurs="0">
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            <xsd:restriction base="xsd:string">
              <xsd:maxLength value="30"/>
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          </xsd:simpleType>
        </xsd:element>
        <xsd:element name="isAutomatedRetry" minOccurs="0">
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            <xsd:restriction base="xsd:string">
              <xsd:enumeration value="D1NO"/>
              <xsd:enumeration value="D1YS"/>
            </xsd:restriction>
```


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```
          </xsd:simpleType>
        </xsd:element>
        <xsd:element name="nextRetryDateTime" nillable="true"
type="xsd:dateTime" minOccurs="0"/>
        <xsd:element name="retryUntilDateTime" nillable="true"
type="xsd:dateTime" minOccurs="0"/>
        <xsd:element name="veeGroupRole" nillable="true" minOccurs="0">
        <xsd:simpleType>
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              <xsd:enumeration value="D1ES"/>
              <xsd:enumeration value="D1IL"/>
              <xsd:enumeration value="D1IS"/>
              <xsd:enumeration value="D1MO"/>
              <xsd:enumeration value="D1PR"/>
            </xsd:restriction>
          </xsd:simpleType>
        </xsd:element>
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minOccurs="0"/>
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          <xsd:simpleType>
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              <xsd:maxExclusive value="9999999999.999999"/>
            </xsd:restriction>
          </xsd:simpleType>
        </xsd:element>
        <xsd:element name="startReadingCondition" type="xsd:string"
minOccurs="0"/>
        <xsd:element name="preVEE" minOccurs="0">
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                <xsd:simpleType>
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                    <xsd:maxLength value="14"/>
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                </xsd:simpleType>
              </xsd:element>
              <xsd:element name="dvcIdN" minOccurs="0">
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                    <xsd:maxLength value="120"/>
                  </xsd:restriction>
                </xsd:simpleType>
              </xsd:element>
              <xsd:element name="mcId" minOccurs="0">
                <xsd:simpleType>
                  <xsd:restriction base="xsd:string">
                    <xsd:maxLength value="12"/>
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                </xsd:simpleType>
              </xsd:element>
              <xsd:element name="mcIdN" minOccurs="0">
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```


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```
                    <xsd:maxLength value="120"/>
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              </xsd:element>
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                </xsd:simpleType>
              </xsd:element>
              <xsd:element name="uom" minOccurs="0">
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                    <xsd:maxLength value="30"/>
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                </xsd:simpleType>
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                </xsd:simpleType>
              </xsd:element>
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                </xsd:simpleType>
              </xsd:element>
              <xsd:element name="externalTOU" minOccurs="0">
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                    <xsd:maxLength value="30"/>
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                </xsd:simpleType>
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                    <xsd:maxLength value="30"/>
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                </xsd:simpleType>
              </xsd:element>
              <xsd:element name="externalSQI" minOccurs="0">
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                    <xsd:maxLength value="30"/>
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                </xsd:simpleType>
              </xsd:element>
              <xsd:element name="stDt" nillable="true" type="xsd:dateTime"
minOccurs="0"/>
              <xsd:element name="stQty" minOccurs="0">
```


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```
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                      <xsd:minExclusive value="-9999999999.999999"/>
                      <xsd:maxExclusive value="9999999999.999999"/>
                    </xsd:restriction>
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                </xsd:element>
                <xsd:element name="enDt" nillable="true" type="xsd:dateTime"
minOccurs="0"/>
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                      <xsd:maxExclusive value="9999999999.999999"/>
                    </xsd:restriction>
                  </xsd:simpleType>
                </xsd:element>
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                      <xsd:enumeration value="D1GA"/>
                      <xsd:enumeration value="D1IL"/>
                      <xsd:enumeration value="D1MO"/>
                    </xsd:restriction>
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                <xsd:element name="mcIS" minOccurs="0">
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                      <xsd:enumeration value="D1SC"/>
                    </xsd:restriction>
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                      <xsd:enumeration value="D1SH"/>
                    </xsd:restriction>
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                    </xsd:restriction>
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```


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```
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                  </xsd:simpleType>
                </xsd:element>
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minOccurs="0"/>
                <xsd:element name="ccond" type="xsd:string" minOccurs="0"/>
                <xsd:element name="sts" minOccurs="0">
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                          <xsd:sequence>
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                                  <xsd:maxExclusive value="99999"/>
                                </xsd:restriction>
                              </xsd:simpleType>
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                                  <xsd:maxLength value="6"/>
                                </xsd:restriction>
                              </xsd:simpleType>
                            </xsd:element>
                          </xsd:sequence>
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                      </xsd:element>
                    </xsd:sequence>
                  </xsd:complexType>
                </xsd:element>
                <xsd:element name="msrs" minOccurs="0">
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                    <xsd:sequence>
                      <xsd:element name="mL" minOccurs="0"
maxOccurs="unbounded">
                        <xsd:complexType>
                          <xsd:sequence>
                            <xsd:element name="s" minOccurs="0">
```


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```
                              <xsd:simpleType>
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                                  <xsd:maxExclusive value="99999"/>
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                            </xsd:element>
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type="xsd:dateTime" minOccurs="0"/>
                            <xsd:element name="q" minOccurs="0">
                              <xsd:simpleType>
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                                  <xsd:minExclusive value="-9999999999.999999"/>
                                  <xsd:maxExclusive value="9999999999.999999"/>
                                </xsd:restriction>
                              </xsd:simpleType>
                            </xsd:element>
                            <xsd:element name="ue" minOccurs="0">
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                                  <xsd:enumeration value="D1UE"/>
                                </xsd:restriction>
                              </xsd:simpleType>
                            </xsd:element>
                            <xsd:element name="fc" type="xsd:string"
minOccurs="0"/>
                            <xsd:element name="r" minOccurs="0">
                              <xsd:simpleType>
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                                  <xsd:maxExclusive value="9999999999.999999"/>
                                </xsd:restriction>
                              </xsd:simpleType>
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                            <xsd:element name="rc" type="xsd:string"
minOccurs="0"/>
                            <xsd:element name="sts" minOccurs="0">
                              <xsd:complexType>
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                                  <xsd:element name="stsL" minOccurs="0"
maxOccurs="unbounded">
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                                              <xsd:maxExclusive value="99999"/>
                                            </xsd:restriction>
                                          </xsd:simpleType>
                                        </xsd:element>
                                        <xsd:element name="st" minOccurs="0">
                                          <xsd:simpleType>
                                            <xsd:restriction base="xsd:string">
                                              <xsd:maxLength value="6"/>
                                            </xsd:restriction>
```


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```
                                    </xsd:simpleType>
                                  </xsd:element>
                                </xsd:sequence>
                              </xsd:complexType>
                            </xsd:element>
                          </xsd:sequence>
                        </xsd:complexType>
                      </xsd:element>
                    </xsd:sequence>
                  </xsd:complexType>
                </xsd:element>
              </xsd:sequence>
            </xsd:complexType>
          </xsd:element>
        </xsd:all>
      </xsd:complexType>
    </xsd:element>
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    <xsd:element name="processData" minOccurs="0">
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          <xsd:element name="isShiftedStartEnd" minOccurs="0">
            <xsd:simpleType>
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                <xsd:enumeration value="D1NO"/>
                <xsd:enumeration value="D1YS"/>
              </xsd:restriction>
            </xsd:simpleType>
          </xsd:element>
          <xsd:element name="isShiftedIntervals" minOccurs="0">
            <xsd:simpleType>
              <xsd:restriction base="xsd:string">
                <xsd:enumeration value="D1NO"/>
                <xsd:enumeration value="D1YS"/>
              </xsd:restriction>
            </xsd:simpleType>
          </xsd:element>
          <xsd:element name="isTimeZoneConverted" minOccurs="0">
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                <xsd:enumeration value="D1NO"/>
                <xsd:enumeration value="D1YS"/>
              </xsd:restriction>
            </xsd:simpleType>
          </xsd:element>
          <xsd:element name="isErrorEncountered" minOccurs="0">
            <xsd:simpleType>
              <xsd:restriction base="xsd:string">
                <xsd:enumeration value="D1NO"/>
                <xsd:enumeration value="D1YS"/>
              </xsd:restriction>
            </xsd:simpleType>
          </xsd:element>
          <xsd:element name="servicePointId" minOccurs="0">
            <xsd:simpleType>
              <xsd:restriction base="xsd:string">
```


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```
                        <xsd:maxLength value="12"/>
                      </xsd:restriction>
                    </xsd:simpleType>
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                  <xsd:element name="installationConstant" minOccurs="0">
                    <xsd:simpleType>
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                        <xsd:minExclusive value="-999999.999999"/>
                        <xsd:maxExclusive value="999999.999999"/>
                      </xsd:restriction>
                    </xsd:simpleType>
                  </xsd:element>
                  <xsd:element name="deviceId" minOccurs="0">
                    <xsd:simpleType>
                      <xsd:restriction base="xsd:string">
                        <xsd:maxLength value="12"/>
                      </xsd:restriction>
                    </xsd:simpleType>
                  </xsd:element>
                  <xsd:element name="allowNonZeroIntervalsForEstimate"
minOccurs="0">
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                      <xsd:restriction base="xsd:string">
                        <xsd:enumeration value="D1NO"/>
                        <xsd:enumeration value="D1YS"/>
                      </xsd:restriction>
                    </xsd:simpleType>
                  </xsd:element>
                  <xsd:element name="disableReEstimate" minOccurs="0">
                    <xsd:simpleType>
                      <xsd:restriction base="xsd:string">
                        <xsd:enumeration value="D1NO"/>
                        <xsd:enumeration value="D1YS"/>
                      </xsd:restriction>
                    </xsd:simpleType>
                  </xsd:element>
                  <xsd:element name="reEstimationActivity" minOccurs="0">
                    <xsd:simpleType>
                      <xsd:restriction base="xsd:string">
                        <xsd:maxLength value="14"/>
                      </xsd:restriction>
                    </xsd:simpleType>
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                  <xsd:element name="logs" minOccurs="0">
                    <xsd:complexType>
                      <xsd:all>
                        <xsd:element name="logsList" minOccurs="0">
                          <xsd:complexType>
                            <xsd:sequence>
                              <xsd:element name="logsEntry" minOccurs="0">
                                <xsd:complexType>
                                  <xsd:sequence>
                                    <xsd:element name="sequence" minOccurs="0">
                                      <xsd:simpleType>
                                        <xsd:restriction base="xsd:decimal">
                                          <xsd:minExclusive value="-999"/>
```


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```
            <xsd:maxExclusive value="999"/>
          </xsd:restriction>
        </xsd:simpleType>
      </xsd:element>
      <xsd:element name="mo" minOccurs="0">
        <xsd:simpleType>
          <xsd:restriction base="xsd:string">
            <xsd:maxLength value="12"/>
          </xsd:restriction>
        </xsd:simpleType>
      </xsd:element>
      <xsd:element name="pkValue1" minOccurs="0">
        <xsd:simpleType>
          <xsd:restriction base="xsd:string">
            <xsd:maxLength value="50"/>
          </xsd:restriction>
        </xsd:simpleType>
      </xsd:element>
      <xsd:element name="pkValue2" minOccurs="0">
        <xsd:simpleType>
          <xsd:restriction base="xsd:string">
            <xsd:maxLength value="50"/>
          </xsd:restriction>
        </xsd:simpleType>
      </xsd:element>
      <xsd:element name="pkValue3" minOccurs="0">
        <xsd:simpleType>
          <xsd:restriction base="xsd:string">
            <xsd:maxLength value="50"/>
          </xsd:restriction>
        </xsd:simpleType>
      </xsd:element>
      <xsd:element name="pkValue4" minOccurs="0">
        <xsd:simpleType>
          <xsd:restriction base="xsd:string">
            <xsd:maxLength value="50"/>
          </xsd:restriction>
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Configuring M&V Options

Use the information in this section when defining M&V options used with Customer Program Management.

- Defining M&V Subscription Types
- Defining M&V Calculation Groups
- Defining M&V Calculation Rules
- Configuring Dynamic Aggregation Options

Defining M&V Subscription Types

You use the **M&V Subscription Type** portal to display and maintain M&V subscription types.

Refer to Understanding M&V Subscription Types for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **M&V Subscription Type**.

The following zones may appear as part of the portal's **Main** tab page:

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- **M&V Subscription Type List**: This zone lists all M&V subscription type records. Broadcast a record to display the details of the selected record.
- **M&V Subscription Type**: This zone displays the selected M&V subscription type.

Defining M&V Calculation Groups

You use the **M&V Calculation Group** portal to display and maintain Measurement and Verification calculation groups.

Refer to Understanding M&V Calculation Groups for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **M&V Calculation Group**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **M&V Calculation Group**: This zone displays basic information about M&V calculation group.
- **M&V Calculation Rules List**: This zone lists the M&V calculation rules belonging to the group.

Defining M&V Calculation Rules

You use the **M&V Calculation Rule** portal to display and maintain Measurement and Verification calculation rules.

Refer to Understanding M&V Calculation Rules and Understanding M&V Calculation Groups for more information.

You can access the portal by selecting **Admin**, select **Customer Program Management**, then select **M&V Calculation Rule**. You are brought to a query portal with options for searching. Once your record has been selected you are brought to the maintenance portal to view and maintain the selected record.

The following zones may appear as part of the portal's **Main** tab page:

- **M&V Settlement Calculation Rule**: This zone displays the M&V calculation rule, including parameters used when executing the rule.
- **Eligibility Criteria List**: This zone lists eligibility criteria for the current calculation rule. Eligibility criteria are configured criteria used to determine whether to execute a specific calculation rule.

M&V Calculation Rules

The following is a list of the calculation rules provided as part of base product that are used with M&V calculations. For more information on how each rule executes and can be configured, follow the link provided on the rule.

Program Settlement Calculation Rule Name	Purpose
Vector and Service Quantity Math (D2-Math)	This rule is designed to facilitate configuration of complex vector calculations. It is based on a series of underlying services with vectors configured as input to the calculations.

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Configuring Dynamic Aggregation Options

This section outlines the business objects and configuration data that should be used when configuring dynamic aggregation for use with M&V processing. Several dynamic aggregation configuration entities have specific options designed for the specific types of aggregations used with M&V processing.

Data Sources

Data sources for M&V aggregation should be created using the following business objects:

- Entity Group from Controllable Device (D1-DataSourceEntityGrpCtrlDvc): Used for Data Sources related to Device Population entity groups.
- Entity Group from MDM - Service Points (D1-DataSourceEntityGrpMDMSP): Used for Data Sources related to Control group entity groups.

Data Source Template SQL

The above Data Sources use the following values from the Data Source SQL (D1-DataSourceSQLLookup) extendable lookup:

- Measurements from Control Device Links Dim Scan (X1_MSRMT_FROM_CTRL_DVC_DIM_SCAN_SQL)
- Measurements from Control Device Links Find Constituent (X1_MSRMT_FROM_CTRL_DVC_FIND_CONST_SQL)
- Measurement from MDM SP Find Constituents (X1_MSRMT_FROM_US_SP_FIND_CONST_SQL)

Dynamic Aggregation Measuring Component Types

Dynamic Aggregation Measuring Component Types for M&V aggregation should be created using the following business objects:

- Regression Aggregator Type for M&V (X1-RegressionAggregatorMVType)

Regression Aggregator Type for M&V measuring component types are defined by the following:

- **Measuring Component Business Object**: The business object used when creating measuring components of this type. This should be Regression Aggregator Type for M&V (X1-RegressionAggregatorMVType)
- **Measurement Business Object**: The business object used to capture and store aggregated measurement data for measuring components of this type. This should be Aggregation Measurement (D1-AggregationMeasurement).
- **Data Source**: The source of the data that will be aggregated and the specific type of data that should be aggregated. Note that the Service Type of the data source, as determined by its associated objects (e.g. Measuring Component Type, Device Type, Service Point Type), must match the Service Type for this measuring component type. This should be a Data Source based on the Entity Group from Controllable Device (D1-DataSourceEntityGrpCtrlDvc)
- **M&V Regression Parameters**: Parameters used in regression calculations for aggregator measuring components of this type, including:
  - **M&V Subscription Type**: The M&V subscription type used when creating M&V transactions for aggregator measuring components of this type.

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  - **Confidence level**: a number (two decimal places) between 0 and 1 used as input to regression
  - **Pre-treatment period minutes**: The number of minutes of the Pre-Treatment Period"
  - **Pre-event period minutes**: The number of minutes of the "Pre-Event Period".
  - **Post-event period minutes**: The number of minutes of the "Post-Event Period".
- **Value Identifiers**: The UOM, TOU, and SQI used to identify the values to be calculated, For each value identifier either the **Value Calculation Method** or **Value Derivation Algorithm** must be defined (not both). These define how values are calculated or derived during M&V processing. These values will be mapped to **Regression Output Quantities**.
- **Regression Output Quantities**: Mappings between output quantities from the regression analysis and value identifiers, used to capture service quantities on M&V transactions. These mappings include:
  - **Regression Output Quantity**: defined by values for the Regression Output Quantity Lookup (X1-RegOutputQuantityLookup) extendable lookup, including:
    * Intercept
    * Coefficient for Time
    * Coefficient for Treatment
    * Coefficient for Time * Treatment
    * Event Control Hourly
    * Event Treat Hourly
    * Pre Control Average
    * Pre Treat Average
  - **Value Identifier Type**: Value identifiers defined for the measuring component type

Aggregation Groups

Aggregation Groups for M&V aggregation should be created using the following business objects:

- Aggregation Group (D1-AggregationGroup)

Measuring Component Sets

- Aggregation Foundation Set (D1-AggregationFoundationSet)

Aggregation Criteria Source Types

The Aggregation Foundation Set (D1-AggregationFoundationSet) measuring component set uses the following values from the Aggregation Criteria Source Type (D1-CriteriaSourceTypeLookup) extendable lookup:

- Entity Group (ENTITY GROUP)

This allows measuring component set dimension and criteria to be based on Device Population and Control groups.

- Configuring Data Sources
- Configuring Data Source Template SQL
- Configuring Dynamic Aggregation Measuring Component Types
- Configuring Aggregation Groups

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- Configuring Measuring Component Sets
- Configuring Aggregation Criteria Source Types

Configuring Data Sources

This portal is used to display and maintain data sources.

Refer to Understanding Data Sources for more information.

You can access the portal by selecting **Admin**, then **Aggregation**, then **Data Source**.

The following zones may appear as part of the portal's **Main** tab page:

- **Data Source List**: This zone lists all data source records. Broadcast a record to display the details of the selected record.
- **Aggregation Data Source**: This zone provides information about the selected data source.

Configuring Data Source Template SQL

Template SQL used when generating dynamic queries used in aggregation processing is defined in the Data Source SQL (D1-DataSourceSQLLookup) extendable lookup. The base package data source business objects reference appropriate base package values from this extendable lookup.

For example, the **Aggregation SQL** option on the Measurements from US Service Points data source business object (D1-DataSourceMeasurements) references the "D1_MSRMT_FROM_US_SP_MCTYPE_SQL" value from the Data Source SQL extendable lookup.

If an implementation requires template SQL that differs from the base package, custom extendable lookup values can be created and referenced on the data source business object.

When creating custom template SQL, start from an existing extendable lookup value. Select the value that most closely matches your requirements and use the **Duplicate** function to create a copy, and edit the SQL as needed.

Use the following procedure to add a custom extendable lookup value to a data source business object.

1. Add a business object option of the appropriate type to the data source business object. For instance, if creating custom SQL for aggregation, add an **Aggregation SQL** option.
2. Enter a **Sequence** higher than the base package option.
3. Specify the custom extendable lookup value in the **Option Value** field.

Configuring Dynamic Aggregation Measuring Component Types

The **Measuring Component Type** portal is used to display and maintain dynamic aggregation measuring components.

Refer to Understanding Dynamic Aggregation Measuring Component Types for more information about dynamic aggregation measuring components.

Configuring Measuring Component Types

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Configuring Aggregation Groups

This portal is used to display and maintain aggregation groups.

Refer to Understanding Aggregation Groups for more information.

You can access the portal by selecting **Admin**, then **Aggregation**, **Aggregation Group**.

The following zones may appear as part of the portal's **Main** tab page:

- **Aggregation Group List**: This zone lists all aggregation group records. Broadcast a record to display the details of the selected record.
- **Aggregation Group**: This zone provides information about a selected aggregation group. The **Record Actions** section of this zone includes the following options:
  - Click **Delete Measurements** to clear the measurements of all measuring component sets of the aggregation group for a specified time range. This runs the Clean up Aggregation Group (D1-CLAGP) batch process using the "Measurement Only" (MSRMTONLY) Purge Option.
  - Click **Delete All MC Set Data** to clear all data for all measuring component sets of the aggregation group. This runs the Clean up Aggregation Group (D1-CLAGP) batch process using the "All" (ALL) Purge Option.
  - Click **Delete All Aggregation Runs** to clears all aggregation group runs of the aggregation group. This runs the Clean Up Aggregation Group Runs (D1-AGGRC) batch process.

  See **Batch Processing** below for more information about the batch processes used by these options.
- **Aggregation Measuring Component Sets**: This zone lists measuring component sets associated with the selected aggregation group. Click **Resequence** to change the order of the measuring component sets in the aggregation group. Click **Add** to add a new measuring component set to the aggregation group.
  - Click the icon in the **Delete Measurements** column to delete the measurements of the measuring component set for a specified time range. This runs the Clean up Aggregation Group (D1-CLAGP) batch process using the "Measurement Only" (MSRMTONLY) Purge Option for the measuring component.
  - Click the icon in the **Delete MC Set Data** column to delete all data of the measuring component set. This runs the Clean up Aggregation Group (D1-CLAGP) batch process using the "All" (ALL) Purge Option for the measuring component.

  See **Batch Processing** below for more information about the batch processes used by these options.
- **Aggregation Group Run**: This zone lists individual aggregation runs performed for the selected aggregation group. Broadcast a record to display the details of the selected record. This zone displays up to 10 records. If there are more than 10 records, use the **Previous** and **Next** buttons to navigate between pages of records. Click **Add** to execute an ad hoc aggregation group run.
  - Click the icon in the **Delete** column to delete the aggregation group run. This runs the Clean Up Aggregation Group Runs (D1-AGGRC) batch process for the aggregation group run. Not applicable for aggregation group runs currently "In Progress". See **Batch Processing** below for more information about the batch processes used by this option.

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  - Click the icon in **Cancel** column to cancel an "In Progress" aggregation group run. Applicable only for aggregation group runs currently "In Progress".

- **Aggregation Group Run Details**: This zone displays details for a selected aggregation group run.
  - Click **Clear Batch Runs** to clear any batch runs that have been run. This clears dimension scan batch run and aggregation batch run details.
  - Click the icon in the **Restart** column to restart the aggregation group run. Available only for aggregation group runs in "Error" (see the **Aggregation Batch Run** column)

The following zones may appear as part of the portal's **Settlement Batch Run Statistics** tab page:

- **Settlement Batch Run Statistics**: This zone displays details regarding batch processes run for aggregation groups.

Batch Processing

Several of the options available for maintaining aggregation group runs are based on specific batch processes. This section provides additional details regarding these.

Clean up Aggregation Group (D1-CLAGP)

The Clean up Aggregation Group (D1-CLAGP) batch process can be used to purge aggregation group data and can perform either of the following:

- Clean up the aggregation group's measuring component set(s)' aggregator measuring components and their aggregated measurements
- Clean up a specific measuring component set's aggregator measuring components and their aggregated measurements

Parameters used by this batch process include the following:

- **Restrict by Aggregation Group** (restrictToAggregationGroup): (Required) The code for the aggregation group for which data is purged. This limits the clean up to aggregators linked to this aggregation group's measuring component sets.
- **Restrict by MC Set** (restrictToMCSet): The code for the measuring component set for which data is purged. This limits the clean up to the specific aggregation group's measuring component set. If not provided, all the aggregation group's measuring component sets will be included in the purge process.
- **Purge Option** (purgeOption): (Required) Specifies the mode in which data is purged. Options include:
  - MSRMTONLY: - Purge measurement data only
  - ALL: Purge all measurement data, any settlement items related to the measuring component, any attribute data snapshots related to the settlement item, attribute value related to the Settlement Item, any related measuring component participants (aggregators)
- **Start Date/Time** (startDateTime): The start date and time for the period to be deleted when **Purge Option** is MSRMT_ONLY. This must be provided in the format YYYY-MM-DD-HH.MM.SS.
- **End Date/Time** (endDateTime): The end date and time for the period to be deleted when **Purge Option** is MSRMT_ONLY. This must be provided in the format YYYY-MM-DD-HH.MM.SS.

Clean Up Aggregation Group Runs (D1-AGGRC)

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The Clean Up Aggregation Group Runs (D1-AGGRC) batch process can be used to purge either a single aggregation group run or all aggregation group runs of an aggregation group. Note this process does NOT purge the corresponding data such as measurements, settlement items, and so. Purging data can be performed using the Clean up Aggregation Group (D1-CLAGP) batch process.

Parameters used by this batch process include the following:

- **Restrict by Aggregation Group** (restrictToAggregationGroup): (Required) The code for the aggregation group for which aggregation group runs are pursed. This limits the clean up to aggregation group runs linked to this aggregation group
- **Restrict by Aggregation Group Run** (restrictToAggregationGroupRun): The code for a specific aggregation group run that will be cleaned up.

Configuring Measuring Component Sets

This portal is used to display and maintain measuring component sets.

Refer to Understanding Measuring Component Sets for more information.

You can access the portal by selecting **Admin**, then **Aggregation**, **Measuring Component Set**.

The following zones may appear as part of the portal's **Main** tab page:

- **Measuring Component Set**: This zone displays details of a selected measuring component set.
- **Dimensions**: This zone lists the dimensions used to identify the attributes by which the aggregation should be analyzed. Note: Data in this zone is edited by clicking the **Edit** button in the **Measuring Component Zone**.
- **Criteria**: This zone lists the criteria that limits the data to be aggregated through a series of inclusions, exclusions, or both. Note: Data in this zone is edited by clicking the **Edit** button in the **Measuring Component Zone**.
- **Individually Managed Items**: This zone lists the criteria used to identify specific customers that should be aggregated in isolation from all other data that matches the dimensions and criteria defined for the measuring component set. Note: Data in this zone is edited by clicking the **Edit** button in the **Measuring Component Zone**.
- **Measuring Component Set Participants**: This zone displays the measuring components that are in the Measuring Component Set Participant table for the measuring component set. For each measuring component, this zone displays the most recent and last measurement date/times.

Configuring Aggregation Criteria Source Types

The options in the **Source Type** and **Source Entity** drop-down lists used when configuring Dimensions, Criteria, and Individually Managed Items are defined in the Aggregation Criteria Source Type (D1-CriteriaSourceTypeLookup) extendable lookup. The measuring component set business objects reference this extendable lookup.

Each of the base package Source Type values (Characteristic, Identifier, Market Participant, Table, and Entity Group) are records in this extendable lookup. The Source Entity values for each of these are defined in the corresponding record.

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For example, the “Table” Source Type defines the base package “Table” Source Entity values (Device, Device Event, Measuring Component, Service Point, Usage Subscription, and Usage), along with criteria path details for each (based on data source class).

If an implementation requires Source Type or Source Entity values that differ from the base package, custom extendable lookup values can be created.

When for creating custom values for this extendable lookup, start from an existing extendable lookup value. Select the value that most closely matches your requirements and use the **Duplicate** function to create a copy, and edit as needed.

Defining Customer Program Service Task Types

You use the **Service Task Type** portal to display and maintain customer program service task types.

Refer to Understanding Customer Program Service Task Types for more information.

You can access the portal by selecting **Admin**, select **General**, then select **Service Task Type**.

The following zones may appear as part of the portal's **Main** tab page:

- **Service Task Type List**: This zone lists all service task types defined in the system. Broadcast a record to display the details of the selected record.
- **Service Task Type**: This zone displays the selected service task type.

Defining Enrollment Options

This section outlines the configuration needed to support enrollment and unenrollment processes.

Create Service Task Types

You must create one or more service task types for different types of enrollment and unenrollment processes. The number of service task types needed is based on the number of programs, program subscription types, and device location types you have configured.

See Understanding Customer Program Service Task Types and Defining Customer Program Service Task Types for more information about working with customer program service task types.

Create Action Method

You must also configure an Action Method to enroll or unenroll customers using the **Process Flow** portal.

Use the following procedure to create an action method used with customer program enrollment or unenrollment processing.

1. Select **Admin**, select **System**, then select **Action Method**, **Add**.
2. Select "Customer Program Enrollment Action Method" or "Customer Program Unenrollment Action Method" from the **Action Method Business Object** drop-down list on the **Select Business Object** screen and click **OK**.
3. Enter the following on the **Action Method** screen:
    - **Action Method**: A code for your action method

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- **Action Method Role**: Customer Program Enrollment (or Customer Program Unenrollment)
- **Description**: A description of your request type
- **Default Details**:
  - **Process Flow Type**: Customer Program Enrollment Process (or Customer Program Unenrollment Process)
  - **Enable Bring Your Own**: Indicates if the "Bring Your Own" option is available on the Device Setup panel of Enrollment process flows. Only available for action methods based on the "Customer Program Enrollment Action Method" business object.
  - **Appointment Resource Option**: Indicates if available appointments should be based on an Activity Type or Template Activity (default). If set to "Template Activity", appointment slots are selected based on labor requirements defined in the Template Activity specified in the Enrollment/Unenrollment service task type as well as the selected crew shift type and crew.
  - **Appointment Slot Days**: The number of days added to the selected appointment date to build a date range for the list of available appointment slots on the Device Setup panel of Enrollment or Unenrollment process flows.
  - **Show Application Date**: Indicates whether or not the enrollment or unenrollment date should be displayed on Enrollment or Unenrollment process flow panels.

4. Click **Save**.

See Defining Action Methods for more information about creating Action Method records.

Defining Program Service Call Options

This section outlines the configuration needed to support service call processes.

Create Service Task Types

You must create one or more service task types for different types of service call processes. The number of service task types needed is based on the number of programs, program subscription types, and device location types you have configured.

See Understanding Customer Program Service Task Types and Defining Customer Program Service Task Types for more information about working with customer program service task types.

Create Action Method

You must also configure an Action Method to create service calls for customers using the Process Flow portal.

Use the following procedure to create an action method used with customer program service call processing.

1. Select **Admin**, select **System**, then select **Action Method**, **Add**.
2. Select "DA Program Service Call Action Method" from the **Action Method Business Object** drop-down list on the **Select Business Object** screen and click **OK**.
3. Enter the following on the **Action Method** screen:
   - **Action Method**: A code for your action method

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- **Action Method Role**: Program Service Call
- **Description**: A description of your request type
- **Default Details**:
  - **Process Flow Type**: Program Service Call Process
  - **Appointment Resource Option**: Indicates if available appointments should be based on an Activity Type or Template Activity (default). If set to "Template Activity", appointment slots are selected based on labor requirements defined in the Template Activity specified in the program call service task type as well as the selected crew shift type and crew.
  - **Appointment Slot Days**: The number of days added to the selected appointment date to build a date range for the list of available appointment slots on the Device Setup panel of program call process flows (maximum value of 9 days)

4. Click **Save**.

See Defining Action Methods for more information about creating Action Method records.

Defining Manual Work Activity Completion Options

This topic outlines the configuration needed to support manual work order activity completion processes.

Create Action Method

You must configure an Action Method to manually complete work activities using the Process Flow portal.

Use the following procedure to create an action method used with manual work order activity completion processing.

1. Select **Admin**, select **System**, select **Action Method**, then select **Add**.
2. Select "Work Activity Completion Action Method" from the **Action Method Business Object** drop-down list on the **Select Business Object** screen and click **OK**.
3. Enter the following on the **Action Method** screen:
   - **Action Method**: A code for your action method
   - **Action Method Role**: Work Activity Completion
   - **Description**: A description of your request type
   - **Process Flow Type**: Work Activity Completion Process
4. Click **Save**.

See Defining Action Methods for more information about creating Action Method records.

Configuring the Customer Program Summary Portal

This topic describes the process for configuring the **Customer Program Summary** portal.

Refer to the Using the Customer Program Summary Portal section of the *Business User Guide* for more information on this functionality.

The zones on the **Customer Program Summary** portal leverage a number of insight types and insight groups. Insight types and insight classes are provided with the base package, but

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you must create insight groups that contain specific insight types in order for these zones to display the correct information.

The table below lists the zones in the **Customer Program Summary** portal, along with details regarding the insight group that must be created for each zone, including the insight class, the visible structure, and the insight type to be included in the insight group.

Zone	Insight Group	Insight Class	Valid Visual Structures	Insight Type
Current Enrollment	Current Enrollment	Program Enrollment	Card Insight	Customer Current Program Enrollment (X1-DACSCURPE)
Customer Insights	Customer Insights	Customer Insights	Card Insight	In Progress Service Tasks (X1-DACSINPRGSVCTASKS)
Customer Program Activity	Customer Event Participation	Customer Participation	Inline Insight	Customer Event Participation (X1-DACSCSPRT)
Eligible Programs	Eligible Programs	Eligible Programs	Card Insight	Eligible Customer Program (X1-DACSELPGM)

Refer to Contextual Insights, Insight Groups, and Defining Insight Groups for more information about configuring insight groups.

Configuring the Program Dashboard

This section describes the process for configuring the **Program Dashboard**.

Refer to the Using the Program Dashboard section of the *Business User Guide* for more information on this functionality.

This dashboard leverages a method of pre-staging data known as Statistics Snapshots. See Understanding Statistics for more information on statistics snapshots.

Configuring the **Program Dashboard** includes the following:

Master Configuration

To access the Master Configuration portal select **Admin**, select **General**, then select **Master Configuration**.

Select the Program Dashboard Configuration master configuration.

Use the **Add** button beside the record to configure for the first time. If a record has already been added, then click the **Edit** button instead. Use the embedded help to guide you through the meaning of each configuration field.

This master configuration includes the following options:

- **Color Options**: Allows configuration of the colors used for Enrolled, Unenrolled, and Active data on the graph.
- **Chart Options**: The **Stacked Bars** option specifies if bar graphs for enrollments and unenrollments should display as stacked bars (checked) or as a part of side by side bars (unchecked).

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Configure Statistic Control and Statistic Snapshots

Statistic controls are the source for capturing the numbers of enrolllments, unenrollments, and active program subscriptions.

Statistic snapshots capture the numbers for each metric. Statistic controls are configuration records that define the specific types of metrics to capture.

Statistic snapshots are captured periodically via the F1-STATS (Statistics Control Monitor) batch program.

Configure the following Statistics Control records:

Statistics Control	Description	Category	Status	Snapshot Frequency Hours	Retention Mode	Snapshot Business Object
MONTHLY	Program Dashboard Statistics Control - Monthly	Operational	Active	24.00	Retain All Snapshots	Subscription Trend Snapshot - Monthly (X1-SubscriptionTrendMonthly)
WEEKLY	Program Dashboard Statistics Control - Weekly	Operational	Active	24.00	Retain All Snapshots	Subscription Trend Snapshot - Weekly (X1-SubscriptionTrendWeekly)

See Capturing Statistics for more information about statistics.

Configure Subscription Trend Snapshot Business Objects and Algorithms (Optional)

By default, the Subscription Trend Snapshot business objects are configured to capture 13 months of data per snapshot. This can be changed by adjusting the value of the “Period Bucket Limit” parameters on the Create Subscription Trend Snapshot algorithms (defined as Enter algorithms on the Complete state of the snapshot business objects).

The table below lists the snapshot business objects and their respective algorithms.

Snapshot Business Object	Create Subscription Trend Snapshot Algorithm
Subscription Trend Snapshot - Monthly (X1-SubscriptionTrendMonthly)	Create Subscription Trend Snapshot - Monthly (X1-CRESTS)
Subscription Trend Snapshot - Weekly (X1-SubscriptionTrendWeekly)	Create Subscription Trend Snapshot - Weekly (X1-CRESTSWKY)

Configure Statistics Control Business Object

The Statistics Control (F1-Statistics) business object should be configured to specify the "Statistics Control Monitor" batch control in the **Monitor Process** drop-down list on the "Active" state.

To configure this business object, do the following:

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1. Open the Statistics Control (F1-Statistics) business object in the **Business Object** portal.
2. Navigate to the **Lifecycle** tab, and expand the "Active" state.
3. Select "Statistics Control Monitor" from the **Monitor Process** drop-down list.
4. Click **Save**.

Batch Processing

The **Program Dashboard** dashboard is configured to be refreshed regularly (as frequently as daily). To refresh the data used in the dashboard, the F1-STATS batch process should be processed in sequence after other regularly schedule batch processing is complete to generate statistic snapshots based on statistic controls.

Use the following parameters when running this batch process:

- Maintenance Object (maintenanceObject): F1-STATS
- Restrict by Business Object (restrictToBusinessObject): F1-Statistics
- Restrict by Status Code (restrictToBOStatus): ACTIVE

Adding Custom Fields to Customer Program Process Flows

The Customer Program process flows provided with the base package, including enrollment and unenrollment, are based on predefined process flow types that, among other things, specify the data area used by each panel in the process flow. Implementations can add custom fields to process flow panels by extending the data areas used by each panel. This involves creating new data areas that reference the existing data areas associated with each panel as an "Extended Data Area".

To extend a process flow:

- Identify the fields to be added. If needed, create the new fields and other related data, such as lookups, extendable lookups, and so on. Refer to Fields for more information about fields.
- Create a new data area.
  - Specify the data area you wish to extend in the **Extended Data Area** field.
  - Define the new fields in the schema of your new data area.
  - Refer to Data Areas for more information about creating data areas.

Process Flow Types and Data Areas

This section provides details around the data areas used with the Digital Asset process flow types.

The process flow types provided with the base package include:

- Program Enrollment Process (X1-DIGITALASSETENROLLMENT)
- Program Unenrollment Process (X1-DIGITALASSETUNENROLLMENT)
- Program Program Service Call Process (X1-DAPROGRAMSERVICECALL)

The tables below list the data areas defined in these process flow types. These are the data areas that can be extended as needed. For example, to add custom fields to the Program Enrollment panel, you would extend the Digital Asset Enrollment - Program (X1-DAEnrollEligibility) data area.

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Enrollment Process Flow Data Areas

The table below lists the base package data areas used by each panel for the Digital Asset Enrollment Process (X1-DIGITALASSETENROLLMENT) process flow type.

Process Flow Panel	Data Area
Customer	Digital Asset Enrollment - Customer (X1-DAEnrollCustomer)
Program Enrollment	Digital Asset Enrollment - Program (X1-DAEnrollEligibility)
Related Program Enrollment	Digital Asset Enrollment - Related Program (X1-DAEnrollRelatedProgram)
Device Setup	Digital Asset Enrollment - Device Setup (X1-DAEnrollDeviceSetup)
Summary	Digital Asset Enrollment - Summary (X1-DAEnrollSummary)

Unenrollment Process Flow Data Areas

The table below lists the base package data areas used by each panel for the Digital Asset Unenrollment Process (X1-DIGITALASSETUNENROLLMENT) process flow type.

Process Flow Panel	Data Area
Customer	Digital Asset Unenrollment - Customer (X1-DAUnenrollCustomer)
Program Enrollment	Digital Asset Unenrollment - Program (X1-DAUnenrollProgram)
Device Setup	Digital Asset Unenrollment - Device Setup (X1-DAUnenrollDeviceSetup)
Summary	Digital Asset Unenrollment - Summary (X1-DAUnenrollSummary)

Program Service Call Process Flow Data Areas

The table below lists the base package data areas used by each panel for the Digital Asset Program Service Call Process (X1-DAPROGRAMSERVICECALL) process flow type.

Process Flow Panel	Data Area
Customer	Digital Asset Program Service Call Customer (X1-DAProgramServiceCallCust)
Trouble Report	Digital Asset Program Service Call Action (X1-DAProgramServiceCallAction)
Summary	Digital Asset Program Service Call Summary (X1-DAProgramServiceCallSummary)

Defining Other Related Options

Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management both share significant functionality with Oracle Utilities Work and Asset Management. The following administrative options are also available with Oracle Utilities Digital Asset Cloud Service and Oracle Utilities Customer Program Management.

Organizations

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Compliance

Service History

Asset Management

Operational Device Management

Inventory

Purchasing

Work Options

Preventive Maintenance

Scheduling

Approvals

Financials

Configuration Options

> **Note**
>
> Menu items for some features in the above functional areas may may have moved in Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Digital Asset Management. To access to a specific menu item, enter a forward slash ("/") followed by the name of the menu item in the **Unified Search** field. For instance, to access the "**Asset Type, Search**" menu item, you could enter "/asset type" (the search is case-insensitive) in the **Unified Search** field, and select "Asset Type" from the list that appears below the text field.

Customer Program Management Integrations

This section describes options for integrating Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management with other systems.

- Customer Program Management Cloud Service / Customer Program Management Inbound Web Services
- Grid Edge Distributed Energy Resources Management System Integrations
- Oracle Utilities Customer Cloud Service Integrations
- Oracle Field Service Integrations
- Customer Information System Integrations
- Analytics Application Integrations
- Importing Data from External Systems
- Extracting M&V Data for use in External Systems

Customer Program Management Cloud Service / Customer Program Management Inbound Web Services

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Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management include inbound web service REST APIs that can be used for customer enrollment and unenrollment, managing event participation, and other processes. Refer to Inbound Web Services for general information about inbound web service options.

Use the **Inbound Web Service** portal to view additional details about these web services and their supported operations.

Program Enrollments

The Program Enrollments (X1-ProgramEnrollment) inbound web service can be used to enable submission of program enrollment and unenrollment requests from external systems such as a customer information system. This web service includes the following operations:

- Create Program Enrollment (enrollProgram): Used to create an enrollment request to enroll a customer in a program
- Create Program Unenrollment (unenrollProgram): Used to create an unenrollment request to unenroll (remove) a customer from a program
- Enroll Additional Device (enrollDevice): Used to create a service task to add a device to an existing program enrollment
- Get Program Enrollment (getProgramEnrollment): Used to retrieve enrollment information
- Get Program Unenrollment (getProgramUnenrollment): Used to retrieve unenrollment information
- Post Acknowledgement (postAcknowledgement): Used to send an acknowledgement containing a list of devices and their corresponding Head End Registration Status.

See About Enrollment and Unenrollment in the *Business User Guide* for more information about the processes used to enroll and unenroll customers in programs.

Program Event

The Program Event (X1-ProgramEvent) inbound web service can be used to create and update program events from external systems such as an advanced distribution management system (ADMS) such as Oracle Utilities Network Management System or a supervisory control and data acquisition (SCADA) system. This web service includes the following operations:

- Create Program Event (createProgramEvent): Used to create program events. Program events begin in the "Scheduled" state (Created in Pending, but auto-transitions to "Scheduled")
- Action Program Event (actionProgramEvent): Used to transition event to different states, such as In Progress, Complete, or Cancelled.

See See About Program Events in the *Business User Guide* for more information about program events.

Program Event Participation

The Program Event Participation (X1-ProgramEventParticipation) inbound web service can be used to send event participation data from external systems such as an advanced distribution management system (ADMS) such as Oracle Utilities Network Management System or a supervisory control and data acquisition (SCADA) system. This web service includes the following operations:

- Reserve Device (reserveDevice): Used to "reserve" devices for an upcoming event by creating records in the Event Participation table. This process can also create an event if it doesn't already exist.

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- Post-Event Update (postEventOutcome): Used to update device event participation records with the outcome of the event

See About Event Participation in the *Business User Guide* for more information about event participation.

Program Eligibility and Qualification Questions

The Program Eligibility and Qualification Questions (X1-ProgramEligibilityAndQualification) inbound web service can be used to retrieve the eligible programs for a customer, each program's questions that will be asked to the customer during the enrollment process, and expected answers from a customer in order to qualify in the program. This web service includes the following operations:

- Get Eligible Programs (getEligiblePrograms): Used to retrieve the eligible programs for a customer
- Get Informational Questions (getInformationalQuestions): Used to retrieve a program's informational questions used in the enrollment process, and expected answers from a customer.
- Get Qualification Questions (getQualifyingQuestions): Used to retrieve a program's qualification questions used in the enrollment process, and expected answers from a customer in order to qualify in the program

See About Programs in the *Business User Guide* for more information about program qualification and eligibility.

Controllable Device Status

The Controllable Device Status (X1-ControllableDeviceStatus) inbound web service can be used to receive the status of a controllable device from an external application. This web service includes the following operations:

- Post Controllable Device Status Check (postControllableDeviceStatus): Used by an external application to send the status of a controllable device

See About Controllable Assets and Devices in the *Business User Guide* for more information about controllable devices.

Current Program Enrollment

The Current Program Enrollment (X1-CurrentProgramEnrollment) inbound web service can be used to retrieve the current program enrollment for the specified customer. This web service includes the following operations:

- Retrieve Program Enrollment (retrieveProgramEnrollment): Used to retrieve the current program enrollment for the specified customer

See About Enrollment and Unenrollment in the *Business User Guide* for more information about the processes used to enroll and unenroll customers in programs.

Program Context

The Program Context (X1-ProgramContext) inbound web service can be used to retrieve customer context information comprising name value pairs, which can help indicate various programs in which the customer may be enrolled. This web service includes the following operations:

- Get Program Context (getProgramContexts): Used to retrieve the program context for a customer

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See About Enrollment and Unenrollment in the *Business User Guide* for more information about the processes used to enroll and unenroll customers in programs.

Appointment Tasks

The Appointment Tasks (X1-AppointmentTasks) inbound web service can beused to request and track appointments related to service order field activities for the customer via self-service portals. This web service includes the following operations:

- Book Appointment (bookAppointment): Used to book an appointment
- Cancel Appointment (cancelAppointment): Used to cancel an appointment
- Retrieve Pending Tasks (retrievePendingTasks): Used to retrieve a list of pending tasks
- Search Appointment Slots (searchAppointmentSlots): Used to search for available appointment slots
- Search For Tasks (searchForTasks): Used to search for tasks

Work Activity Appointment Tasks

The Work Activity Appointment Tasks (X1-WorkActivityAppointmentSlots) inbound web service can be used to request and schedule appointment slots related to work activities. This web service includes the following operations:

- Get Work Activity Appointment Slots (getAppointmentSlots): Used to get available appointment slots for a work activity
- Schedule Activity (scheduleAppointment): Used to schedule an appointment for a work activity

DER Device Management

The DER Device Management (X1-DERDeviceManagement) inbound web service can be used to perform registration and/or enrollment of Distributed Energy Resource (DER) devices. This web service includes the following operations:

- Register DER Device (registerDERDevice): Used by an external application to register and enroll a DER device. This operation creates a DER asset and device, as well as an enrollment service task to enroll the device in a program specified in the inbound web service request, or if a program is not provided based on the specification defined for the asset. The enrollment service task is created in the "Pending" state. The service task should be processed either manually or via the Service Task Monitor (Deferred) (F1-STKDF) batch process.
- DER Interconnection (interconnectDER): Used by an external application to send interconnection attributes of a DER asset from an external system that handles the interconnection process for the utility. The incoming data is validated against existing asset manufacturer and model combinations, leading to the creation of an interconnection service task to allow the initial creation of the DER asset. Enrollment for assets that require interconnection attributes must be performed separately via the Register DER Device operation. The interconnection service task is created in the "Pending" state. The service task should be processed either manually or via the Service Task Monitor (Deferred) (F1-STKDF) batch process.

Registration of DER devices includes populating various attributes of the device and related specifications. Specification attribute and attribute values must be defined for the specification prior to registration of DER devices related to specification.

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See About Controllable Assets and Devices, Maintaining Controllable Assets and Device, and Maintaining Specifications in the *Business User Guide* for more information about controllable devices and where asset and specification attribute values are maintained.

Device Verification

The Device Location Verification (D1-DeviceVerificationService) SOAP inbound web service can be used to perform verification of equipment associated with a meter or service point. This service performs the following validations:

- **Device Validation:**
  - The device must exist for the given Serial Number and NIC ID.
  - The device must not currently be installed at any program location.
- **Program Location Validation**
  - The program location must exist.
  - The program location must be associated with the provided service point.

Grid Edge Distributed Energy Resources Management System Integrations

The Oracle Utilities Customer Program Management Cloud Service Integration to Oracle Utilities Distributed Energy Resources Management System supports integration with Oracle Utilities Network Management System and other components of the Oracle Utilities DERMS solution. This integration provides the following functionality:

- **Enrollment Synchronization**: As customers are enrolled in programs, enrollment data is synchronized with Oracle Utilities Network Management System.
- **Enrollment Request**: When customers enroll controllable devices in a program through a head end system provider or aggregator/vendor, enrollment requests are sent to Oracle Utilities Live Energy Connect, which then sends the enrollment request to Oracle Utilities Customer Program Management Cloud Service or Oracle Utilities Customer Program Management.
- **Device Data Synchronization**: As controllable devices are created and updated, device data is synchronized with Oracle Utilities Network Management System. When Distributed Energy Resource (DER) devices are registered and created, device data includes asset and specification attributes and values. When device data is synchronized, Oracle Utilities Network Management System sends an acknowledgement containing a list of devices and their corresponding Head End Registration Status and the appropriate devices are updated accordingly. If devices are grouped via Entity Groups, grouping information is included in the device data synchronized with Oracle Utilities Network Management System.
- **Device Population Synchronization**: As device population groups are created and updated, device population data is synchronized with Oracle Utilities Network Management System. When device population data is synchronized, Oracle Utilities Network Management System sends an acknowledgement and the device population group is updated to reflect successful synchronization.
- **Customer and Device Unavailability**: If customers and their controllable devices are deemed unavailable to participate in program events via Customer Unavailability events, customer unavailability information is sent to Oracle Utilities Network Management System. If changes are later made to a customer unavailability period, those changes are sent to Oracle Utilities Network Management System.
- **DER Aggregator Data Synchronization**: As DER Aggregators are created and updated, aggregator data is synchronized with Oracle Utilities Network Management System. DER

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Aggregator data synchronization includes contact and program offering information. Note that deletion of DER Aggregators does **not** trigger data synchronization.

- **Control Score Extract**: Device control scores are extracted and sent to Oracle Utilities Network Management System on a daily basis. DERMS operators use this control score information (in addition to other data) to identify sets of devices that should participate in program events. Note that devices associated with programs whose program type has a **Program Category** of "DER Registration" are excluded from control score calculations and extract.
- **Event Participation**: Oracle Utilities Network Management System sends device reservation information to create event participation records (and events if they don't already exist in the system). If a customer opts out of an event, a notification is sent to Oracle Utilities Network Management System to exempt the device from the event.
- **Event Outcome - Device Score Calculation**: Oracle Utilities Grid Edge Distributed Energy Resources Management System sends event outcome details after scheduled events. This ensures that the actual program event participation outcome for each controllable device is correctly updated and can be factored into the controllable device score calculation.
- **Program Rule Synchronization:** When a Device Score rule is added to program, or an existing Device Score Program Rule associated with a program is edited, program rule data is synchronized with Oracle Utilities Network Management System.

Refer to the **Oracle Utilities Customer Program Management Cloud Service Integration to Oracle Utilities Distributed Energy Resources Management System** documentation for more information about this integration.

Oracle Utilities Customer Cloud Service Integrations

The Oracle Utilities Customer Cloud Service Integration to Oracle Utilities Customer Program Cloud Service supports integration with Oracle Utilities Customer Cloud Service. This integration provides the following functionality:

- Initial and incremental extract of customer data including persons, service points, and service agreements from Oracle Utilities Customer Cloud Service (or Oracle Utilities Customer to Meter or Oracle Utilities Customer Care and Billing). See **Customer Data Extract** in the *Oracle Utilities Customer Cloud Service User Guides* for more information about this process.
- Initial and incremental import of customer data into Oracle Utilities Customer Program Management Cloud Service. See Importing Customer-Related Data from a Customer Information System for details regarding this process. Customer Program Management Cloud Service can be configured to send an acknowledgement to Customer Cloud Service upon import of customer data.

Refer to the Oracle Utilities Customer Cloud Service Integration to Oracle Utilities Customer Program Cloud Service documentation for more information about this integration.

Oracle Field Service Integrations

The Oracle Utilities Customer Program Management Cloud Service Integration to Oracle Field Service supports integration with Oracle Field Service. This integration provides the following functionality:

- **Work Activity Request**: Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management creates work orders and associated

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work activities as part of the device setup step within the enrollment or unenrollment process for utility-owned controllable devices. Work activities can also be created for supporting investigation work as part of troubleshooting. These work activities contain customer contact information, information about any related programs, and key information related to the type of work, the work window, its duration, required crew, and details to be captured during the work. Work activities are sent to Oracle Field Service so that crews can be assigned as appropriate.

- **Work Activity Completion**: When the work activities are completed, Oracle Field Service sends work completion details back to Oracle Utilities Customer Program Management Cloud Service and Oracle Utilities Customer Program Management, which in turn continues processing of the enrollment or unenrollment request.

Refer to the **Oracle Utilities Customer Program Cloud Service Integration to Oracle Field Service** documentation for more information about this integration.

Customer Information System Integrations

This section describes integrations with customer information systems such as Oracle Utilities Customer to Meter or Oracle Utilities Customer Cloud Service.

- Sending Customer Settlement Transaction Requests
- Downloading Customer Settlement Transactions

Sending Customer Settlement Transaction Requests

Customer settlement transactions are created upon requests from a customer information system (CIS). Customer settlement transaction requests are sent in a file which is processed by a batch process which creates the individual customer settlement transactions. Customer settlement transaction requests include the customer contact or account or metered service, the program, the start and end date for the requested time period, and the type of request.

See About Customer Settlement Transactions for more information.

Uploading Customer Settlement Transaction Requests

Customer settlement requests are uploaded using the Customer Settlement Transaction Upload (X1-CSTUP) batch process. This batch process uploads data from a .tab-delimited file. For each data row in the file, this process creates a Customer Settlement Transaction record.

This batch processes use the following parameters:

- **File Name**: The name of the file to upload. File names can use wildcards (Required)
- **Flat Path**: The file location where the upload file is located. This can be a file location on a local server or a location in Object Storage. See Referencing URIs in the *Framework Administrative User Guide* for more information. (Required)
- **Processed File Extension**: The text appended to the file name after the file has been processed. Default is "PROCESSED".
- **Error On No Files Found**: Indicates whether or not an error is issued if no files are found matching the given name in the given path. Valid values are "true" (default) and "false".

Use the **Batch Control** portal to learn more about these and other parameters used by these batch process.

Customer Settlement Request Upload File Format

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Customer settlement request upload files use the following tab-separated values format:

Field Name	Optional/Required	Notes
External Settlement Request ID	Required	An id for the customer settlement request from the CIS application.
External Contact ID*	Required*	The external id of the customer for which the Customer Settlement will be created. For requests from Customer Care and Billing or Customer to Meter, this is the Person ID.
External Account ID*	Required*	The external id of the account for which the Customer Settlement will be created. For requests from Customer Care and Billing or Customer to Meter, this is the Account ID.
External Metered Service ID*	Required*	The external id of the metered service for which the Customer Settlement will be created. For requests from Customer Care and Billing or Customer to Meter, this is the Service Agreement ID.
External Program ID	Required	The external ID of the program for which the Customer Settlement will be created. This is used for filtering in case the customer is enrolled in multiple programs.
Start Date	Required	The date on which the customer settlement period starts. This assumes a start time at the start of the day.
End Date	Required	The date on which the customer settlement period ends. This assumes a start time at the end of the day.
Customer Settlement Request Type	Required	A flag that indicates the type of customer settlement request. Valid values are values for the Customer Settlement Request Type (EVT_SETT_REQ_TYPE_FLG) lookup, and include: • D1FL (Final) • D1PC (Periodic) • D1RL (Rebill) • D1UT (Unenrollment)
Included Transactions	Required	A flag that indicates the types of transactions included in the customer settlement. Valid values are values for the Included Transaction (INCLUDED_TRANSACTION_FLG) lookup, and include: • X1BO (Both) • X1EV (Event Settlement) • X1IF (Incentive and Fee)

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* Only 1 of the fields markers with an asterisk (*) can be included:

- If the External Contact ID is provided, the system evaluates all Metered Services for the contact.
- If the External Account ID is provided, the system evaluates all Metered Services for the account.
- If the External Metered Service ID is defined as a Settlement Group on a Program Subscription, the Customer Settlement is run with the **Settlement Aggregation Method** set to "Grouped". See About Customer Settlement Transactionsfor more information.

Sample Record

Below is a sample file:

```
Tmp5    MBFEXT0605_1    PRG002    2023-04-06    2023-04-07    D1FL    X1EV
```

Downloading Customer Settlement Transactions

Customer settlement transactions can be downloaded for import into a customer information system via a batch process which creates a delimited file containing customer settlement transaction information.

See About Customer Settlement Transactions for more information about customer settlement transactions.

Batch Control

Customer settlement transactions are downloaded using the Customer Settlements Extract (X1-CSEXT) batch process. This batch process downloads data into a delimited file, the details of which are specified by the batch control parameters.

This batch processes use the following parameters:

- **File Integration Type**: The file integration type (see below) used to extract customer settlement transactions (see below).
- **File Name**: The name of the downloaded file. File names can use wildcards (Required)
- **File Path**: The file location to which the file will be downloaded. This can be a file location on a local server or a location in Object Storage. See Referencing URIs in the *Framework Administrative User Guide* the for more information. (Required)
- **File Format**: The extract file format. Valid values are CSV (delimited) FIXD (fixed position output) or XML (XML document).
- **File Delimiter**: The delimiter to use for the CSV file format
- **Start Date (optional)**: A date that specifies the start of the date range for which customer settlement transactions are extracted. Used with the End Date parameter.
- **End Date (optional)**: A date that specifies the end of the date range for which customer settlement transactions are extracted. Used with the Start Date parameter.
- **External Account Id (optional)**: An external account ID used to restrict the customer settlements transactions extracted to those for the specified account.
- **Extract Option**: Flag used to re-extract previously extracted customer settlements. Valid values include:

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- **Y**: Used to Re-extract only previously extracted customer settlement transactions that match other criteria. This should only be used when specifying a Start/End Date.
- **N**: Not Re-Extract (default)

Use the **Batch Control** portal to view additional details about these parameters.

File Integration Type

The customer settlement transaction extract process uses the Customer Settlements Extract (X1-CustomerSettlementExtract) file integration type, defined as a parameter on the Customer Settlements Extract (X1-CSEXT) batch process.

Implementations that require a different extract format can create a custom file integration type that defines their own extract format and process. This includes creating a custom extract algorithm and a custom extract data area.

Refer to Extract Using File Integration for more information about the role of file integration types.

Extract Algorithm Parameters

The Customer Settlements Extract (X1-CustomerSettlementExtract) file integration type uses the Customer Settlements Extract (X1CUSTSETEXT) algorithm to extract customer settlement transactions. This algorithm includes a "Line Charge Option" parameter with the following options:

- **A** (Aggregated): The algorithm outputs a single line charge from aggregated program settlements
- **D** (Detailed): The algorithm outputs lines charges for each program settlement

The default setting for this parameter is "D", but this can be overridden if needed by creating a new algorithm version and changing the value of this parameter.

File Format

The file format of the extract file is defined by the Customer Settlements Extract (X1-CustomerSettlementExtract) data area (specified on the Customer Settlement Extract (X1-CustomerSettlementExtract) file integration record on the Customer Settlements Extract (X1-CustomerSettlementExtract) file integration type.

Customer settlement transaction extract files use the following format:

Field Name	Mapping	Notes
Start Date	Customer Settlement Start Date	
End Date	Customer Settlement End Date	
Account Id	Metered Service External Account Id	
External Id	Customer Settlement Id	
Description		This will be derived message: Customer Settlement for Period (%1 - %2)
Program Code		
Saved Consumption		
Actual Consumption		
Number of Events		

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<table>
<tr><th>Field Name</th><th>Mapping</th><th>Notes</th></tr>
<tr><td>Line Charges

<table><tr><th>Field Name</th><th>Mapping</th></tr><tr><td>Sequence</td><td>Generated</td></tr><tr><td>Line Description</td><td>Program Settlement Line Description</td></tr><tr><td>Amount</td><td>Program Settlement Amount * -1</td></tr><tr><td>Line Charge External Id</td><td>Event Settlement Id</td></tr></table></td><td></td><td>This column contains the list of program event settlement and incentives and fees settlement amounts.

Each settlement row is delimited by a semi-colon (;) and each row column is delimited by comma (,).

Depending on the extract algorithm, this list will contain 1 row for Aggregated extract option or many for Detailed extract option (default).</td></tr>
</table>

Note that this format is patterned after the format used by the Billable Charge Upload Staging Table used by Oracle Utilities Customer Care and Billing, Oracle Utilities Customer to Meter, Oracle Utilities Customer Cloud Service, and Oracle Utilities Billing Cloud Service.

Analytics Application Integrations

Integration with external analytics applications provide the following functionality:

- Program Settlement Creation: The external analytics application sends files which contain the actual consumption or demand reductions achieved for the duration of the event for each customer. These records are used to determine financial settlement data. There are two types of these files:
  - "KWH Avoided" files contain consumption reduction values. See Processing KWH Avoided Files for more information.
  - "KW Drop" files contain demand reduction values. See Processing KW Drop Files for more information.
- Processing KWH Avoided Files
- Processing KW Drop Files

Processing KWH Avoided Files

An external analytics application sends "kWh avoided" files containing the actual energy reduction achieved for the duration of the event for each customer, which can be used to determine financial settlement data. These files consist of comma separated records for each participating metered service point which are sent to Oracle Cloud Object Storage. A batch process imports these files and creates business flags that capture the data for each metered service point. This section describes how the application processes these "kWh avoided" files.

KWH Avoided File Format

"kWh avoided" files use the following comma values format:

Field	Description	Example
EventId	ID of the program event	4011

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Field	Description	Example
EventType	The program event type	Economic
ProgramId	The Program ID for the event	1234512345
SPId	The Metered Service Point ID	1122334455
ActualStartTime	Start time of the event	2022-12-13T14:30:00-05:00
ActualEndTime	End time of the event	2022-12-13T16:30:00-05:00
IntervalSize(Seconds)	The interval size of the interval values included, represented in seconds.	900
TotalkWh	The total kWh for the event period	75.00
TotalKwhSavedForPeriod	The total kWh saved for the event period	33.00
KwhSaved<n>	Individual interval values that comprise the total kWh saved for the event period. The number of interval values is based on the duration of the event divided by the interval size.	1: 5.00 2: 3.00 3: 2.00 4: 2.00 5: 3.00 6: 8.00 7: 6.00 8: 4.00

Below is a sample file, based on the example data above:

```
EventId,EventType,ProgramId,SPId,ActualStartTime,ActualEndTime,IntervalSize(Se
conds),TotalKwh,TotalKwhSavedForPeriod,KwhSaved1,KwhSaved2,KwhSaved3,KwhSaved4
,.....
4011,Economic,1234512345,1122334455,2022-12-13T14:30:00-05:00,2022-12-13T16:30
:00-05:00,900,75.00,33.00,5.00,3.00,2.00,2.00,3.00,8.00,6.00,4.00
```

Batch Processing

"kWh avoided" files are processed using the kWh Avoided Business Flag Upload (X1-KWHAV) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be scheduled to run on a regular basis.

This batch processes uses the Create kWh Avoided Business Flag (X1-KWHAVDBUS) algorithm (defined for the "File Upload" **System Event** on the **Algorithms** tab of the **Batch Control** portal). This algorithm uses the following parameters:

- **Business Flag Standard Name**: The Standard Name (X1-KWHAVOIDED) used to identify the Business Flag Type for business flags created by the batch process. See Understanding Business Flags and Standard Name for more information about business flag standard names.
- **Interval Data Condition Value**: The usage transaction service quantity condition code for the interval data values captured in the business flag, from the Usage Transaction SQ Interval Condition (D2-UTSQIntvlConditionLookup) extendable lookup

Note that these parameter values cannot be changed. Implementations wishing to use alternative values for these parameters must create their own version of this algorithm and add the customer algorithm to the batch control.

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KWH Avoided Business Flags

The kWh Avoided Business Flag Upload (X1-KWHAV) batch process creates business flags for each metered service point in the "kWh avoided" files sent from an external analytics application. These business flags are created using the kWh Avoided Business Flag (X1-KWhAvdBusinessFlag) business object.

"kWh avoided" business flags include the following:

- **Business Flag Type**: The business flag type on which the business flag is based. Business flag types specify details for business flags of a certain type.
- **Status**: The current status of the business flag
- **Metered Service Point ID**: The metered service point associated with the business flag
- **Business Flag Date/Time**: The date and time the business flag was created. Note that this is not related to the time period of the interval data values contained in the record.
- **Actual Start Date/Time**: The start date and time of the event
- **Actual End Date/Time**: The end date and time of the event
- **Initiating System**: the system that created the business flag. When blank it indicates the business flag was created internally.
- **External Information**: Identifiers received from the system that initiated the business flag
  - **Event External Identifier**: External ID for the event
  - **Program External ID**: The program's external ID
  - **Source File ID**: An ID used to group business flags that were received in the same file
  - **External Reference System**: an alternate reference for the external system. This is used to identify the initiating system.
  - **External Service Point ID**: the identifier for the service point in the initiating system
- **Details**: Details of the program event that resulted in the actual energy reduction, including:
  - **Program Settlement Processed**: A flag that indicates if an program settlement transaction has been created from this business flag. Note that this is only visible when editing the business flag.
  - **Program Event ID**: ID for the program event
  - **Program Event Category**: The event's category
  - **Status**: The status of the data import. Can be one of the following:
    - **Success**: The import contained a Total KWh value and all interval values
    - **Partial**: The import contained a Total kWh value and some interval values
    - **Failure**: The import contained a Total kWh value but no interval values
  - **Total kWh**: The service point's total energy (in kWh) for the event.
  - **Total kWh avoided**: The service point's total energy reduction (in kWh) for the event. If the Status is "Success" this value should equal the total of the interval values listed below.
  - **Interval Size**: The interval size of the interval values included, represented as hh:mm:ss (hours:minutes:seconds)

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- **Interval Data**: A table listing the individual interval values that comprise the energy reduction. Each interval value is defined by:
  - **Sequence**: The sequence number for the interval value. The number of interval values should equal the duration of the event divided by the interval size. For example, for an event that last 2 hours with an interval size of 15 minutes, there would be 8 interval values.
  - **Date/Time**: The date and time of the interval value. Note that the first interval value should have a **Date/Time** equal to the **Actual Start Date/Time**.
  - **Quantity**: The interval value, in kWh. The total of these values should equal the **Total kWh avoided** value above.
  - **Interval Condition Value**: The usage transaction service quantity condition assigned to the value (from the **Interval Data Condition Value** parameter on the Create kWh Avoided Business Flag (X1-KWHAVDBUS) algorithm).

KWH Avoided Business Flag Processing

When "kWh avoided" business flags enter the "Additional Processing" state, the Program Settlement Creation (X1-EVTSETCR) algorithm creates a program settlement transaction based on the details contained in the business flag. If the Interval Size (Seconds) on the business flag is different from the Interval Size defined on the business flag type, the interval values are converted to match the interval size defined on the business flag type.

For example, a business flag contains the following 15-minute interval values (Interval Size of 900 seconds):

Date/Time	Value
2022-12-13T14:00:00	5.00
2022-12-13T14:15:00	3.00
2022-12-13T14:30:00	2.00
2022-12-13T14:45:00	2.00
2022-12-13T15:00:00	3.00
2022-12-13T15:15:00	8.00
2022-12-13T15:30:00	6.00
2022-12-13T15:45:00	4.00

If the Interval Size defined on the business flag type is 1-hour intervals (Interval Size of 01:00:00), the 15-minute interval values would be summed to create the following 1-hour interval values.

Date/Time	Value
2022-12-13T14:00:00	12 (the sum of the first four 15-minute interval values)
2022-12-13T15:00:00	21 (the sum of the second four 15-minute interval values)

KWH Avoided Business Flag Types

You must create a business flag type that references the business flag Standard Name and business flag business object to be used when creating business flags, as well as the unit of measure, time of use period, and service quantity identifier combination used to define the interval usage values on program settlement transactions created from business flags. This should be creating using the kWh Avoided Business Flag Type (X1-KWhAvdBusinessFlagType) business object, and should contain the following:

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- **Business Flag Type**: A code for the business flag type.
- **Standard Name**: The business flag standard name for business flags based on this type. This should be kWh Avoided (X1-KWHAVOIDED).
- **Related Transaction BO**: The business object used for business flags based on this type. This defaults to kWh Avoided Business Flag (X1-KWhAvdBusinessFlag) and should not be changed unless your implementation has created its own "kWh avoided" business flag business object.
- **Default Priority**: The default priority assigned to business flags based on this type. This is used to prioritize processing of business flags based on this type relative to other business flags.
- **Status**: The status of the business flag type. Business flags are created only from "Active" business flag types.
- **Description**: A description of the business flag type. This is used in information strings for the business flag type.
- **UOM/TOU/SQI**: Parameters that define how the "kWh avoided" interval values will be represented on program settlement transactions created from business flags of this type
  - **UOM**: The unit of measure used to define how the "kWh avoided" interval values will be represented on program settlement transactions
  - **TOU**: The time of use period used to define how the "kWh avoided" interval values will be represented on program settlement transactions
  - **SQI**: The service quantity identifier used to define how the "kWh avoided" interval values will be represented on program settlement transactions
  - **Interval Size**: The size of the "kWh avoided" interval values created on program settlement transactions, represented as hours:minutes:seconds (HH:MI:SS). This should match the interval size used for interval price sets.

See Understanding Business Flags for more information about business flags and business flag types.

Processing KW Drop Files

An external analytics application sends "kW drop" files containing the demand reductions achieved for the duration of an event for each customer, which can be used to determine financial settlement data. These files consist of comma separated records for each participating metered service point which are sent to Oracle Cloud Object Storage. A batch process imports these files and creates business flags that capture the data for each metered service point. This section describes how the application processes these "kW drop" files.

KW Drop File Format

"kW drop" files use the following comma values format:

Field	Description	Example
EventId	ID of the program event	5011
ProgramId	The Program ID for the event	1234512345
SPId	The Metered Service Point ID	1122334455
ActualStartTime	Start time of the event	2022-12-13T14:30:00-05:00
ActualEndTime	End time of the event	2022-12-13T16:30:00-05:00

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Field	Description	Example
IntervalSize(Seconds)	The interval size of the interval values included, represented in seconds.	900
MaxKwDrop	The maximum kW drop value of the KwDrop values.	20.00
KwDrop<n>	Individual interval values that indicate the kW drop values during the event period. The number of interval values is based on the duration of the event divided by the interval size.	1: 5.00 2: 3.00 3: 20.00 4: 2.00 5: 6: 8.00 7: 8:

Below is a sample file, based on the example data above:

```
EventId,ProgramId,SPId,ActualStartTime,ActualEndTime,IntervalSize(Seconds),MaxKwDrop,KwDrop1,KwDrop2,KwDrop3,KwDrop4,.....
5011,1234512345,1122334455,2022-12-13T14:30:00-05:00,2022-12-13T16:30:00-05:00,900,20.00,5.00,3.00,20.00,2.00,,8.00,,
```

Batch Processing

"kW drop" files are processed using the kW Drop Business Flag Upload (X1-KWDRP) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be scheduled to run on a regular basis.

This batch processes uses the Create kW Drop Business Flag (X1-KWDROPBUS) algorithm (defined for the "File Upload" **System Event** on the **Algorithms** tab of the **Batch Control** portal). This algorithm uses the following parameters:

- **Business Flag Standard Name**: The Standard Name (X1-KWDROP) used to identify the Business Flag Type for business flags created by the batch process. See Understanding Business Flags and Standard Name for more information about business flag standard names.
- **Interval Data Condition Value**: The usage transaction service quantity condition code for the interval data values captured in the business flag, from the Usage Transaction SQ Interval Condition (D2-UTSQIntvlConditionLookup) extendable lookup

Note that these parameter values cannot be changed. Implementations wishing to use alternative values for these parameters must create their own version of this algorithm and add the customer algorithm to the batch control.

KW Drop Business Flags

The kW Drop Business Flag Upload (X1-KWDRP) batch process creates business flags for each metered service point in the "kW drop" files sent from an external analytics application. These business flags are created using the KW Drop Business Flag (X1-KWBusinessFlag) business object.

"kW drop" business flags include the following:

- **Business Flag Type**: The business flag type on which the business flag is based. Business flag types specify details for business flags of a certain type.

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- **Status**: The current status of the business flag
- **Metered Service Point ID**: The metered service point associated with the business flag
- **Business Flag Date/Time**: The date and time the business flag was created. Note that this is not related to the time period of the interval data values contained in the record.
- **Actual Start Date/Time**: The start date and time of the event
- **Actual End Date/Time**: The end date and time of the event
- **Initiating System**: the system that created the business flag. When blank it indicates the business flag was created internally.
- **External Information**: Identifiers received from the system that initiated the business flag
  - **Event External Identifier**: External ID for the event
  - **Program External ID**: The program's external ID
  - **Source File ID**: An ID used to group business flags that were received in the same file
  - **External Reference System**: an alternate reference for the external system. This is used to identify the initiating system.
  - **External Service Point ID**: the identifier for the service point in the initiating system
- **Details**: Details of the program event that resulted in the actual energy reduction, including:
  - **Program Settlement Processed**: A flag that indicates if an program settlement transaction has been created from this business flag. Note that this is only visible when editing the business flag.
  - **Program Event ID**: ID for the program event
  - **Program Event Category**: The event's category
  - **Status**: The status of the data import. Can be one of the following:
    - **Success**: The import contained a Total KWh value and all interval values
    - **Partial**: The import contained a Total kWh value and some interval values
    - **Failure**: The import contained a Total kWh value but no interval values
  - **Max kW Drop**: The maximum drop (in kW) for the event. This equals the maximum **Quantity** value from the values in the **Interval Data** section.
  - **Interval Size**: The interval size of the interval values included, represented as hh:mm:ss (hours:minutes:seconds)
  - **Interval Data**: A table listing the individual interval values that represent the demand reduction at each interval. Each interval value is defined by:
    - **Sequence**: The sequence number for the interval value. The number of interval values should equal the duration of the event divided by the interval size. For example, for an event that last 2 hours with an interval size of 15 minutes, there would be 8 interval values.
    - **Date/Time**: The date and time of the interval value. Note that the first interval value should have a **Date/Time** equal to the **Actual Start Date/Time**.
    - **Quantity**: The interval value, in kW. The maximum of these values should equal the **Max kW Drop** value above.
    - **Interval Condition Value**: The usage transaction service quantity condition assigned to the value (from the **Interval Data Condition Value** parameter on the Create kWh Avoided Business Flag (X1-KWHAVDBUS) algorithm).

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KW Drop Business Flag Processing

When "kW drop" business flags enter the "Additional Processing" state, the KW Drop Program Settlement Creation (X1-KWEVTSTCR) algorithm creates a program settlement transaction based on the details contained in the business flag. If the Interval Size (Seconds) on the business flag is different from the Interval Size defined on the business flag type, the interval values are converted to match the interval size defined on the business flag type.

KW Drop Business Flag Types

You must create a business flag type that references the business flag Standard Name and business flag business object to be used when creating business flags, as well as the unit of measure, time of use period, and service quantity identifier combination used to define the interval usage values on program settlement transactions created from business flags. This should be creating using the KW Drop Business Flag Type (X1-KWDropBusinessFlagType) business object, and should contain the following:

- **Business Flag Type**: A code for the business flag type.
- **Standard Name**: The business flag standard name for business flags based on this type. This should be kW Drop (X1-KWDROP).
- **Related Transaction BO**: The business object used for business flags based on this type. This defaults to KW Drop Business Flag (X1-KWBusinessFlag) and should not be changed unless your implementation has created its own "kW drop" business flag business object.
- **Default Priority**: The default priority assigned to business flags based on this type. This is used to prioritize processing of business flags based on this type relative to other business flags.
- **Status**: The status of the business flag type. Business flags are created only from "Active" business flag types.
- **Description**: A description of the business flag type. This is used in information strings for the business flag type.
- **UOM/TOU/SQI**: Parameters that define how the "kW drop" interval values will be represented on program settlement transactions created from business flags of this type
  - **UOM**: The unit of measure used to define how the "kW drop" interval values will be represented on program settlement transactions
  - **TOU**: The time of use period used to define how the "kW drop" interval values will be represented on program settlement transactions
  - **SQI**: The service quantity identifier used to define how the "kW drop" interval values will be represented on program settlement transactions
  - **Interval Size**: The size of the "kW drop" interval values created on program settlement transactions, represented as hours:minutes:seconds (HH:MI:SS).

See Understanding Business Flags for more information about business flags and business flag types.

Importing Data from External Systems

This section describes how data from external systems can be imported. This includes customer-related data such as contacts, metered service points, and metered services, as well as device and enrollment data including controllable devices, device locations, enrollments, and event participation records.

- Importing Customer-Related Data from a Customer Information System

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- Importing Device and Program Enrollment Data from a Demand Response Management System (DRMS)
- Importing Facility and Network Location Data from a Distributed Energy Resource System

Importing Customer-Related Data from a Customer Information System

Customer-related data includes contacts, metered service points, and metered services, and is usually imported from a customer information system such as Oracle Utilities Customer to Meter or Oracle Utilities Customer Cloud Service. Data to be imported is sent to a tab-delimited flat file, which is uploaded into the system via batch processing which creates inbound data synchronization (sync) requests. These sync requests are processed and validated by a monitor batch process, and then a separate batch process creates master data records from each.

Import Process Overview

This section provide an overview of the import process and outlines the various system objects used for each type of data (contacts, metered service points, and metered services). The overall process is as follows:

1. Data to be imported is exported from the CIS into a tab-delimited values file.
2. An "Upload" batch process is used to create inbound sync requests in the Pending state based on object-specific initial synchronization business objects. A separate inbound sync request is created for each row in the import file.
3. The inbound sync requests are processed using the Sync Request Monitor (F1-SYNRQ) batch process.
4. An "Initial Sync Request - Load" batch process is used to create individual master data records from each inbound sync request.

Initial Load vs. Incremental Uploads

Customer data can be uploaded in one of two modes: Initial Load or Incremental. The upload mode is defined by the Initial Load Sync Flag value in the upload file.

Initial Load uploads are used when setting up the system to import contact, metered service point, and metered service data from a customer information system such as Oracle Utilities Customer to Meter or Oracle Utilities Customer Cloud Service.

Incremental uploads are used to update customer data as customer data changes in the customer information system. Incremental uploads do NOT use "Import Sync Request - Load" batch processes. Records are added or updated automatically once validated.

Upload Batch Processes

Import files are uploaded using object-specific "Upload" batch processes. See Import Process Object Summary below for the specific "Upload" batch process used for each type of customer data. These should be run as needed for the initial import, as well as subsequent incremental updates.

These processes use the following parameters:

- **File Name**: The name of the file to upload. File names can use wildcards (Required)
- **Flat Path**: The file location where the upload file is located. This can be a file location on a local server or a location in Object Storage. See Referencing URIs in the *Framework Administrative User Guide* for more information. (Required)

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- **Processed File Extension**: The text appended to the file name after the file has been processed. Default is "PROCESSED".
- **Error On No Files Found**: Indicates whether or not an error is issued if no files are found matching the given name in the given path. Valid values are "true" (default) and "false".
- **External System**: The external system that created the upload file (Required)

Use the **Batch Control** portal to learn more about these and other parameters used by these batch processes.

Inbound Sync Request Business Objects

Inbound sync requests are created by the "Upload" batch processes, and are based on "Initial Sync Request" business objects. See Import Process Object Summary below for the specific "Initial Sync Request" business objects used for each type of customer data.

The table below outlines the stages of the inbound sync request lifecycle. Use the **Business Object** portal to learn more about these business objects and the details of each lifecycle state.

State	Notes
Pending	Inbound sync requests begin in this state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition sync requests in this state to the Transform/Validate state.
Transform/Validate	In this state the data is validated and transformed as needed for import. In this state values defined by lookups are derived from the data in the upload file via extendable lookups. Sync requests move from this state to either the Validated or Add/Update states, depending on the type of upload. See Initial Load vs. Incremental Uploads for more information.
Validation Error	Sync requests enter this state if an error occurs during validation in the Transform/Validate step. If a sync request needs to be updated manually, it can be put into this state via the **Correct** action in the **Record Actions** section.
Validated	Initial Load sync requests enter this state following validation in the Transform/Validate step. If corrections need to be made, users can use the **Correct** action in the **Record Actions** section to transition the record to the Validation Error state.
Add/Update	Incremental sync requests enter this state following validation in the Transform/Validate step, and records are either added or updated as appropriate.
Loaded	Initial Load sync requests enter this state when a record has been successfully loaded,
Synchronized	Incremental sync requests enter this state when a record has been successfully added or updated. The Create Acknowledgement (X1-CRESRACK) algorithm, defined as an Enter algorithm on this state, can be configured to send an acknowledgement to the system from which the imported data originated. This requires defining the **Outbound Message Type** parameter on the algorithm. The base package includes the Send Sync Request Acknowledgement (X1-SYNREQACK) outbound message type which can be used for this.

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State	Notes
Discarded	The sync request enters this state if the sync request is discarded from either the Validated or Validation Error state,

Initial Sync Request Load Batch Processes

Master data records are created from inbound sync requests using "Initial Sync Request - Load" batch processes. See below for the specific "Initial Sync Request - Load" batch processes used for each type of customer data. These should be run as needed for the initial import, as well as subsequent incremental updates.

Use the **Batch Control** portal to view the parameters used by these batch processes.

Import Process Object Summary

The table below lists the batch controls and business objects used by each type of customer data.

Import Order	Object Type	Upload Batch Process	Inbound Sync Request Business Object	Initial Sync Request Load Batch Process
1	Contact	Contact File Upload (X1-COUPL)	Contact Initial Sync Request (X1-DASyncReqContact)	Initial Sync Request - Load Contacts (X1-SILCO)
2	Metered Service Point	Metered Service Point File Upload (X1-MSPUP)	Metered Service Point Sync Request BO (X1-SyncReqMeteredSP)	Initial Sync Request - Load Metered SP (X1-SLMSP)
3	Metered Service	Metered Service File Upload (X1-MSUPL)	Metered Service Inbound Sync Request (X1-DASyncReqMeteredService)	Initial Sync Request - Load Metered Service (X1-SILMS)

> **Note**
>
> Customer data **must** be imported in the order listed above.

- Importing Contacts
- Importing Metered Service Points
- Importing Metered Services

Importing Contacts

This topic provides additional details related to importing contacts from a customer information system for use with Customer Program Management.

Contact Import File Format

Contact import files use the following tab-separated values format:

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Field Name	Optional/Required	Notes
External Reference Id	Optional	The contact's reference ID in the CIS application
Change Date Time	Optional	The date and time on which the contact was changed. Applicable only for Incremental Uploads Will be used to sequence processing in case there are multiple changes to the same contact.
Initial Load Sync Flag	Required	A value that indicates the type of upload. Valid values are: • F1IL - Initial Load • F1IC - Incremental
External Id	Required	The contact's ID in the CIS application. When importing data from Customer to Meter or Customer Cloud Service this is the Contact External ID.
Contact Type	Required	The type of contact. When importing data from Customer to Meter or Customer Cloud Service this will be either Person or Business. If the provided contact type has not been defined as a Program Contact Type, an extendable lookup is used to map this value to the Contact Type used.
Name	Required	The contact's name. For format for this is <FIRST_NAME> <LAST_NAME> (note the space between them.
Home Phone	Optional	A home phone number associated with person-type contacts.
Mobile Phone	Optional	A mobile phone number associated with person-type contacts.
Phone	Optional	A phone number associated with business-type contacts.
Email	Optional	An email address for the contact.
Life Support Sensitive Load	Required	A flag that indicates if the contact requires a Life Support Sensitive Load. Valid values are "true" and "false" An extendable lookup is used to map this value to the Life Support Sensitive Load flag used in Customer Program Management.
Life Support Sensitive Load Description	Optional	An optional description for Life Support Sensitive Load.
Is Erased	Optional	A flag that indicates if the contact has been obfuscated (if supported) in the CIS application. Valid values are Y/N (Default) Applicable only to Incremental Uploads This should be set to "N" if Object Erasure is not supported in the CIS application.

Sample Record

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Below is a sample file:

```
EXTREFCON11    2023-06-21T13:15:00-08:00    F1IC    EXTCONTACT1    P    John
Smith    (510)777-8888    (510)777-9090    (510)556-4556
johnsmith@gmail.com    false    None    N
```

Upload Batch Process

Contact import files are uploaded using the Contact File Upload (X1-COUPL) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import, as well as subsequent incremental updates.

This process creates inbound sync requests in the "Pending" state (see below).

The Contact File Upload (X1CONTUPLD) algorithm used by this batch process uses the following extendable lookups to map data in the import file to values defined in Customer Program Management:

- CCB Contact Type Mapping (D1-CCBContactTypeLookup)
- CCB Life Support Sensitive Load Mapping (D1-CCBLifeSupSensitiveLdLookup)

Values must be defined for these extendable lookups before import files can be uploaded and used with Customer Program Management.

Inbound Sync Request Business Object

Contact inbound sync requests are based on the Contact Initial Sync Request (X1-DASyncReqContact) business object.

Inbound sync requests are created in the "Pending" state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition these to the "Transform/Validate" state where the data is validated and transformed as needed for import. What happens next is based on the type of sync request:

- Initial Load sync requests then move to the "Validated" state (or "Validation Error" if an error is encountered). These are processed by an "Initial Sync Request Load" batch process (see below) .
- Incremental sync requests move to the "Add/Update" state in which algorithms add or update records as appropriate and then to the "Synchronized" state.
- The Create Acknowledgement (X1-CRESRACK) algorithm on the "Synchronized" state can be configured to send an acknowledgement to the system from which the imported data originated. This requires specifying the "Send Sync Request Acknowledgement" (X1-SYNREQACK) outbound message type for the **Outbound Message Type** parameter on the algorithm.

Initial Sync Request Load Batch Process

Contacts imported as part of an Initial Load upload are created from Initial Load inbound sync requests using the Initial Sync Request - Load Contacts (X1-SILCO) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import, as well as subsequent incremental updates.

This process transitions the inbound sync requests to the "Loaded" state.

Importing Metered Service Points

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This topic provides additional details related to importing metered service points from a customer information system.

Metered Service Point Import File Format

Metered service point import files use the following tab-separated values format:

Field Name	Optional/Required	Notes
External Reference Id	Optional	The metered service point's reference ID in the CIS application.
Change Date Time	Optional	The date and time on which the metered service point was changed. Applicable only for Incremental Uploads Will be used to sequence processing in case there are multiple changes to the same metered service point.
Initial Load Sync Flag	Required	A value that indicates the type of upload. Valid values are: • F1IL - Initial Load • F1IC - Incremental
External Id	Required	The metered service point's ID in the CIS application. When importing data from Customer to Meter or Customer Cloud Service this is the Service Point External ID.
Metered SP Type	Required	The type of metered service point. When importing data from Customer to Meter or Customer Cloud Service this comes from the Service Point Type. If the provided metered service point type has not been defined as a Metered Service Point Type an extendable lookup is used to map this value to the Metered Service Point Type used with Customer Program Management.
SP Source Status	Required	The metered service point's source status. Valid values are values for the Source Status (SP_SRC_STAT_FLG) lookup, and include: • D1CN (Connected) • D1DC (Disconnected)
Division	Optional	The metered service point's division. If the provided division has not been defined as a Division, an extendable lookup is used to map this value to the Division used with Customer Program Management.
External Premise Id	Optional	The ID of the premise associated with the metered service point in the CIS application.
Time Zone	Required	The time zone in which the metered service point is located.
Country	Optional	The country in which the metered service point is located.
Postal	Optional	The metered service point's postal code.
Address 1	Optional	The metered service point's address.

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Field Name	Optional/Required	Notes
Address 2	Optional	Additional details regarding the metered service point's address (if applicable).
Address 3	Optional	Additional details regarding the metered service point's address (if applicable).
Address 4	Optional	Additional details regarding the metered service point's address (if applicable).
City	Optional	The city in which the metered service point is located.
County	Optional	The county in which the metered service point is located.
State	Optional	The state in which the metered service point is located.
Longitude	Optional	The metered service point's longitude.
Latitude	Optional	The metered service point's latitude.
Life Support Sensitive Load Flag	Required	A flag that indicates if the metered service point requires a Life Support Sensitive Load. Valid values are "true" and "false" An extendable lookup is used to map this value to the Life Support Sensitive Load flag used with Customer Program Management.
Life Support Sensitive Load Description	Optional	An optional description for Life Support Sensitive Load.
Status	Required	The current state of the metered service point. Valid values are "ACTIVE" and "INACTIVE".

Sample Record

Below is a sample file:

```
EXTREFMSP11    2023-06-21T14:01:00-08:00    F1IC    EXTMSP1    ZZ-
EXTMSPTYPE    D1CN    ZZEDV    EXTPREM1    USPACIFIC    USA    94705    7610
Block Derby St    Addr2    Addr3    Addr4    Berkley    Alameda    CA
-81.697494    41.501120    false        ACTIVE
```

Upload Batch Process

Metered service point import files are uploaded using the Metered Service Point File Upload (X1-MSPUP) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import, as well as subsequent incremental updates.

This process creates inbound sync requests in the "Pending" state (see below).

The Metered Service Point File Upload (X1MSPUPL) algorithm used by this batch process uses the following extendable lookups to map data in the import file to values used with Customer Program Management:

- CCB Service Point Type Mapping (D1-CCBSPTypeLookup)
- CCB Life Support Sensitive Load Mapping (D1-CCBLifeSupSensitiveLdLookup)
- CIS Division Mapping (D1-CCBDivisionLookup)

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Values must be defined for these extendable lookups before import files can be uploaded.

Inbound Sync Request Business Object

Metered service point inbound sync requests are based on the Metered Service Point Sync Request BO (X1-SyncReqMeteredSP) business object.

Inbound sync requests are created in the "Pending" state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition these to the "Transform/Validate" state where the data is validated and transformed as needed for import. What happens next is based on the type of sync request:

- Initial Load sync requests then move to the "Validated" state (or "Validation Error" if an error is encountered). These are processed by an "Initial Sync Request Load" batch process (see below) .
- Incremental sync requests move to the "Add/Update" state in which algorithms add or update records as appropriate and then to the "Synchronized" state.
- The Create Acknowledgement (X1-CRESRACK) algorithm on the "Synchronized" state can be configured to send an acknowledgement to the system from which the imported data originated. This requires specifying the "Send Sync Request Acknowledgement" (X1-SYNREQACK) outbound message type for the **Outbound Message Type** parameter on the algorithm.

Initial Sync Request Load Batch Process

Metered service points imported as part of an Initial Load upload are created from Initial Load inbound sync requests using the Initial Sync Request - Load Metered SP (X1-SLMSP) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import, as well as subsequent incremental updates.

This process transitions the inbound sync requests to the "Loaded" state.

Importing Metered Services

This topic provides additional details related to importing metered services from a customer information system.

Metered Services Import File Format

Metered service import files use the following tab-separated values format:

Field Name	Optional/Required	Notes
External Reference Id	Optional	The metered service's reference ID in the CIS application.
Change Date Time	Optional	The date and time on which the metered service was changed. Applicable only for Incremental Uploads Will be used to sequence processing in case there are multiple changes to the same metered service point.
Initial Load Sync Flag	Required	A value that indicates the type of upload. Valid values are: • F1IL - Initial Load • F1IC - Incremental

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Field Name	Optional/Required	Notes
External Id	Required	The metered service's ID in the CIS application. When importing data from Customer to Meter or Customer Cloud Service this is the Service Agreement External ID.
Metered Service Type	Required	The type of metered service. When importing data from Customer to Meter or Customer Cloud Service this comes from the Service Agreement Type. If the provided metered service point type has not been defined as a Metered Service Type, an extendable lookup is used to map this value to the Metered Service Type used with Customer Program Management.
External Contact ID	Optional	The ID of the contact associated with the metered service in the CIS application. When importing data from Customer to Meter or Customer Cloud Service this is the Contact External ID.
External Account ID	Optional	An ID used to identify the account associated with the metered service record in the CIS application.
Start Date Time	Required	The date and time on which the metered service record started.
End Date Time	Optional	The date and time on which the metered service record ended or will end (if applicable).
Division	Optional	The metered service's division. If the provided division has not been defined as a Division, an extendable lookup is used to map this value to the Division used with Customer Program Management.
SA Status	Optional	The metered service's status. If the provided status has not been defined as an Status, an extendable lookup is used to map this value to a Status defined for Customer Program Management.
Rate Schedule List	Optional	A concatenated list of rate schedules and effective dates associated with the metered service. Each row in this list is composed of the following: • Rate Schedule • Effective Date Each element in the row will be delimited by comma (,). Each row in the list will be delimited by semi-colon (;). For example: ERES-1,2022-01-01ERES-2,2021-01-01

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Field Name	Optional/Required	Notes
Metered SP List	Optional	A concatenated list of metered service points associated with the metered service. Each row in this list is composed of the following: • External Metered SP Id (Required) • Start Date Time (Required) • End Date Time (Optional) Each element in the row will be delimited by comma (,). Each row in the list will be delimited by semi-colon (;). Example: 6800401571,2022-12-13T14:30:00-05:00,1703304223,2022-12-13T14:30:00-05:00,
Is Erased	Optional	A flag that indicates if the customer has been obfuscated (if supported) in the CIS application. Valid values are Y/N (Default) Applicable only to Incremental Uploads This should be set to "N" if Object Erasure is not supported in the CIS application.

Sample Record

Below is a sample file:

```
EXTREFMS11    2023-06-15T13:02:00-08:00    F1IC    EXTMS1    CA!ZZMTRDST
EXTCONTACT1    EXTACCT1    2022-10-15T09:23:00-08:00
2023-06-14T13:45:00-08:00    ZZEDV    20    ERESRBOH,2022-11-09;
EXTMSP1,2022-11-09T13:14:55-08:00,2023-04-14T08:25:44-08:00;    Y
```

Upload Batch Process

Metered service import files are uploaded using the Metered Service File Upload (X1-MSUPL) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import, as well as subsequent incremental updates.

This process creates inbound sync requests in the "Pending" state (see below).

The Metered Service File Upload (X1_LEGMSUPLD) algorithm used by this batch process uses the following extendable lookups to map data in the import file to values used with Customer Program Management:

- CCB SA Type Mapping (D2-CCBSATypeLookup)
- CCB SA Status Mapping (D2-CCBSAStatusLookup)
- CIS Division Mapping (D1-CCBDivisionLookup)

Values must be defined for these extendable lookups before import files can be uploaded.

Inbound Sync Request Business Object

Metered service inbound sync requests are based on the Metered Service Inbound Sync Request (X1-DASyncReqMeteredService) business object.

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Inbound sync requests are created in the "Pending" state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition these to the "Transform/Validate" state where the data is validated and transformed as needed for import. What happens next is based on the type of sync request:

- Initial Load sync requests then move to the "Validated" state (or "Validation Error" if an error is encountered). These are processed by an "Initial Sync Request Load" batch process (see below) .
- Incremental sync requests move to the "Add/Update" state in which algorithms add or update records as appropriate and then to the "Synchronized" state.
- The Create Acknowledgement (X1-CRESRACK) algorithm on the "Synchronized" state can be configured to send an acknowledgement to the system from which the imported data originated. This requires specifying the "Send Sync Request Acknowledgement" (X1-SYNREQACK) outbound message type for the **Outbound Message Type** parameter on the algorithm.

Initial Sync Request Load Batch Process

Metered services imported as part of an Initial Load upload are created from Initial Load inbound sync requests using the Initial Sync Request - Load Metered Service (X1-SILMS) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import, as well as subsequent incremental updates.

This process transitions the inbound sync requests to the "Loaded" state.

Importing Device and Program Enrollment Data from a Demand Response Management System (DRMS)

Device and program enrollment data includes controllable devices, device locations, enrollments, and event participation records, and is usually imported from a demand response management system (DRMS) such as Oracle Utilities Network Management System. Data to be imported is sent to a tab-delimited flat file, which is uploaded into the system via batch processing which creates inbound data synchronization (sync) requests. These sync requests are processed and validated by a monitor batch process, and then a separate batch process creates master data records from each.

Device and program enrollment data uploads are used when setting up the system to import data from a demand response management system (DRMS) as Oracle Utilities Network Management System. Once the implementation is live, device and program enrollment information will created in in the application and sent to the demand response management system (DRMS),

> **Note**
>
> Device and program enrollment data cannot be imported until AFTER importing customer data (see Importing Customer-Related Data from a Customer Information System).

Import Process Overview

This section provide an overview of the import process and outlines the various system objects used for each type of data (controllable devices, device locations, enrollments, and event participation). The overall process is as follows:

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1. Data to be imported is exported from the DRMS into a tab-delimited values file.
2. An "Upload" batch process is used to create inbound sync requests in the Pending state based on object-specific initial synchronization business objects. A separate inbound sync request is created for each row in the import file.
3. The inbound sync requests are processed using the Sync Request Monitor (F1-SYNRQ) batch process.
4. An "Initial Sync Request - Load" batch process is used to create individual master data records from each inbound sync request.

Import of some types of data uses additional batch processing. These are noted in the data-specific topics that follow.

Upload Batch Processes

Import files are uploaded using object-specific "Upload" batch processes. See Import Process Object Summary below for the specific "Upload" batch process used for each type of device and enrollment data. These should be run as needed for the initial import, as well as subsequent incremental updates.

These processes use the following parameters:

- **File Name**: The name of the file to upload. File names can use wildcards (Required)
- **Flat Path**: The file location where the upload file is located. This can be a file location on a local server or a location in Object Storage. See Referencing URIs in the *Framework Administrative User Guide* for more information. (Required)
- **Processed File Extension**: The text appended to the file name after the file has been processed. Default is "PROCESSED".
- **Error On No Files Found**: Indicates whether or not an error is issued if no files are found matching the given name in the given path. Valid values are "true" (default) and "false".
- **External System**: The external system that created the upload file (Required)

Use the **Batch Control** portal to learn more about these and other parameters used by these batch process.

Inbound Sync Request Business Objects

Inbound sync requests are created by the "Upload" batch processes, and are based on "Initial Sync Request" business objects. See Import Process Object Summary below for the specific "Initial Sync Request" business objects used for each type of customer data.

The table below outlines the stages of the inbound sync request lifecycle. Use the **Business Object** portal to learn more about these business objects and the details of each lifecycle state.

State	Notes
Pending	Inbound sync requests begin in this state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition sync requests in this state to the Transform/Validate state.
Transform/Validate	In this state the data is validated and transformed as needed for import. In this state values defined by lookups are derived from the data in the upload file via extendable lookups. Sync requests move from this state to either the Validated state.

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State	Notes
Validation Error	Sync requests enter this state if an error occurs during validation in the Transform/Validate step. If a sync request needs to be updated manually, it can be put into this state via the **Correct** action in the **Record Actions** section.
Validated	Initial Load sync requests enter this state following validation in the Transform/Validate step. If corrections need to be made, users can use the **Correct** action in the **Record Actions** section to transition the record to the Validation Error state.
Loaded	Initial Load sync requests enter this state when a record has been successfully loaded,
Discarded	The sync request enters this state if the sync request is discarded from either the Validated or Validation Error state,

Initial Sync Request Load Batch Processes

Master data records are created from inbound sync requests using "Initial Sync Request - Load" batch processes. See Import Process Object Summary below for the specific "Initial Sync Request - Load" batch processes used for each type of device and enrollment data. These should be run as needed for the initial import, as well as subsequent incremental updates.

Use the **Batch Control** portal to view the parameters used by these batch processes.

Import Process Object Summary

The table below lists the batch controls and business objects used by each type of device and enrollment data.

Import Order	Object Type	Upload Batch Process	Initial Synchronization Business Object	Initial Synchronization Load Batch Process
1	Controllable Device	Legacy Controllable Device File Upload (X1-DVUPL)	Controllable Device Initial Sync Request (X1-DASyncReqControllableDevice)	Initial Sync Request - Load Controllable Device (X1-SILDV)
2	Device Location	Legacy Device Location File Upload (X1-DLUPL)	Device Location Initial Sync Request (X1-DASyncReqDeviceLocation)	Initial Sync Request - Load Device Location (X1-SILDL)
3	Enrollment	Legacy Enrollment File Upload (X1-ENUPL)	Enrollment Initial Sync Request (X1-DASyncReqEnrollment)	Initial Sync Request - Load Enrollment (X1-SILEN)
4	Event Participation	Legacy Participation Event File Upload (X1-PTUPL)	Event Participation Sync Request BO (X1-DASyncReqEventParticipation)	Initial Sync Request - Load Event Participation (X1-SLPAR)

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> **Note**
>
> Device and program enrollment data **must** be imported in the order listed above.

- Importing Controllable Devices
- Importing Device Locations
- Importing Enrollments
- Importing Event Participation Records

Importing Controllable Devices

This topic provides additional details related to importing legacy controllable devices from a demand response management system (DRMS).

Controllable Device Import File Format

Legacy controllable device import files use the following tab-separated values format:

Field Name	Optional/Required	Notes
Legacy Device Id	Required	An id for the controllable device in the DRMS application.
Device Type	Required	The controllable device's type. This must be a valid controllable device type. See Understanding Controllable Asset Types for more information.
Serial Number	Optional	The controllable device's serial number.
Badge Number	Optional	The controllable device's badge number.
NIC ID	Required	The controllable device's Network Identification Card (NIC) ID.
Head End Registration	Optional	A flag that indicates if the controllable device is registered in the head end system. Valid values are values for the Head-End Registration Status (HEAD_END_REGISTR_STATUS_FLG) lookup, and include: • D1RE - Registered • D1NR - Not Registered • D1DR - Deregistered
Legacy Device Date Time	Required	The controllable device's asset disposition date and time. This will be one of the following: • In-Store Date Time: Date and time when the asset came into the storeroom/ warehouse or when asset was removed from the location. • Retire Date Time: Date and time when the asset was expired. • Repair Date Time: Date and time when the asset came into the repair shop

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Field Name	Optional/Required	Notes
Specification	Required	The specification associated with the controllable device. This must be a valid specification.
Asset Ownership	Optional	A flag that indicates the controllable device's ownership. Valid values are values for the Asset Ownership (ASSET_OWNERSHIP_FLG) lookup, and include: • W1CO - Customer Owned • W1OW - Utility Owned
Asset Status	Required	A value that indicates the current status of the controllable device. Valid values include: • INSTORE • INREPAIR • RETIRED

Sample Record

Below is a sample file:

```
EXTDVC3    ZZ-MUYU    SERIALNBR3    BADGENBR3    NICID3    D1NR
2023-04-23T12:22:00-05:00    ZZ-MUYU-CD-SPEC    W1CO    INSTORE
```

Upload Batch Process

Legacy controllable device import files are uploaded using the Legacy Controllable Device File Upload (X1-DVUPL) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import.

This process creates inbound sync requests in the "Pending" state (see below).

Inbound Sync Request Business Object

Controllable device inbound sync requests are based on the Controllable Device Initial Sync Request (X1-DASyncReqControllableDevice) business object.

Inbound sync requests are created in the "Pending" state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition these to the "Transform/Validate" state where the data is validated and transformed as needed for import and moved into the "Validated" state (or "Validation Error" if an error is encountered). These are processed by an "Initial Sync Request Load" batch process (see below).

Initial Sync Request Load Batch Process

Legacy controllable devices are created from inbound sync requests using the Initial Sync Request - Load Controllable Device (X1-SILDV) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import.

This process transitions the inbound sync requests to the "Loaded" state.

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Create Controllable Asset from Controllable Device Batch Process

The Create Controllable Asset from Controllable Device (X1-CRAST) batch control is used to create controllable assets from newly uploaded controllable devices. This process should be run as needed for the initial import.

This process uses the following algorithms:

- Select Records - Controllable Devices without an asset id (X1-SLNOASSET): This algorithm selects controllable devices where the legacy device ID is populated, but the Asset ID is empty.
- Process Record - Create Controllable Asset (X1CREATASSET): This algorithm creates controllable assets from data in the Controllable Device Initial Sync Request (X1-DASyncReqControllableDevice) inbound sync requests created for each controllable device.

This process uses the following parameters:

- **Default Out of Service Location**: The fallback out of service location used when creating controllable assets if other state-specific out of service locations are not defined. (Required) Note that controllable asset types must be configured with the appropriate device location types for each these states. See Understanding Controllable Asset Types for more information.
- **In Store Out of Service Location**: The out of service location when creating controllable assets in the "In Store" state.
- **InRepair Out of Service Location**: The out of service location when creating the controllable assets in the "In Repair" state.
- **Retired Out of Service Location**: The out of service location when creating the controllable assets in the "In Store", "In Repair" or "Retired" state.

Use the **Batch Control** portal to learn more about these and other parameters used by these batch process.

> **Note**
>
> Because a controllable asset's disposition includes a device location, and device locations are imported after importing controllable devices, controlled devices that currently "Installed" are imported in the "In Store" state. Their status will be corrected when the device locations are imported.

Importing Device Locations

This topic provides additional details related to importing legacy device locations from a demand response management system (DRMS).

Device Location Import File Format

Legacy device location import files use the following tab-separated values format:

Field Name	Optional/Required	Notes
Legacy Device Location Id	Required	The id for the device location in the DRMS application.

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Field Name	Optional/Required	Notes
Device Location Type	Required	The device location's type. This must be a valid device location type. See Understanding Device Location Types for more information.
CIS Metered Service Point	Required	The id for the metered service point associated with the device location in the CIS application.
Ok To Enter	Optional	A value that indicates if it is okay for field service crews to enter the device location. Valid values are values defined for the Ok to Enter (D1-OkToEnterLookup) extendable lookup.
SP Warning	Optional	A value that indicates any warnings for field service crews when at the device location (such as a dog). Valid values are values defined for the SP Warning (D1-SPWarningLookup) extendable lookup.
SP Instruction	Optional	A value that provides any special instructions for field service crews when at the device location. Valid values are values defined for the SP Instruction (D1-SPInstructionLookup) extendable lookup.
SP Instruction Details	Optional	A text string containing any additional details related to the SP Instruction value.
Key	Optional	A value that indicates if a key is available for field service crews when at the device location. Valid values are values defined for the Key (D1-KeyLookup) extendable lookup.
Key Id	Optional	A text string containing any additional details related to a key.
Device Location	Optional	A value that indicates the location of the controllable device at the device location. Valid values are values defined for the Device Location (D1-DeviceLocationLookup) extendable lookup.
Device Location Details	Optional	A text string containing any additional details related to the device location.

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Field Name	Optional/Required	Notes
Device List	Optional	A concatenated list of controllable devices current installed at the device location. Each row in this list is composed of the following: • Legacy Device Id (Required) • Attach Date Time (Required) • Remove Date Time (Optional) • Active/Inactive Indicator (D1YS/ D1NO) (Required) Each element in the row will be delimited by comma (,). Each row in the list will be delimited by semi-colon (;). Example: DVC1,2022-12-13T14:30:00-05:00,,D1YS DVC2,,2022-12-13T14:30:00-05:00,D1YS ;

Sample Record

Below is a sample file:

```
EXTDVCLOC1    ZZ-MUYU    EXTMSP1    ZZNO    DOG    C    service point
instruction details    ZZ1    key1    LEFT    DeviceLoc1 details    ACTIVE
EXTDVC1,2022-11-09T09:23:00-05:00,2023-04-15T14:04:00-05:00,D1YS;
```

Upload Batch Process

Legacy device location import files are uploaded using the Legacy Device Location File Upload (X1-DLUPL) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import.

This process creates inbound sync requests in the "Pending" state (see below).

The Legacy Device Location File Upload (X1LGDVLOCUPL) algorithm used by this batch process uses the following extendable lookups to map data in the import file to values used with Customer Program Management:

- Ok to Enter (D1-OkToEnterLookup)
- SP Warning (D1-SPWarningLookup)
- SP Instruction (D1-SPInstructionLookup)
- Key (D1-KeyLookup)
- Device Location (D1-DeviceLocationLookup)

Values must be defined for these extendable lookups before device location import files can be uploaded.

Inbound Sync Request Business Object

Controllable device inbound sync requests are based on the Device Location Initial Sync Request (X1-DASyncReqDeviceLocation) business object.

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Inbound sync requests are created in the "Pending" state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition these to the "Transform/Validate" state where the data is validated and transformed as needed for import and moved into the "Validated" state (or "Validation Error" if an error is encountered). These are processed by an "Initial Sync Request Load" batch process (see below).

Initial Sync Request Load Batch Process

Legacy controllable devices are created from inbound sync requests using the Initial Sync Request - Load Device Location (X1-SILDL) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import.

This process transitions the inbound sync requests to the "Loaded" state.

Create Asset Locations from Device Location Batch Process

The Create Asset Location from Device Location (X1-CRASL) batch control is used to create asset locations from newly uploaded device locations.

This process uses the following algorithms:

- Select Records - Device locations without an asset location (node) (X1SLNOASTLOC): This algorithm selects device locations where the legacy device location ID is populated, but the Asset service point ID is empty.
- Process Record - Create Asset Location (Node) (X1CRASSETLOC): This algorithm creates asset locations from data in the Device Location Initial Sync Request (X1-DASyncReqDeviceLocation) inbound sync requests created for each device location.

This process uses the following parameters:

- **Default Out of Service Location**: The out of service location used when creating controllable assets if state-specific out of service locations are not defined. (Required)

Use the **Batch Control** portal to learn more about these and other parameters used by these batch process.

Importing Enrollments

This topic provides additional details related to importing legacy program enrollments from a demand response management system (DRMS). Program enrollments are defined by program subscriptions in Customer Program Management.

Enrollment Import File Format

Legacy enrollment import files use the following tab-separated values format:

Field Name	Optional/Required	Notes
Legacy Enrollment Id	Required	The id for the enrollment in the DRMS application.
CIS Metered Service	Required	The id for the metered service point associated with the enrollment in the CIS application.
Program Subscription Type	Required	The program subscription type. This must be a valid program subscription type. See Understanding Program Subscription Types for more information.

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Field Name	Optional/Required	Notes
Start Date Time	Required	The date and time on which the program subscription record started.
End Date Time	Optional	The date and time on which the program subscription record ended or will end (if applicable).
Legacy Device Location Id	Required	The id for the device location in the DRMS application.
Legacy Program External Id	Required	The id for the program in the DRMS application.
Status	Required	The current status of the enrollment/ program subscription. Valid values include: • ACTIVE • INACTIVE

Sample Record

Below is a sample file:

```
EXTENR2    EXTMS2    ZZ_MZ_TEST    2022-10-24T08:00:00-05:00
2024-10-24T08:00:00-05:00    EXTDVCLOC2    LEGACYPRG1    ACTIVE
```

Upload Batch Process

Legacy enrollment import files are uploaded using the Legacy Enrollment File Upload (X1-ENUPL) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import.

This process creates inbound sync requests in the "Pending" state (see below).

Inbound Sync Request Business Object

Enrollment inbound sync requests are based on the Enrollment Initial Sync Request (X1-DASyncReqEnrollment) business object.

Inbound sync requests are created in the "Pending" state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition these to the "Transform/Validate" state where the data is validated and transformed as needed for import and moved into the "Validated" state (or "Validation Error" if an error is encountered). These are processed by an "Initial Sync Request Load" batch process (see below).

Initial Sync Request Load Batch Process

Program subscriptions for legacy enrollments are created from inbound sync requests using the Initial Sync Request - Load Enrollment (X1-SILEN) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import.

This process transitions the inbound sync requests to the "Loaded" state.

Importing Event Participation Records

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This topic provides additional details related to importing legacy event participation records from a demand response management system (DRMS).

Event Participation Import File Format

Legacy event participation import files use the following tab-separated values format:

Field Name	Optional/Required	Notes
Legacy Event Participation ID	Required	The id for the event participation record in the DRMS application.
Reservation Start Date Time	Required	The start date and time of the event.
Reservation End Date Time	Required	The end date and time of the event.
Participation Start Date Time	Optional	The start date and time of the device's participation in the event, Some devices may participate in only a portion of an event. If not applicable, this field is blank.
Participation End Date Time	Optional	The end date and time of the device's participation in the event, Some devices may participate in only a portion of an event. If not applicable, this field is blank.
Legacy Controllable Device Id	Required	The id for the controllable device in the DRMS application.
Legacy Program External Id	Required	The id for the program in the DRMS application.
Legacy Program Subscription Id	Required	The id for the enrollment (program subscription) in the DRMS application.
Preemptive Opt Out	Optional	A flag that indicates if the event participation had opted-out of prior to the event. Valid values are values for the Preemptive Opt-Out (PREEMPTIVE_OPT_OUT_FLG) lookup, and include: • D1NO (No) • D1YS (Yes)
Event Outcome	Optional	A flag that indicates the outcome of the event. Valid values are values for the Outcome (OUTCOME_FLG) lookup, and include: • D1SP (Successful participation) • D1IO (In-flight Override) • D1ND (Non-responsive device) • D1ER (Error) • D1CN (Cancelled)
Event Participation Status	Required	A text string that specifies the status of the event participation. Valid values include: • PRE-EVENT • POST_EVENT • CLOSED • CANCELLED

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Sample Record

Below is a sample file:

```
EXTEVTPART2    2022-09-01T08:00:00-05:00    2022-09-11T08:00:00-05:00
2022-09-01T08:00:00-05:00    2022-09-11T08:00:00-05:00    EXTDVC2
LEGACYPRG1    EXTENR2    D1YS    D1SP    PRE-EVENT
```

Upload Batch Process

Legacy event participation import files are uploaded using the Legacy Participation Event File Upload (X1-PTUPL) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import.

This process creates inbound sync requests in the "Pending" state (see below).

Inbound Sync Request Business Object

Event participation inbound sync requests are based on the Event Participation Sync Request BO (X1-DASyncReqEventParticipation) business object.

Inbound sync requests are created in the "Pending" state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition these to the "Transform/Validate" state where the data is validated and transformed as needed for import and moved into the "Validated" state (or "Validation Error" if an error is encountered). These are processed by an "Initial Sync Request Load" batch process (see below).

Initial Sync Request Load Batch Process

Legacy event participation records are created from inbound sync requests using the Initial Sync Request - Load Event Participation (X1-SLPAR) batch process. Use the **Batch Control** portal to view the parameters used by this batch process. This process should be run as needed for the initial import.

This process transitions the inbound sync requests to the "Loaded" state.

Importing Facility and Network Location Data from a Distributed Energy Resource System

Facility and network location data includes service points and associated network entities such as transformers, feeders, substations, and weather stations and can be imported from a distributed energy resources system (DERMS) such as Oracle Utilities Grid Edge DERMS or Oracle Utilities Network Management System. Data to be imported is sent to a flat file, which is uploaded into the system via batch processing which creates inbound data synchronization (sync) requests. These sync requests are processed and validated by a monitor batch process, and then a separate batch process creates master data records from each.

Import Process Overview

This section provide an overview of the import process and outlines the various system objects used at each stage in the process. The overall process is as follows:

1. Data to be imported is exported from the DERMS into a flat file.
2. The Network Location File Upload (D1-NLUP) batch process is used to create inbound sync requests in the Pending state based on object-specific initial synchronization

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business objects. A separate inbound sync request is created for each row in the import file.

3. The inbound sync requests are processed using the Sync Request Monitor (F1-SYNRQ) batch process.
4. The Maintain Network Location (D1-MNLOC) batch process is used to create individual master data records from each inbound sync request.

Initial vs. Ongoing Uploads

Network location data can be uploaded both as part of the initial system set up, and as part of ongoing system maintenance. The process functions the same for both.

Initial uploads are used when setting up the system to import network location data including metered service points, transformers, feeders, substations, and weather stations. Ongoing uploads are used to update network location data as the data changes over time.

Network Location Import File Format

Network location import files use the following tab-separated values format:

Field Name	Optional/Required	Notes
CIS Service Point	Required	The ID of the metered service point in the customer information system.
External Transformer ID	Required	The external ID for the transformer. Used to populate the External Transformer ID when creating transformer records.
Transformer Name	Required	The name of the transformer. Used to populate the Description on transformer records.
External Feeder ID	Required	The external ID for the feeder. Used to populate the External Feeder ID when creating feeder records.
Feeder Name	Required	The name of the feeder. Used to populate the Description on feeder records.
External Substation ID	Required	The external ID for the substation. Used to populate the External Substation ID when creating substation records.
Substation Name	Required	The name of the substation. Used to populate the Description on substation records.
External Weather Station Name	Optional	The name of the weather station, Used to populate the Description on weather station records.

Sample Record

Below is a sample file:

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```
CISSP1    EXTTRAN01    TRAN01    EXTFEED01    FEED01    EXTSUBST01    SUBST01
EXTWST01
```

Upload Network Location Batch Processes

Import files are uploaded using he Network Location File Upload (D1-NLUP) batch process. These should be run as needed for the initial upload, as well as subsequent ongoing updates.

This batch process uses the following parameters:

- **File Name**: The name of the file to upload. File names can use wildcards (Required)
- **Flat Path**: The file location where the upload file is located. This can be a file location on a local server or a location in Object Storage. See Referencing URIs in the *Framework Administrative User Guide* for more information. (Required)
- **Character Encoding**: The character encoding to use for the extract file. The default is UTF-8.
- **Processed File Extension**: The text appended to the file name after the file has been processed. Default is "PROCESSED".
- **Error On No Files Found**: Indicates whether or not an error is issued if no files are found matching the given name in the given path. Valid values are "true" (default) and "false".
- **External System**: The external system that created the upload file (Required)

Use the **Batch Control** portal to learn more about these and other parameters used by this batch process.

SP Network Location Sync Request Business Object

Inbound sync requests are created by the upload batch process, and are based on the SP Network Location Sync Request (D1-SyncReqInSPNetworkLocation) business object.

The table below outlines the stages of the inbound sync request lifecycle. Use the **Business Object** portal to learn more about this business object and the details of each lifecycle state.

State	Notes
Pending	Inbound sync requests begin in this state. The Sync Request Monitor (F1-SYNRQ) batch process is used to transition sync requests in this state to the Validate state.
Validate	In this state the data is validated and transformed as needed for import. In this state, system IDs are derived from the external IDs in the upload file.
Validation Error	Sync requests enter this state if an error occurs during validation in the Validate step. If a sync request needs to be updated manually, it can be put into this state via the **Correct** action in the **Record Actions** section.
Processed	Initial Load sync requests enter this state when a record has been successfully loaded,
Discarded	The sync request enters this state if the sync request is discarded from the Validation Error state,

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Maintain Network Location Batch Process

Master data records are created from inbound sync requests using he Maintain Network Location (D1-MNLOC) batch process. This should be run as needed for the initial import, as well as subsequent ongoing updates.

This batch process uses the following parameters:

- **Override Low Identifier**: A custom low id to use in calculating a range of records to process for a thread. The parameter value can be an actual number between 0's (e.g. 000000000) and 9's (e.g. 9999999999) or it can be set to 'auto'. If auto is configured, it is set to the lowest current value on the database table associated with the background process.
- **Override High Identifier**: A custom high id to use in calculating a range of records to process for a thread. The parameter value can be an actual number between 0's (e.g. 000000000) and 9's (e.g. 9999999999) or it can be set to 'auto'. If auto is configured, it is set to the highest current value on the database table associated with the background process.

Use the **Batch Control** portal to view the parameters used by these batch processes.

Extracting M&V Data for use in External Systems

This section describes how M&V data can be extracted from for use in external systems. This includes event impact and statistics data, which could be used by analytics applications used to compare the impact details for a Treatment group and its corresponding Control group, or to analyze event statistics.

- Extracting M&V Event Impact Data - Treatment Groups
- Extracting M&V Event Impact Data - Control Groups
- Extracting M&V Event Statistics

Extracting M&V Event Impact Data - Treatment Groups

M&V event impact data for Treatment groups (Device Population groups) can be extracted for import into an external system via a batch process which creates a file containing data from Service Point Event Outcome records.

See About Service Point Event Outcome Snapshots for more information.

Batch Control

M&V event impact data for Treatment groups is extracted using the Stage Impact Extract - Treatment Group (X1-SIETG) batch process. This batch process downloads data into a file, the details of which are specified by the batch control parameters.

This batch processes use the following parameters:

- **File Integration Type**: The file integration type (see below) used to extract M&V event impact data for Treatment groups (see below).
- **File Name**: The name of the downloaded file. File names can use wildcards (Required).
- **File Path**: The file location to which the file will be downloaded. This can be a file location on a local server or a location in Object Storage. See Referencing URIs in the *Framework Administrative User Guide* the for more information (Required).

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- **File Format**: The extract file format. Valid values are CSV (delimited) FIXD (fixed position output), XML (XML document), JSON (JSON document) or JSNL (JSON Lines).
- **File Delimiter**: The delimiter to use for the CSV file format.

Use the **Batch Control** portal to view additional details about these and other parameters.

File Integration Type

The M&V event impact extract process uses the Stage Impact Extract - Treatment Group (X1-SIETGExtract) file integration type, defined as a parameter on the Stage Impact Extract - Treatment Group (X1-SIETG) batch process.

Implementations that require a different extract format can create a custom file integration type that defines their own extract format and process. This includes creating a custom extract algorithm and a custom extract data area.

Refer to Extract Using File Integration for more information about the role of file integration types.

File Format

The file format of the extract file is defined by the Stage Impact - Treatment Group Record (X1-SIETGExtractRecord) data area, specified on the Stage Impact Extract - Treatment Group (X1-StageImpactTreatmentGroup) file integration record on the Stage Impact Extract - Treatment Group (X1-SIETGExtract) file integration type.

M&V event impact data for Treatment groups files use the following format:

Field Name		Notes
Event ID		This is the External Event ID in the Program Event
Stage ID		This is the External ID in the Program Event
Treatment Group		Entity Group of the Service Point Event Outcome
Service Point		Service Point of the Service Point Event Outcome
		This is the Customer's SP ID - external ID
Stage Impacts		
	Date Time	This is the Outcome Date Time from the Service Point Event Outcome Quantity
	Quantity	
	Quantity Description	Unit of Measure Description and Service Quantity Identifier Description
	Temperature	
	Temperature Description	This is the description on temperature quantity, for example Fahrenheit

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Extracting M&V Event Impact Data - Control Groups

M&V event impact data for Control groups can be extracted for import into an external system via a batch process which creates a file containing data from Service Point Event Outcome records.

See About Service Point Event Outcome Snapshots for more information.

Batch Control

M&V event impact data for Control groups are extracted using the Stage Impact Extract - Control Group (X1-SIECG) batch process. This batch process downloads data into a file, the details of which are specified by the batch control parameters.

This batch processes use the following parameters:

- **File Integration Type**: The file integration type (see below) used to extract M&V event impact data for Control groups (see below).
- **File Name**: The name of the downloaded file. File names can use wildcards (Required).
- **File Path**: The file location to which the file will be downloaded. This can be a file location on a local server or a location in Object Storage. See Referencing URIs in the *Framework Administrative User Guide* the for more information (Required).
- **File Format**: The extract file format. Valid values are CSV (delimited) FIXD (fixed position output), XML (XML document), JSON (JSON document) or JSNL (JSON Lines).
- **File Delimiter**: The delimiter to use for the CSV file format.

Use the **Batch Control** portal to view additional details about these and other parameters.

File Integration Type

The M&V event impact extract process uses the Stage Impact Extract - Control Group (X1-SIECGExtract) file integration type, defined as a parameter on the Stage Impact Extract - Control Group (X1-SIECG) batch process.

Implementations that require a different extract format can create a custom file integration type that defines their own extract format and process. This includes creating a custom extract algorithm and a custom extract data area.

Refer to Extract Using File Integration for more information about the role of file integration types.

File Format

The file format of the extract file is defined by the Stage Impact - Control Group Record (X1-StgImpactExtControlGrp) data area, specified on the Stage Impact Extract - Control Group (X1-StageImpactControlGroup) file integration record on the Stage Impact Extract - Control Group (X1-SIECGExtract) file integration type.

M&V event impact data for Control groups files use the following format:

Field Name	Notes
Event ID	This is the External Event ID in the Program Event

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Field Name		Notes
Stage ID		This is the External ID in the Program Event
Control Group		Control Group linked the M&V Transaction's Subscription's Entity Group
Service Point		Service Point belonging to the Control Group
		This is the Customer's SP ID - external ID
Control Group Load		
	Date Time	
	Quantity	
	Quantity Description	Unit of Measure Description and Service Quantity Identifier Description
		OR
		Unit of Measure Description + 'Net'

Extracting M&V Event Statistics

M&V event statistics can be extracted for import into an external system via a batch process which creates a file containing M&V event statistics information from both Service Point Event Outcome records and M&V transactions.

See About Service Point Event Outcome Snapshots and About M&V Transactions for more information.

Batch Control

M&V event statistics are extracted using the Event M&V Statistics Extract (X1-EVMVE) batch process. This batch process downloads data into a file, the details of which are specified by the batch control parameters.

This batch processes use the following parameters:

- **File Integration Type**: The file integration type (see below) used to extract M&V event statistics (see below).
- **File Name**: The name of the downloaded file. File names can use wildcards (Required).
- **File Path**: The file location to which the file will be downloaded. This can be a file location on a local server or a location in Object Storage. See Referencing URIs in the *Framework Administrative User Guide* the for more information (Required).
- **File Format**: The extract file format. Valid values are CSV (delimited) FIXD (fixed position output), XML (XML document), JSON (JSON document) or JSNL (JSON Lines).
- **File Delimiter**: The delimiter to use for the CSV file format.

Use the **Batch Control** portal to view additional details about these and other parameters.

File Integration Type

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The M&V event statistics extract process uses the Event M&V Statistics Extract (X1-EVMVExtract) file integration type, defined as a parameter on the Event M&V Statistics ExtractX1-EVMVE) batch process.

Implementations that require a different extract format can create a custom file integration type that defines their own extract format and process. This includes creating a custom extract algorithm and a custom extract data area.

Refer to Extract Using File Integration for more information about the role of file integration types.

File Format

The file format of the extract file is defined by the Event M&V Statistics Extract Record (X1-EVMVExtractRecord) data area, specified on the Event M&V Statistics Extract (X1-EVMVExtract) file integration record on the Event M&V Statistics Extract (X1-EVMVExtract) file integration type.

M&V event statistics extract files use the following format:

Field Name	Notes
Event ID	This is the External Event ID in the Program Event.
Stage ID	This is the External ID in the Program Event
Treatment Group	Entity Group from the Service Point Event Outcome
Control Group	Control Group linked to the Treatment Group
Coefficient of Determination	From M&V Transaction
Multiple R	From M&V Transaction
Standard Error	From M&V Transaction
Number of Observations	From M&V Transaction
B0	From M&V Transaction Service Quantities
B0 Intercept Standard Error	From M&V Transaction
B0 Confidence Interval Low	From M&V Transaction
B0 Confidence Interval High	From M&V Transaction
Coefficient for Time (B1)	From M&V Transaction Service Quantities
B1	From M&V Transaction
B1 Confidence Interval Low	From M&V Transaction

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Field Name	Notes
B1 Confidence Interval High	From M&V Transaction
B2	From M&V Transaction Service Quantities
B2 Standard Error	From M&V Transaction
B2 Confidence Interval Low	From M&V Transaction
B2 Confidence Interval High	From M&V Transaction
B3	From M&V Transaction Service Quantities
B3 Standard Error	From M&V Transaction
B3 Confidence Interval Low	From M&V Transaction
B3 Confidence Interval High	From M&V Transaction

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Part V
Oracle Utilities Cloud Service Foundation

Welcome to the Oracle Utilities Cloud Service Foundation Administrative User Guide. This document describes how to administer features associated with Oracle Utilities Cloud Service Foundation.

> **Note**
>
> This document does not apply to all implementations. Contact your system administrator to confirm if your implementation includes Oracle Utilities Cloud Service Foundation.

- Process Automation Tool
- Data Conversion Support for Cloud Implementations
- Batch Scheduler for Cloud Implementations
- Batch Queues Overview
- Batch Alerts
- ILM Dashboard for Cloud Implementations
- Oracle Cloud Infrastructure Identity and Access Management Integration
- Oracle Cloud Object Storage
- Maintaining Customer Code

Process Automation Tool

The Process Automation Tool allows customers and implementers to orchestrate and automate a set of infrastructure related multi-step processes. The tool provides the ability to monitor the progress of such process and each of the steps. The tool also supports user actions at the process and step level.

The process automation tool is made out of the following system entities:

- Infrastructure Process - a Business Object of the Service Task MO.
- Infrastructure Process Step - a Business Object of the Service Task MO.
- Infrastructure Process Type - a Business Object of the Service Task Type MO.
- Infrastructure Process Step Type - a Business Object of the Service Task Type MO.

An Infrastructure Process references a type that includes the steps that are a part of that process. The steps are executed one by one according to their sequence as long as the previous step ended successfully. When a step in a process fails, the process will stop and wait for a user to take further actions.

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An Infrastructure Process can span up to two product environments. This means that it can invoke and monitor steps in two systems. This, for example, allows it to orchestrate a configuration migration (using the Content Migration Assistant, described in your cloud service's *Administrative User Guide*) from one product environment to another. Such a migration can include steps to create the export data on the **source** environment, move the export file to the **target** environment and execute all the import tasks on the target environment, all as a single Infrastructure Process. In this case the Infrastructure Process will be created on the **target** environment and will pull the configuration from the **source** environment.

> **Note**
>
> This is done in order to ensure that only application users with sufficient security privileges in any system environment can create Infrastructure Processes that can update that environment.
>
> The rule is that when an Infrastructure Process is created to run processes on two systems, the process will always be created on the **environment with the higher security requirements**. For example, if you need to run processes on the Development and Test environments, the infrastructure process will be created and executed from the Test environment (assuming that the Test environment has higher security requirements than the Development environment).

The steps that make an Infrastructure Process reference a step type that governs their behavior. A comprehensive set of process and step types is provided with the product. This set can be extended by implementers as needed.

- Creating an Infrastructure Process
- Executing an Infrastructure Process
- Monitoring Infrastructure Process Progress
- Process Automation Tool Setup
- Configuring New Infrastructure Processes
- CMA Migration Infrastructure Process Types

Creating an Infrastructure Process

To create a new process, navigate using **Admin > Implementation Tools > Infrastructure Process**. Use the Infrastructure Process Query to search for an existing process. One an Infrastructure Process is selected, you are brought to the maintenance portal to view and maintain the selected record.

The following points provide information about creating a new Infrastructure Process.

Infrastructure Process references an **Infrastructure Process Type**. When creating a new process you need to select the type that the process will be based on.

The **Name** of the process is used for tracking purposes. The name doesn't have to be unique in the system.

The **Process Steps** list is read-only and represents the steps that were configured on the Infrastructure Process Type.

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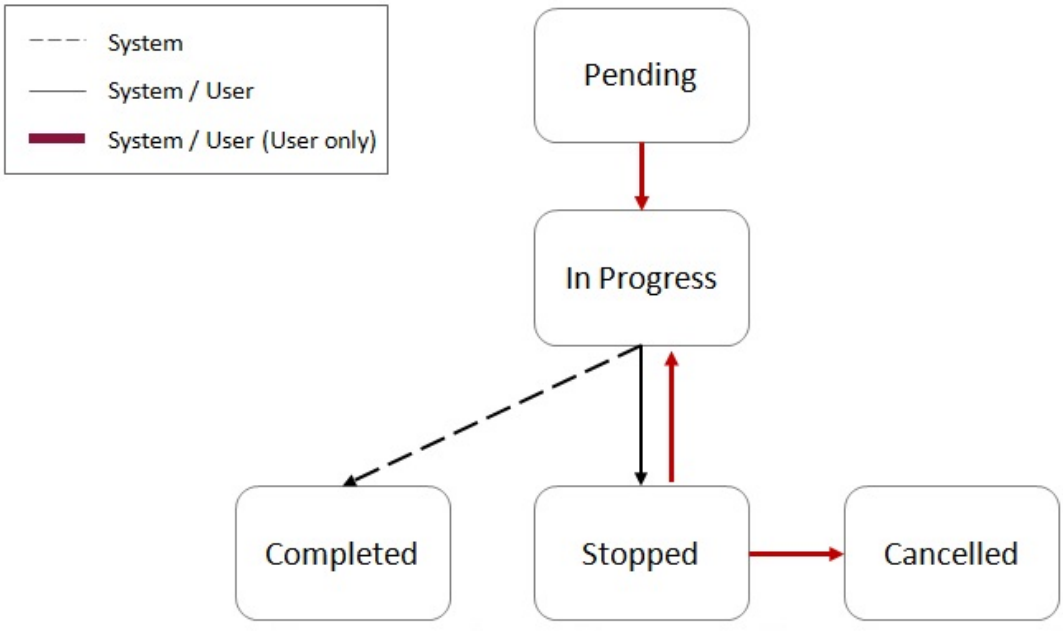
> **Note**
>
> Changing information on the Infrastructure Process Type, including the steps, will not affect existing Infrastructure Process records.

The **Process Details** section represents additional information that is required according to the corresponding process type definition.

Executing an Infrastructure Process

Infrastructure Process Lifecycle



New processes are created in a Pending status. While in this status the Infrastructure Process record can be modified, deleted or duplicated.

> **Note**
>
> Once an Infrastructure Process record is created, its type cannot be changed. To change the type, you can delete the process that was created with the wrong type (if it is still in Pending status) and create a new process with the correct type.

Use the **Start** action, on the maintenance portal to begin the process execution. The process status will change to **In Progress**.

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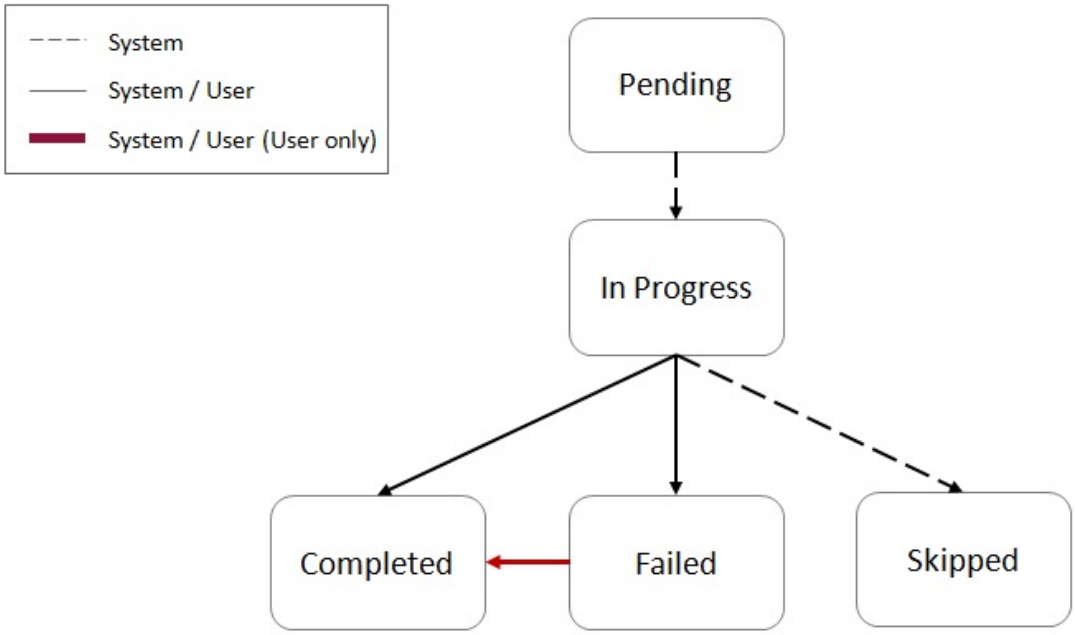
> **Note**
>
> While the Infrastructure Process is in **Pending** status, the steps will not have a status or any available actions. When the process transitions to **In Progress** status the process step records are created. From that point on they have a status and actions according to the step that and status.

While the process is **In Progress** the steps of the process will execute one by one according to their sequence. The process can be stopped using the **Stop** action. In this case the current step that is in progress will continue but the next step will not be executed. If any of the steps fail, the process will also transition into **Stopped** status and will not execute the next step.

When the process is in **Stopped** status it can be resumed by selecting the **Resume** action, or it can be cancelled by selecting the **Cancel** action.

Infrastructure Process Step Lifecycle



A process steps is created in **Pending** status and is transitioned to **In Progress** by the process logic when its turn to execute arrives.

When a step is **In Progress**, the following transitions are possible:

- Transition the step into Completed status upon successful completion of the step's work or by selecting the **Complete** action.
- Transition the step into **Failed** status when an error was detected during the step's work or by selecting the **Fail** action.
- Steps may include logic that will transition the step into **Skipped** status if that logic determines that the step should not be executed.

When the step is In Progress, selecting the **Job Status** action will display information about the job running status (if it is a batch job type of step).

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> **Note**
>
> Manually changing the step status to **Completed** or **Failed** while the step is In Progress should be carefully considered. This should only be done when step stays **In Progress** status for a long time and upon investigation it is clear that some manual intervention is required.

When a step is in **Failed** status it is still possible to manually transition the step into Completed status.

> **Note**
>
> Transitioning the step from **Failed** to **Completed** status should only be done if it is clear that the step was able to successfully accomplish its task. This will likely be established after some investigation.

Monitoring Infrastructure Process Progress

- Infrastructure Process Control
- Monitoring a Running Infrastructure Process
- Dealing with Exceptions

Infrastructure Process Control

The Infrastructure Process Control portal provides an overview of Infrastructure Processes that are active (i.e. in **Pending** or **In Progress** status) or processes that did not complete (i.e. in **Stopped** status) within the last X days.

Navigate to Infrastructure Process Control portal, using **Admin > Implementation Tools > Infrastructure Process Control**.

Available actions on this portal are:

- **New Process** - creates a new Infrastructure Process
- **Environment Setup** - directs the user to the master configuration related to the process automation tool

Select any of the processes from the portal lists for more information.

Monitoring a Running Infrastructure Process

When a process is running (in **In Progress** status), you can monitor its progress by refreshing the page. To configure automatic page refresh, refer to the User Portal Preferences for this portal.

The Infrastructure Process maintenance portal provides information about the status of the overall process as well as each of the steps.

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You can also view the details of each individual step including their log for more information or to investigate exceptions.

Dealing with Exceptions

Infrastructure Process steps can be divided into two main categories:

- Steps that start a batch process (job)
- Steps that are not batch process related

In addition, steps can be local or remote. Local steps execute on the same product environment that the process is executing while remote steps are executed on a different product environment.

- Batch Job Step Exceptions
- Non-Batch Step Exceptions

Batch Job Step Exceptions

Batch job steps start a batch job either locally or on a different product environment.

Batch Job Step in Failed Status as a Result of a Batch Job Error

When a batch process (local or remote) ends with an error, the process step is automatically transitioned to **Failed** status.

In this case, you should:

1. Ascertain the cause of the job failure (in the local or remote environment).
2. If the issue is temporary or can be fixed, fix it and then rerun the batch job manually using the Batch Job Submission page (in the local or remote environment). If the resubmitted job ended successfully, you can transition the process step to the **Completed** status and use the **Resume** action at the process level to continue the process execution.

If the issue cannot be resolved, further investigation is required. In this case the process should remain in **Stopped** status.

Batch Job Step in In Progress Status While Batch Job Ended With an Error

When an Infrastructure Process Step that is associated with a batch job stays in **In Progress** status while the batch job ended with an error, further investigation is required. One possible cause for that situation could be an error that causes the job to fail and at the same time also prevents the job from communicating its status back to the originating process step.

In this case you should manually transition the step into **Failed** status and continue your investigation.

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> **Note**
>
> If you decide to stop the Infrastructure Process altogether (as a result of the exception), it is a good idea to mark the batch job that failed "Do Not Attempt Restart" in the Batch Run Control for that batch run. This will ensure that the next time the Infrastructure Processes runs, when it gets to that batch process step it will not attempt to resume the execution that ended with an exception, possibly causing a repeat of the exception.

Batch Job Step in In Progress Status While Batch Job Ended Successfully

When an Infrastructure Process Step that is associated with a batch job stays in **In Progress** status while the batch job ended successfully, further investigation is required. In this case, once you ascertained that the job did actually end successfully, you can manually transition the process step into **Completed** status and use the **Resume** action at the process level to continue its execution.

Non-Batch Step Exceptions

Infrastructure Process Steps that are not associated with batch jobs can experience errors as well and therefore can fail. As a reminder, the logic for these steps can experience local or remote errors. When such a step fails, information about the failure can be found in the process step log.

Process Automation Tool Setup

The process automation tool requires the setup of the following components:

- Master Configuration
- External Systems
- Message Senders

In addition, a security setup is required.

The setup itself is done automatically as part of the environment provisioning process. The information in this section is provided for reference and in case changes in existing setup are required.

- Security Setup
- Master Configuration Setup
- External Systems and Message Senders

Security Setup

Before the process automation tool can be used, the security credentials of the Message Senders, used by the process automation tool, must be updated.

In order to execute the security setup, navigate using **Admin > Implementation Tools > Process Automation Security Setup**.

The setup script will ask you to provide a User ID, a Password and to indicate whether or not to override the existing security setup.

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Please contact your system or security administrator for more information about what User ID should be used for this setup.

You should select to override existing security setup when you need to update the User ID or the Password on the existing Messages Senders, used by the process automation tool. A common use case will be mandatory periodic password rotation for the user account that was selected for the setup.

> **Note**
>
> At the end of the process, you will be asked to flush all the system cache. This is required in order for the information update to take effect.

Master Configuration Setup

The process automation tool relies on master configuration settings in order to identify all the product environments that are available to it. The Master Configuration is automatically setup as part of the system provisioning process.

This section describes the setup options in case manual changes are needed.

To access the configuration for the process automation tool, navigate using **Admin** > **General** > **Master Configuration** and look for Process Automation Configuration.

The Main section includes the definition of the **Current Environment** code and the **default file extension** for CMA export files.

The Current Environment code is a **unique** code that is given to each product environment.

The Environment List section describes all the existing product environments that the process automation tool need to interact with, for example, in order to run a process that moves integration configuration from one environment to another.

The environment in the list includes the following details:

- Environment: the environment code.
- **Product**: defined in the Process Automation Product extendable lookup.
- **Domain**: defined in the Process Automation Domain extendable lookup.
- **Migration Source**: select "Yes" if you can migrate configuration data from this environment.

  > **Note**
  >
  > You should not allow automated migration of configuration from your development environment directly to your production environment but you would allow migrating from the development to test environments.

- **External System**: reference to the External System definition that will support communication with the row"s environment.

External Systems and Message Senders

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The process automation tool communicates with other product environments through Outbound Messages.

The automated setup for the process automation tool creates a set of Message Senders and External Systems to support communication with other product environments.

Each product environment which is defined on the Process Automation Configuration has a corresponding unique External System. Each External System contains the details of all the message types that it supports, the message sender for each message type and additional data if required.

Configuring New Infrastructure Processes

The process automation tool configuration is essentially a collection of process types and step types that support the automation of various multi-step processes. A set of Infrastructure Process Types and Infrastructure Process Step Types is provided with the base product. Customers and implementers can create new process and step types.

This section describes the actions required to configure new Infrastructure Process Type and Infrastructure Process Step Type.

- Configuring a New Infrastructure Process Step Type
- Configuring a New Infrastructure Process Type

Configuring a New Infrastructure Process Step Type

In order to configure a new step type, navigate using **Admin > Implementation Tools > Infrastructure Process Step Type**. Use the Infrastructure Process Step Type Query to view existing step types.

> ⚠ **Caution**
>
> Base product step type names start with "K1" and should not be change. Changing these step types can break the process and step types that are provided with the product.

The following points provide information about creating a new Infrastructure Process Step Type.

When creating a new step type, a business object has to be selected first. The Infrastructure Process Step Type BO contains the information necessary for the Infrastructure Process Step that references that step type. For example, a batch process step type BO contains information related to the batch code that should be submitted and the parameters that will be passed to it. You can use existing Infrastructure Process Step Type BOs or create new BOs according to your business requirements.

The **Related Transaction BO** references the Infrastructure Process Step BO. The step BO contains the business logic associated with the step. For example, a batch process step BO is responsible to submit a batch job with to the information from the step type. You can use existing Infrastructure Process Step BOs or create new BOs according to your business requirements.

The **Process Step Type Details** section represents additional information that is required for this specific step type BO.

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Configuring a New Infrastructure Process Type

In order to configure a new process type, navigate using **Admin > Implementation Tools > Infrastructure Process Type**. Use the Infrastructure Process Step all-in-one portal to view existing process types.

> ⚠ **Caution**
>
> Base product process type names start with "K1" and should not be change. Changing these process types can break the base product process types that are provided with the product.

The following points provide information about creating a new Infrastructure Process Type.

When creating a new process type, a business object has to be selected first. The Infrastructure Process Type BO contains information necessary for the Infrastructure Process that references that process type. You can use existing Infrastructure Process Type BOs or create new BOs according to your business requirements.

The **Related Transaction BO** references the Infrastructure Process BO. The process BO contains the business logic associated with the process. This includes the orchestration of the process steps. The process BO also contains information that is shared by step business logic during the process. For example, a process BO that handles migration of data between product environments can have a buffer that will hold the information pulled from the source environment using one step so that another step can use it to push that to the target environment. You can use existing Infrastructure Process BOs or create new BOs according to your business requirements.

The **Process Type Steps** section includes a collection of step types. The sequence of steps has to be unique and this will be sequence of execution.

> ⚠ **Caution**
>
> When selecting step types for a process type you need to consider the fact that not all step types can be used on all process types. For example, some steps need to get or save information in the process itself so it can be used by other steps of that process. These types of steps can only work with a certain type of process. Please refer to the detailed description in each of the base product provided Infrastructure Process Step Types to see what process types they can be referenced on.

The **Infrastructure Process Type Details** section represents additional information that is required for the specific process type BO.

CMA Migration Infrastructure Process Types

The following Infrastructure Process Types are provided to support the following configuration migration use cases:

- CMA Accelerator Load - import an exported file created by the Content Migration Assistant export process.

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- CMA Migration - a wholesale or piecemeal configuration migration (using the Content Migration Assistant), exporting configuration from a source environment and importing it to a target environment.
- CMA Accelerator Load (K1-CMA-LOAD)
- CMA Migration (K1-CMA-MIGRATE)

CMA Accelerator Load (K1-CMA-LOAD)

The K1-CMA-LOAD Infrastructure Process Type supports importing of an exported CMA file.

K1-CMA-LOAD is based on K1-CMAMigrationProcessType Infrastructure Process Type BO and uses the K1-CMAMigration as the Infrastructure Process BO.

The CMA Accelerator Load process type includes load an exported CMA and to run all the batch processes that are a part of the CMA import.

> **Note**
>
> This process type does not include a step for a manual user review. It is assumed that when loading an accelerator, there shouldn't be anything to review and the new configuration content is expected to be new for the most part or OK to override existing configuration.

Using the CMA Accelerator Load Infrastructure Process Type

In order to import a CMA export file (e.g. an accelerator), you need to:

- Upload the file to the system designated storage location for CMA uploads. The location is configured on the CMA Master Configuration entry and is automatically defaulted to an Oracle Cloud Object Storage location during the system installation process.
- Create a new infrastructure process with the K1-CMA-LOAD Infrastructure Process Type and provide the following additional details:
  - **Name**.
  - The **Process Steps** list is for reference only.
  - **Export filename**: specify the CMA export file name that was uploaded to the system. You should specify the full name including the file extension name.
  - **User Review Needed**: select "Yes" only if you are expecting the CMA file to include data that already exists in the system and need to be reviewed before changes are applied.
  - **Default Status For Add**, **Default Status For Update** are relevant in case you selected to have a user review. In this case define the default status of migration data items when imported into the target environment.
- Once the process is saved, you can start it by selecting the Start action.

CMA Migration (K1-CMA-MIGRATE)

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The K1-CMA-MIGRATE Infrastructure Process Type supports a full or partial migration of configuration data, from a remote environment (the source) to the environment that the process is running on (the target).

> **Note**
>
> The configuration migration process is done as a PULL (running on the target environment and pulling data from the source environment) to make sure that users without security privileges to make changes in a product environment "A" won"t be able to run a process from a remote environment "B" that will force changes into "A".

K1-CMA-MIGRATE is based on K1-CMAMigrationProcessType Infrastructure Process Type BO and uses the K1-CMAMigration as the Infrastructure Process BO.

This configuration migration process type includes all the necessary steps to create an export CMA file from a migration request on the source environment, store the file in a shared file location (accessible by the source and target environment processes) and to run all the import batch processes on the target environment to process the file. This process type also includes a step for a manual user review of the imported data if needed.

> **Note**
>
> The shared file location is configured on the Migration Assistant Configuration master configuration entity and is defaulted to an Oracle Cloud Object Storage location during the system installation process.

Using the CMA Migration Infrastructure Process Type

In order to migrate configuration data from a remote environment (the source environment) to the current environment (the target environment) you need to:

- Create a new infrastructure process with the K1-CMA-MIGRATE Infrastructure Process Type and provide the following additional details:
  - **Name**.
  - **From Environment**: select the source environment from which the data will be migrated to the target environment (the current environment). The list of valid environments to choose from is taken from the Process Automation Master Configuration. The target environment is always the current environment - the one that this process is created on.
  - The **Process Steps** list is for reference only.
  - **Migration Request**: specify the CMA Migration Request ID that will be used for the migration process. The migration request should exists on the source environment and will be validated against that environment.
  - **Export filename**: specify the CMA export file name that will be used for the export and import process. You should specify the full name including the file extension name. If you leave this field empty, the system will default the file name according to the migration request ID and the default file extension name.
  - **User Review Needed**: select "Yes" only if you are expecting the CMA file to include data that already exists in the system and need to be reviewed before changes are applied.

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  - **Default Status For Add**, **Default Status For Update** are relevant in case you selected to have a user review. In this case define the default status of migration data items when imported into the target environment.
- Once the process is saved, you can start it by selecting the Start action.

> **Note**
>
> Before using this Infrastructure Process Type, make sure that the import and export directories for the Migration Assistant Configuration master configuration entry are pointing to the SAME shared location. This is required for a successful completion of this process type.

Data Conversion Support for Cloud Implementations

This chapter provides information and requirements on data conversion support for Oracle Utilities Cloud implementations.

- Data Conversion Overview
- Configuring Conversion Data Upload
- Input Data Files
- Conversion Orchestration
- Security Setup for Conversion
- Conversion Reconciliation Reports

Data Conversion Overview

The ability to convert customer data from legacy systems to OUAF based products is critical for every implementation. The following chapter describes the overall process, tools and considerations that are specific to OUAF based product implementations on Oracle Cloud.

- Conversion Steps
- SQL Loader
- Conversion Artifacts

Conversion Steps

In general data conversion effort in the cloud is divided into the following steps:

- Prepare for conversion
- Create conversion data files
- Upload conversion data files to the cloud
- Process conversion data files
- Process converted data in cloud application

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- Approve converted data for production mode

> **Note**
>
> It is important to note that the conversion process is a highly iterative process. All the steps above are likely to be done (completely or partially) multiple times during the conversion process.
>
> For example, customer typically start with a small set of data to convert, they fix issues discovered with that data and then re-create new data files and proceed to convert them. This can happen many times, each time with either a different data sample or bigger and bigger data conversion sets until all the required data has gone through the conversion process.

- Prepare for Conversion
- Create Conversion Data Files
- Upload Data Conversion Files to the Cloud
- Process Conversion Data Files
- Process Converted Data in Cloud Application
- Approve Converted Data for Production Mode

Prepare for Conversion

Preparing for conversion will typically include the following actions:

- Identify the OUAF product entities (Maintenance Objects) for which data will be converted. Refer the specific OUAF product documentation for information about converted entities for that product. Typically, each of the product converted entities will have a set of conversion staging tables that will receive the data from your legacy system before they get processed into the system.

  > **Note**
  >
  > Conversion staging schema design may vary between products, please refer to specific product's documentation for more details.

- Evaluate your project's requirements for the Information Lifecycle Management (ILM) and Data Archiving. If your implementation uses ILM, the ILM Date must be provided as part of the legacy data extract for each eligible table.

  > **Note**
  >
  > ILM support may vary between products, please refer to specific product's documentation for more details.

- Identify tables and maintenance objects whose data requires special treatment. That may include high volume tables, extremely large CLOB data, tables with multiple CLOB fields or any other special considerations related to the legacy data being converted.

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Address the special circumstances by customizing the default configurations:

- Enable conversion for tables that are not marked for conversion in the metadata use the Master Configuration
- If your table(s) contain multiple CLOBs, but you don't plan to supply the legacy data for all of them, create Conversion Task Type for this table(s) and populate **Exclude CLOB Field** list and then add a corresponding entry to Master Configuration's Special Instructions
- If you dealing with high volumes of data, you may want to adjust the load parameters and options for the SQL Loader. In this case, create a **custom Control File Header** (Managed Content), configure a dedicated Conversion Task Type referencing this custom Control File Header and then add a corresponding entry to Master Configuration's Special Instructions. Note that creating the custom Control File Header will result in a control file composed from the custom fragment and the generated fields list.
- If the generated field definitions list in the control file doesn't satisfy your requirements, you may completely override the control file. In this case, create a **custom Control File** (Managed Content, same as above), configure a dedicated Conversion Task Type referencing this custom Override Control File and then add a corresponding entry to Master Configuration's Special Instructions. Make sure your custom Control File contains all the run-time substitution variables that appear in the base Control File Header.

See Conversion Task Types and Conversion Master Configuration chapters for more details.

- Generate the conversion artifacts for the product entities you plan to convert data for. This will include, for example, a set of data specification files that describe the format of data required for each file.
- Explore conversion tasks generated for tables and/or maintenance objects, examine the input data specifications and file lists and determine the expected data formats and input file names.
- Identify your various sources of data and extraction methods.

Create Conversion Data Files

In this step you create the set of data conversion files that were identified for the conversion process. You can choose to generate data files for each staging table or create a smaller set for each converted Maintenance Object.

The data conversion files typically do not include all the data to begin with but start small and grow with every iteration of the conversion process until they reach their maximum size at the end.

> **Note**
>
> When performing data conversion in the cloud, customers don’t have access to the database staging tables. Data scrubbing and transformation activities has to take place before the data files are generated (in each conversion iteration) so the result of these activities is reflected on the data files that are moved to the cloud to be loaded into the staging tables.

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Upload Data Conversion Files to the Cloud

Since data conversion files are created locally they have to be uploaded to the cloud environment in order to be processed and loaded into the conversion staging tables.

In this step you should setup a dedicated input location on the object storage and upload the input data files there.

For more details refer to File Locations .

Process Conversion Data Files

After uploading the files to the cloud, you should run a set of batch processes that will process the data files using Oracle SQL Loader and insert the data to the product conversion staging tables.

The staging table load process also produces output files that provide feedback on the load process.

You can download these output files for review.

> **Note**
>
> The process that imports the data in the files to the staging tables, using Oracle SQL Loader, is using the artifacts that were generated in the "Prepare for Conversion" step.

For more details refer to Understanding Load Data Process .

Process Converted Data in Cloud Application

When the data intended for conversion (for a conversion iteration) is loaded into the appropriate conversion staging tables, the OUAF application in the cloud can process that data according to the product's data model, technical and business rules.

Refer to the OUAF product specific documentation for further guidelines and information on the specific processes and guidelines related to data conversion.

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> **Note**
>
> This is one step of the overall iterative process but it is also includes many internal steps, for example:
>
> 1. Validation of the data in the conversion staging tables.
> 2. Generation of the system assigned keys for the converted entities.
> 3. Migration of the converted data from the staging tables into the actual system tables.
>
> When the processing of the converted data in this iteration is completed, information from the system is used to identity changes necessary to source data, the extraction process or other activities involved in producing the data to be converted.
>
> The process can then start over by loading a new set of data into data conversion files, load them to the staging tables in the cloud and process them once more to get more feedback.

Approve Converted Data for Production Mode

When the quality and scope of data converted has reached its target, the process can stop. Once the overall data has been approved for production mode the conversion process comes to an end. The process of approving the data includes many activities, for example:

- Running various reports to compare converted data with legacy data to verify the quantity and quality of the data.
- Running reports and tests in the new application to verify the data and the system's behavior using that data.
- Manual review of random and key data in the system.

SQL Loader

Loading the data in the data conversion files into the product conversion stating tables is done using Oracle SQL Loader.

Oracle SQL Loader is an Oracle Database Tool that enables mass upload of data from various sources into database tables in a fast and safe way.

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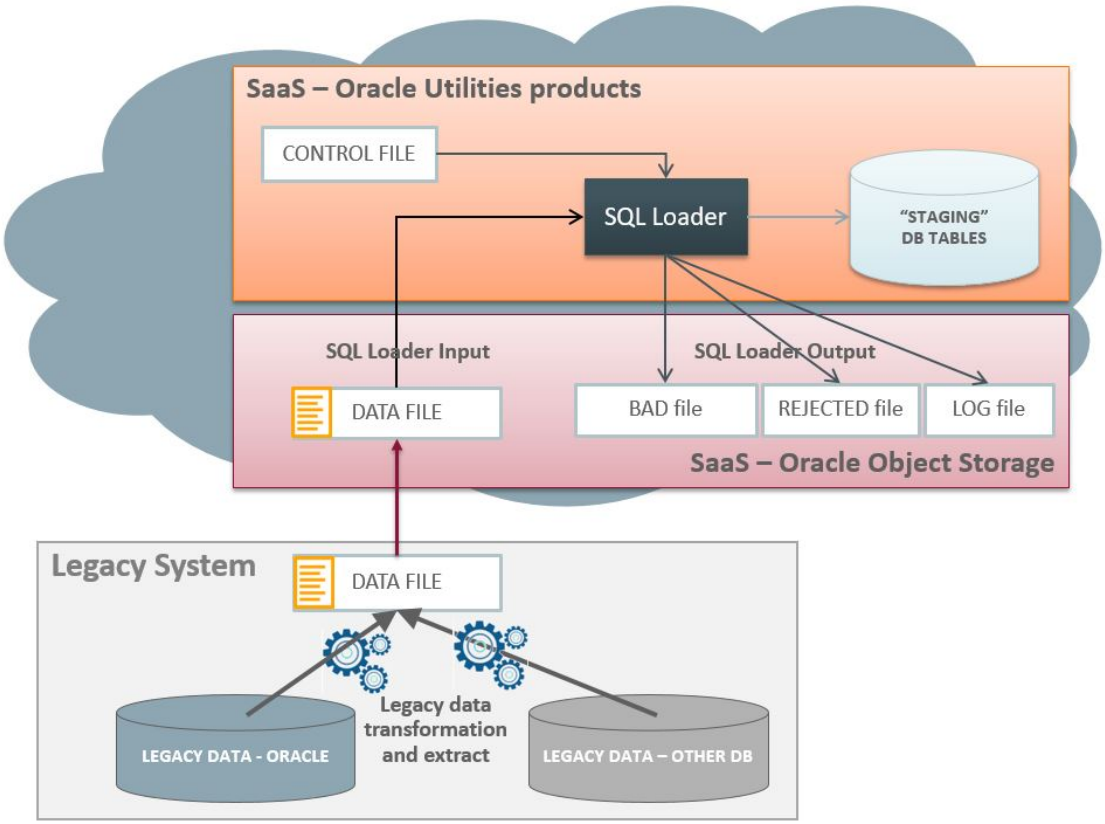

SQL Loader processing is determined by Control Files. The control files for the data conversion process are provided for each of the product conversion staging tables as part of the artifact generation which is a part of the preparations activities before starting the conversion process.

The Control Files typically define:

- The location of input files to load.
- The character set of the input data.
- The target table(s) for the load and how to insert the data (e.g. append to or override).
- How to map the data in the input file to tables and fields.
- The location of the output files (e.g. log, bad or rejected records).
- Options for parallel processing and load balancing.

The control files that are generated for the product include all the parameters necessary to load the product conversion staging tables. There are some customization options for these files that are discussed later.

After loading the control files, SQL Loader reads the records in the input data file(s), converts the input into database tables and columns that are inserted into the database.

SQL Loader has 2 modes of operation:

- **Conventional Path Load** â€“ data is inserted to the database by using database SQL INSERT statements.
- **Direct Path Load** â€“ data is inserted into the database using data blocks that are written directly to the database. This method is much faster and therefore is the method selected for the data conversion process.

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SQL Loader has the ability to deal with multiple data files mapped to multiple tables as well as loading data into CLOB fields.

- Using SQL Loader When Processing Conversion Data Files

Using SQL Loader When Processing Conversion Data Files

Processing of uploaded conversion data files is done via a Batch Process (for each staging table or MO) that does the following:

- Prepares parameters for the SQL Loader process and retrieves Control File for an input table or MO
- Invokes SQL Loader and processes the legacy data extract files that were uploaded to the dedicated File location on cloud
- Archive the input file(s) and upload the SQL Loader output files to the File location so they can be subsequently downloaded by the customer for review.

Conversion Artifacts

The base product includes a set of artifacts that support the conversion process. These artifacts are provided on demand (generated as a result of a user request in the system).

The available artifacts are:

- Input Data Specifications
- SQL Loader Control Files
- Files List
- Conversion Input Data Specifications
- SQL Loader Control Files

Conversion Input Data Specifications

The system will generate a text file with data specification instructions for each of the conversion tables that are supported by the base product.

The specification files are for reference ONLY and are not used by the system at run time. These files describe the data format for each table so that the data specified can be loaded correctly with the Control File that is also generated by the system.

For more details refer to Conversion Artifact Generator .

SQL Loader Control Files

The control files are for internal use and are generated for each of the conversion tables that are supported by the product. These files are used by SQL Loader to interpret and load the data that is provided in the conversion data files.

The control file contains:

- General load parameters and options
- Data field specifications and table-specific load instructions

For more details refer to Conversion Artifact Generator .

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Configuring Conversion Data Upload

The following sections describe the settings and configurations used by various conversion data upload processes.

- Conversion Master Configuration
- Conversion Task Types
- Conversion Artifact Generator
- Conversion Tasks
- Conversion Batch Controls

Conversion Master Configuration

The **Conversion Data Upload Master Configuration** controls generic aspects of the legacy data load process.

The **Main** section captures the definitions globally applicable for all converted objects (tables and/or maintenance objects):

- **Default Conversion Instructions for Artifact Generator** reference conversion task types that define load parameters for individual tables or maintenance objects.
  The Master Configuration captures conversion task types with default configurations for:
  - Typical Table
  - Typical maintenance Object
  - Key Table.

Special Instructions section captures the definitions that support various idiosyncratic data upload scenarios

- **Override Conversion Eligibility â€" Table** list allows you to specify tables that are not marked for conversion in the metadata, but your implementation wishes to include in the conversion data upload and cleanup scope and vice versa - to exclude tables that are marked for conversion in the metadata from the data upload-related operations

> **Note**
>
> If the table you wish to convert has a related key table, this key table has to be explicitly added to this list.
>
> The sequences and the batch run history and other batch operation-related tables are never eligible for conversion operations.

- **Override Instructions** for **Tables** and **Maintenance Objects** define Conversion Instructions (conversion task types) for objects that require special processing or data formatting. For example, the default conversion instruction defines that CLOB data is supplied as a secondary file. The special instruction for a specific table may define that CLOB data is supplied in the main data file.

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Conversion Task Types

To configure a new conversion task type, navigate using Admin > Conversion Support > Conversion Task Type.

Conversion task type controls the data load parameters for the target table or maintenance object. Conversion task type also defines the transactional business object for Conversion Task. The algorithms linked to the transactional business object are responsible for the generation of the Conversion Artifacts: control files, input data specifications and file lists.

> **Note**
>
> The product is delivered with several conversion task types whose names start with 'K1'. These configurations should not be changed directly as they reflect the default behavior of the product. The task types get refreshed with base values at each upgrade.. Use them as a templates; if needed, create a copy and modify it according to your requirements.

Conversion Task Types defines:

General Input Data Instructions (all Conversion Task Types Business Objects)

- **Control File Header** - a fragment of the control file that contains general load parameters. This fragment is included in the generated control file. This is a Foreign Key reference to the **Managed Content** entry.
- **Override Control File** - a full text of the control file that contains both load parameters and field definitions. The entire text is copied into generated control file 'as is'. This is a Foreign Key reference to the **Managed Content** entry.
- **Date and DateTime fields' formats**. These attributes are referencing the Extendable Lookup values for *K1-ConvLoadDateFormatLookup* and *K1-ConvLoadDateTimeFmtLookup business objects*
- Strings to use as **data delimiters** and **data enclosing characters**. These attributes are referencing the Extendable Lookup values for *K1-ConvFileDelimiterLookup* and *K1-ConvFileEnclosingCharLookup* business objects
- **CLOB data extract rule** indicates whether the CLOB data is supplied as part of the input data file or as a separate, secondary file
- **CLOB data line separator** defines how the records are separates in the secondary (CLOB) data file. This value should be set according to the operating system where the legacy data extract was created. This attribute is referencing the Extendable Lookup values for *K1-ConvCLOBLineSeparatorLookup* business object.

  For Linux CLOB Line Separator set the value to ***LF***, for Windows, set the value for ***CR+LF***

CLOB Field Instructions for Tables/MO-s that contain multiple CLOB fields (Business Objects *K1-ConvArtMultClobMOTaskType* and *K1-ConvArtMultClobTblTaskType*)

- Target Object - **Table** or **Maintenance Object**
- **Exclude CLOB Fields** list - the list of CLOB fields that are not expected to be provided with the legacy data extract and therefore should be excluded from the generated control file.

The following Conversion Task Types are pre-configured in the product:

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- **K1-CNV-TABLE** - meant to be used for a single table load. It is referencing a Transactional Conversion Task Business Object whose algorithms generate Table Conversion Artifacts
- **K1-CNV-MO** - meant to be used for a single maintenance object load. It is referencing a Transactional Conversion Task Business Object whose algorithms generate Maintenance Object Conversion Artifacts
- **K1-CNV-KEY-TABLE** - meant to be used for the Key Tables. Key Tables are index-organized tables (IOT) and as such cannot be loaded in multiple concurrent sessions of SQL loader. This Task Type is referencing a Control File Header (Managed Content) where ***Parallel Load*** parameter is set to ***false***

Special configurations for tables that include more than one CLOB field

- Configure a dedicated Conversion Task Type for tables with multiple CLOB fields. Determine and control which CLOB fields to migrate and avoid creating unnecessary empty data files.
- If you wish to migrate all CLOB fields, create a dedicated Conversion Task Type for the Table or Maintenance Object, using business objects *K1-ConvArtMultClobMOTaskType* or *K1-ConvArtMultClobTblTaskType*). Do not populate **Exclude CLOB Fields** list. As a result, the generated Control File and Input Data File Specifications will reference **all CLOB fields**.
- If you wish to migrate only some CLOB fields, create a dedicated Conversion Task Type for the Table or Maintenance Object, using business objects Business Objects *K1-ConvArtMultClobMOTaskType* or *K1-ConvArtMultClobTblTaskType*. Populate the **Exclude CLOB Fields** list. As a result, the generated Control File and Input Data File Specifications will **omit excluded CLOB fields.**
- If no dedicated Conversion Task Type is configured and defined on the Master Configuration as Override Instruction for the Table or MO, the system uses the default Conversion Instruction defined on the Master Configuration. In this case, the generated Control File and Input Data File Specifications will reference a **single CLOB field** among Table's multiple CLOB fields (the one with the lowest table field sequence).

Conversion Artifact Generator

Conversion Artifacts is a set of supporting files used for data upload with SQL Loader. The artifacts are generated based on the table and maintenance object metadata and the definitions from Conversion Master Configuration and Configuration Task Types. Conversion artifacts include SQL Loader control files, input data file specifications and other supplemental files.

- **Input data file specifications** provide detailed field-by-field description of the expected data type and format, field order and other instructions. Your implementation may use these specifications to create the legacy data extract.
- **Control file** defines the rules and options of the data upload
- **File List** enumerates input data files expected to be provided for upload

The generator reads Conversion Master Configuration in order to determine the conversion task type associated with the table or maintenance object.

The generator creates **Conversion Tasks**, one instance per table and/or per maintenance object, creates attachments that store the artifacts and links the attachments to the Conversion Task as Related Objects.

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> **Note**
>
> IMPORTANT: The regeneration is necessary each time the metadata or conversion configurations are amended.

Conversion Tasks query is provided with the base product.

You can choose to generate artifacts for table-level and/or maintenance object-level load, or for the entire system or for specific Table or Maintenance Object:

Generate Artifacts in bulk â€" for all Tables and/or Maintenance Objects

- Submit new batch job for Batch Control K1â€“CNVGA. This process performs a complete refresh of the conversion artifacts. It deletes existing and creates new Conversion Tasks for every Table and/or Maintenance Object that includes tables marked for conversion.

Generate Artifacts for an individual Table or Maintenance Object

- Navigate to **Admin**, then **Conversion**, then **Support**, then **Generate Conversion Artifacts**.
- Select one of the options:
  - **Table search** allows you to select specific target table
  - **Maintenance Object search** allows you to select specific target Maintenance Object.

> **Note**
>
> The process overrides all previously generated artifacts and replaces existing files.

Accessing the Artifacts

Navigate to Conversion Task query and search for the task that is corresponding to a table or a maintenance object. or use other available search criteria. Explore the Attachments collection to view the artifacts.

Conversion Tasks

The following sections provide information about Conversion Tasks and generated conversion artifacts.

- Conversion Task Query
- Conversion Task

Conversion Task Query

Conversion Task query allows to search by variety of criteria:

- Creating User, Conversion Task Type and Status
- Linked Object â€" Table or Maintenance Object
- Exact Conversion Task ID

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Conversion Task

The purpose of the **Conversion Task** is to maintain the conversion artifacts for Table or Maintenance Object. Please consider the following with respect to conversion tasks.

- The business object lifecycle supports multiple attempts to re-generate the artifacts.
- The re-generation could be triggered either manually or by the Conversion Artifact Generator. Only one set of the artifacts is relevant at any point of time, hence only one Conversion Task at the time can exists for a given Table or Maintenance Object.
- Typically, Conversion Tasks are created by Conversion Artifact Generator. However, it can also be created manually by navigating to **Admin**, then **Conversion**, then **Support**, then **Conversion Task**.
- Use the Conversion Task Query to search for an existing entry. Select the entry from the search results to navigate to the maintenance portal to view and maintain the selected record.
- Conversion Task references a Conversion Task Type and contains standard business object record information, including the creation date/time, status update date/time and creating user.
- The task references the object - **Table or Maintenance Object** - for which the artifacts are generated.
- The collection of task's **Related Objects** store references to the Attachments that store a snapshot of the generated files. A new attachment is created after each generation run and linked to the Conversion Task for audit purposes.

Conversion Batch Controls

The following batch controls are delivered with the base product:

Batch Control	Description
K1-CNVLD	Conversion - Load Data using SQL Loader. This process facilitates the legacy data extract upload using SQL Loader. The input data files are expected to be uploaded to a file storage location. See Input and Output File Location for more information about file storage locations. One run uploads the data into a single target Table or Maintenance Object. The process is multi-threaded. This process is discussed in more details in the Data Load Batch chapter

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Batch Control	Description
K1-CNVDS	Conversion - Disable Conversion This process resets the environment indicators and prevents further conversion activities. Once conversion is disabled, the following actions are blocked: • Switching between Conversion and Production • Table truncation • Disable Indexes and Rebuilding the Statistics • Data insertion into Production • Data upload into staging **Note** The process should be executed only once and only after all of the conversion activities are completed and the application is ready for the real production use.
K1-CNVEN	Conversion - Enable Conversion This process resets the environment indicators and enables it for conversion activities. It should be executed at the start of the Conversion project.
K1-DRPIN	Conversion - Disable Indexes on Production Tables This process can be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object. Limitation: the indexes on the batch run history and other batch operation-related tables can not be disabled • If no specific target is populated, the process disables indexes on all converted tables in Production schema
K1-SDSIN	Conversion - Disable Indexes on Staging Tables This process can be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object. Limitation: the indexes on the batch run history and other batch operation-related tables can not be disabled • If no specific target is populated, the process disables indexes on all converted tables in Staging schema
K1-DRICMS	Conversion - Disable Customer Modification Indexes This process can be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object • If no specific target is populated, the process disables indexes on all conversion-eligible tables in Customer Modification schema
K1-RIUSP	Conversion - Rebuild Indexes and Update Statistics in Production This process can be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object • If no specific target is populated, the process rebuilds indexes and updates statistics on all converted tables in Production schema • Specify the sampling size (percentage) for statistics gathering. If not specified, the system will use default dbms_stats.auto_sample_size. • Specify whether you wish to rebuild indexes, to gather table statistics or both. It is recommended to rebuild the indexes and update statistics right after the data upload.

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Batch Control	Description
K1-RIUSS	Conversion - Rebuild Indexes and Update Statistics in Staging This process can be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object • If no specific target is populated, the process rebuilds indexes and updates statistics on all converted tables in Staging schema • Specify the sampling size (percentage) for statistics gathering. If not specified, the system will use default dbms_stats.auto_sample_size • Specify whether you wish to rebuild indexes, to gather table statistics or both It is recommended to rebuild the indexes and update statistics right after the data upload.
K1-RUSCM	Conversion - Update Customer Modification Statistics This process can be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object • If no specific target is populated, the process rebuilds indexes and updates statistics on all conversion-eligible tables in Customer Modification schema • Specify the sampling size (percentage) for statistics gathering. If not specified, the system will use default dbms_stats.auto_sample_size • Specify whether you wish to rebuild indexes, to gather table statistics or both It is recommended to rebuild the indexes and update statistics right after the data upload.
K1-CLNTB	Conversion - Truncate Tables in Production This process can be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object. Limitation: the sequences, the batch run history and other batch operation-related tables can not be truncated • If no specific target is populated, the truncates all converted tables in Production schema
K1-SCLTB	Conversion - Truncate Tables in Staging This process can be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object. Limitation: the sequences, the batch run history and other batch operation-related tables can not be truncated • If no specific target is populated, the truncates all converted tables in Staging schema
K1-CLNCM	Conversion - Truncate Customer Modification Tables This process can be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object • If no specific target is populated, the truncates all conversion-eligible tables in Customer Modification schema
K1-CLNRT	Conversion â€" Truncate XML Resolution Tables This process is allowed to run only in the Staging schema and may be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object • If no specific target is populated, the truncates all XML Resolution tables in Staging schema

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Batch Control	Description
K1-CLNKY	Conversion - Truncate Key Reference Tables This process is allowed to run only in the Staging schema and may be used in two modes: • Populate Table or Maintenance Object batch parameter to process specific object • If no specific target is populated, the truncates all Key Reference tables in Staging schema

- Configuring Data Load Batch Controls for Conversion Project

Configuring Data Load Batch Controls for Conversion Project

The generic batch process K1-CNVLD performs the load of the input data file(s) into a target table or maintenance object, specified as one of the batch parameters.

Consider creating individual batch controls per object (table or maintenance object).

It allows leverage the parallel processing capacity of the system; the data load processes for all objects can be submitted near-simultaneously, thus minimizing the time needed for the legacy data upload, which is only an initial step in the overall data conversion process.

Use batch control K1-CNVLD for rehearsal load batch run for various tables and/or maintenance objects and determine the optimal load strategy:

- Whether the data should be extracted and loaded as single Tables and/or Maintenance Objects
- Whether and how to split the data files and the number of threads for the batch
- Potential log file size and the feasible logging level

Configure data load Batch Controls for each individual Table or Maintenance Object. Pattern the configuration after K1-CNVLD and set the default parameter values for:

- **Input, Output and Archived File Storage Locations**. The location (compartments and buckets) has to be defined in advance in the cloud object storage; batch parameters are referencing Extendable Lookup ***F1-FileStorage*** value(s) corresponding to these locations. The parameter value should be composed as **file-storage:*//***<Extendable Lookup Value>/<object storage bucket name>, for example: *file-storage://OS-SHARED/CONV-Input*
- Target **Table** or **Maintenance Object** Either one of these two parameters must be populated.
- **File Extension**. When specifying the **file extension**, include all the extensions available. For example. if the file name is ***XXX.csv.gz,*** enter parameter value ***csv.gz***
- **Log Level.** Specify the value *LOG* to force SQL Loader to produce the most detailed data upload process log.
- **Retain Input Option**. This parameter controls whether the original input data files should be left 'as is' at the input data location or purged from the object storage or moved to the archived data location. When the input data is archived the timestamp is appended to the original file name.

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> **Note**
>
> Note: if the batch process was not able to upload the input data file, this file remains at the input data location.

- **Max Number of Upload Errors**.

  The value of this parameter pertains to the desired errors threshold for the SQL Loader. The load process halts after the specified number of records in error is reached. The SQL Loader log contains a message SKIPPED=NNN where NNN marks the position of the last record in error in the input data file. The process may then be resumed from this position if the batch is submitted with the ***skip*** parameter populated with the value of SKIPPED from the log.

Default **Thread Count** depends on the type of the uploaded table. Regular tables can be uploaded in a single or multiple threads. Key tables must be uploaded in a single thread

Input Data Files

This section provides information on inputting data files for data conversion.

- Overview
- Input Data for a Staging Table
- Input Data for Maintenance Object
- Limitations for Input Data

Overview

This section provides information on the requirements and details for file upload, loading table, maintenance object, CLOB, layout, data formatting, and so on related to inputting data files for data conversion.

- File Creation and Upload
- Loading Table or Maintenance Object
- Multiple Data Files
- Loading CLOB Data
- File Layout and Data Formatting
- Defining Custom Data Delimiters and Enclosing Characters

File Creation and Upload

The extract data may be uploaded in both compressed and decompressed form.

Supported compressed formats include zip and gzip. The files with extension **.gz** and **.zip** will be automatically decompressed by the system.

> **Note**
>
> For the further details on supported compressed formats please refer to the Oracle Utilities Application Framework documentation.

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File Creation

Use Conversion Task query to retrieve conversion task(s) for table(s) or maintenance object(s) that you are planning to convert. Review input data specifications. Create the data extract text file, using field delimiters, enclosing characters and data formatting according to the specifications.

If the files were created under Windows operating system, it is recommended to remove the carriage return character prior to compression (not applicable for secondary files with CLOB data).

File Compression with gzip

Use gzip utility to compress the file.

- For Windows operating system, download and install gzip utility for Windows. Run the following:

```
# Navigate to the gzip folder
cd C:\gzip-1.3.12-1-bin\bin
# Run gzip.
# New file will be created in the same directory as the original the input file
gzip -k <full path to the input data file>
# Sample command for the file TABLE_NAME.txt located under
# C/myDataDirectory/:
gzip â€“k C/myDataDirectory/TABLE_NAME.txt
```

- For Unix/Linux operating systems, run the following command:

```
gzip < <inputFile name> > <outputFile name with .gz suffix>
# Sample command for the file TABLE_NAME.txt
gzip < TABLE_NAME.txt > TABLE_NAME.txt.gz
```

Loading Table or Maintenance Object

The conversion data upload supports two types of the extract:

- Data extract that contains the data for a single target staging table.

  In this case, the upload process inserts records into a single staging table. The input data file consists of similar records, each represents a row in the target table.

- Data extract that contains the data for the group of target staging tables that represent a Maintenance Object.

  In this case, the upload process populates all the tables that belong to a maintenance object. The input data file contains multiple types of records that are inserted into various tables.

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> **Note**
>
> If the data is uploaded for a Maintenance Object, each record has to be prefixed with the table name that is used as record type indicator. This requirement is also mentioned in the input file specification

- The application stores the large volumes of data in partitioned tables. If the Maintenance Object contains partitioned tables, the data should be uploaded in a certain order:
  - During the data upload, the primary table in the Maintenance Object should be loaded first, then the indexes should be rebuilt, followed by the data upload into the child tables

Multiple Data Files

The large volume of the converted data may require the extract to be split into multiple parts.

In this case the multi-part extract for a target staging Table or Maintenance Object is loaded with a multi-threaded batch run.

Sample scenario:

10M of the Person records are being converted. The extract file is split into 10 files, PERSON1, PERSON2 PERSON3 etc., each file contains 1M records. All 10 files are uploaded to the input file location.

Batch process 'Load Person data' is submitted with 5 threads; each thread picks up 2 files and uploads the data into staging tables.

Loading CLOB Data

The CLOB data can be loaded in two ways:

- Extracted as part of the main data file. This method is suitable for the relatively small CLOB data size. Refer to Limitations for more details.
- Extracted into a separate file. This method is suitable for larger CLOB data sizes and also for large volume tables or maintenance objects. In this scenario, the secondary file has to be uploaded at the same time as the primary data file.

> **Note**
>
> When loading CLOB data as a secondary file, a separate file is created for each CLOB field in the. It means that if the table 'XXX' contains CLOB fields 'clob1Field1' and 'clobField2', the system would expect to process files XXX, XXX_clobField1_CLOB and XXX_clobField2_CLOB. See also Notes on Secondary Data Files

- Notes on Secondary Data Files (CLOB Data)

Notes on Secondary Data Files (CLOB Data)

Secondary data file is loaded simultaneously with the primary data file. The CLOB data extract should contain exactly the same number of records as a primary file.

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> **Note**
>
> When splitting the extract into multiple data files, make sure that the numbers of extracted records in the primary and secondary files are matching.
>
> It is applicable for both table-level and maintenance-object level load.

Sample Scenario:

Table CI_PER includes CLOB column C1_PER_DATA_AREA. The CLOB field is used to store customer's resume.

The legacy table contain 10K records and the CLOB data is available for some of the records

The primary data file, CI_PREM.csv contains 10K lines, one line per record

The secondary data file, CI_PREM_CLOB, contains 10K records too. The records with the empty CLOB are represented by CLOB delimiter.

Primary File – Regular Data Fields	Secondary File - CLOB
12345678,John,Doe,.....	John's resume <endclob>
45165609,Smith,Mary,.....	Mary Smith resume<endclob>
33336733,Brand,Brent,.....	<endclob>
06737482,Sunshine,Julie,.....	Julie Sunshine resume<endclob>

Splitting single table data extract with CLOB

The following example illustrates how to split the single table large volume extract correctly if the CLOB data is supplied in the secondary file:

Assuming the table has 10K records, split into two equal parts. The following files should be created:

- Primary File 1 with 5K records
- Secondary File 1 with 5K CLOB entries
- Primary File 2 with 5K records
- Secondary File 2 with 5K CLOB entries

Splitting maintenance object data extract with CLOB

The following example illustrates how to split the maintenance object large volume extract correctly if the CLOB data is supplied in the secondary file:

Assuming the maintenance object has two tables, one of the tables includes CLOB column and the primary table has 10K records. The data supposed to be split into two equal parts. The following files should be created:

- Primary File 1 with 5K records for the primary table and corresponding records for the child table
- Secondary File 1 with CLOB entries corresponding to the table in the Primary File 1
- Primary File 2 with 5K records for the primary table and corresponding records for the child table

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- Secondary File 2 with CLOB entries corresponding to the table in the Primary File 2

> **Note**
>
> For Maintenance Object-level load consider supplying CLOB data in the primary file, to avoid complicated logic of data splitting.
>
> Refer to CLOB Data - XML for limitations concerning XML CLOB data

File Layout and Data Formatting

The input data specifications file for each Table or Maintenance Object that are subject to conversion are stored as an attachment linked to the corresponding conversion tasks. The Conversion Artifact Generator creates conversion task for each table and/or maintenance object.

Specifications are generated based on the metadata and the conversion configurations defined on Conversion Task Type and Conversion Master Configuration. Configurations control delimiters and enclosing characters and define CLOB data processing rules.

The data extract file is expected to contain one record per each target table row. The data field order in the record has to be exactly the same as it is listed in the specification file.

The specifications contain:

- Data delimiters and expected secondary data file names
- Field-by-field data formatting rules for

  data types and size, Date, DateTime and Time formatting
- Special notes on CLOB fields

The fields in the record are expected to be separated by a delimiter character (or string).

For the not-nullable columns with no data, a single space enclosed in the enclosing character (or string) has to be supplied, for example " "

The CLOB data in the main record has to be enclosed in the CLOB Delimiter string, for example *<clobend>some clob data<clobend>*

The CLOB records in the secondary data file has to be separated by CLOB Delimiter string followed by the new line sign, defined as the CLOB Line Separator. IMPORTANT! the last entry in the CLOB data file has to end with the new line, too

- If the data extract is created on Linux, use Line Feed to separate CLOB records and make sure that there is no space after CLOB Delimiter string
- If the data extract is created on Windows, use Line Feed followed by Carriage Return.

Enclosing character (or string) can also be used to encapsulate data that includes a field delimiter, for example *"Hello, World"*

Defining Custom Data Delimiters and Enclosing Characters

The default configurations are delivered with the base product.

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Your entire legacy data or a specific table, or the data extract mechanism may require use of a different data delimiter and/or enclosing characters. To enable alternative delimiters, perform the following steps:

- Define new data delimiter string, enclosing string, CLOB delimiter string and/or CLOB Line Separator using the corresponding Extendable Lookups
- Configure Conversion Task Type using newly created delimiters
- Amend Conversion Master Configuration, setting default (for all tables or maintenance objects) or override (for specific table or maintenance Object) instructions.
- Regenerate Conversion Artifacts

Now you can create data extract according to the newly generated specifications.

Input Data for a Staging Table

The extract for a single table contains delimited data records. Depending on the conversion configuration, the CLOB data should be supplied either inline or in a separate, secondary file.

Input Data File Names

Input data file names has to follow the rules described in this chapter. The names are case-sensitive.

File Type	File Name
Single data file per table, no CLOB	File name equal target table name, such as CI_PREM
Single data file per table, **single** CLOB column in the table, CLOB data in secondary file	Primary file name equal target table name, such as CI_PREM Secondary file name is composed as target table name concatenated with '_CLOB', such as CI_PREM_CLOB
Single data file per table, **multiple** CLOB columns in the table, CLOB data in secondary file	Primary file name equal target table name, such as CI_PREM **For each CLOB column** being uploaded, the secondary file name is composed as target table name concatenated with CLOB column name concatenated with '_CLOB', such as CI_PREM_COL1_CLOB, CI_PREM_COL2_CLOB
Multiple data files per table, no CLOB	File name is composed as target table name concatenated with file number, such as CI_PREM1, CI_PREM2
Multiple data files per table, CLOB data in secondary file	Primary file name is composed as target table name concatenated with numeric file number, such as CI_PREM1, CI_PREM2, and so on. Secondary file name is composed as target table name concatenated with '_CLOB' and file number, such as CI_PREM_CLOB1, CI_PREM_CLOB2, and so on.

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File Type	File Name
Multiple data files per table, **multiple** CLOB columns in the table, CLOB data in secondary file	Primary file name is composed as target table name concatenated with numeric file number, such as CI_PREM1, CI_PREM2, and so on. **For each CLOB column** being uploaded, the secondary file name is composed as target table name concatenated with CLOB column name concatenated with '_CLOB' and file number, such as CI_PREM_COL1_CLOB1, CI_PREM_COL1_CLOB2, CI_PREM_COL2_CLOB1, CI_PREM_COL2_CLOB2, and so on.

Input Data for Maintenance Object

The extract for a maintenance object contains delimited data records for all tables included in the maintenance object. Depending on the conversion configuration, the CLOB data should be supplied either inline or in a separate, secondary files, one file per table containing CLOB. Refer to Notes on Secondary Data Files (CLOB Data) for limitations concerning XML CLOB data and more details.

Input Data File Names

Input data file names has to follow the rules described in this chapter. The names are case-sensitive.

File names for Maintenance Object contain Maintenance Object Code. If the code includes spaces or special characters, it should be replaced with '_', for example:

For actual MO Code: SP/MTR HIST, in the file name, use SP_MTR_HST

File Type	File Name
Single data file per Maintenance Object, no CLOB	File name equal target maintenance object name, such as PREMISE
Single data file per Maintenance Object, **single** CLOB column in the table, CLOB data in secondary file	Primary file name equal maintenance object name, such as PREMISE Secondary files name composed as maintenance object name concatenated with table name concatenated with '_CLOB'. For example, if PREMISE's CI_PREM table contains CLOB, the secondary file name is: PREMISE_CI_PREM_CLOB
Single data file per Maintenance Object, **multiple** CLOB columns in the table, CLOB data in secondary file	Primary file name equal maintenance object name, such as PREMISE **For each CLOB column** being uploaded, the secondary files name composed as maintenance object name concatenated with table name concatenated with CLOB column name concatenated with '_CLOB'. For example, if PREMISE's CI_PREM table contains two CLOB columns COL1 and COL2 , the secondary file names are: PREMISE_CI_PREM_COL1_CLOB, PREMISE_CI_PREM_COL2_CLOB

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File Type	File Name
Multiple data file per Maintenance Object, no CLOB	File name is composed as target maintenance object name concatenated with file number, such as PREMISE1, PREMISE 2 etc
Multiple data file per Maintenance Object, single CLOB column in the table, CLOB data in secondary file	Primary file name is composed as target maintenance object name concatenated with file number, such as PREMISE1, PREMISE 2 etc Secondary files name composed as maintenance object name concatenated with table name concatenated with '_CLOB' concatenated with file number. For example, if PREMISE's CI_PREM table contains CLOB, the secondary file names are: PREMISE_CI_PREM_CLOB1, PREMISE_CI_PREM_CLOB2, etc
Multiple data file per Maintenance Object, **multiple** CLOB columns in the table, CLOB data in secondary file	Primary file name is composed as target maintenance object name concatenated with file number, such as PREMISE1, PREMISE 2 etc **For each CLOB column** being uploaded, the secondary files name composed as maintenance object name concatenated with table name concatenated with column name concatenated with '_CLOB' concatenated with file number. For example, if PREMISE's CI_PREM table contains two CLOB columns COL1 and COL2 , the secondary file names are: PREMISE_CI_PREM_COL1_CLOB1, PREMISE_CI_PREM_COL1_CLOB2, PREMISE_CI_PREM_COL2_CLOB1, PREMISE_CI_PREM_COL2_CLOB2 etc

Limitations for Input Data

Key Tables

Due to technical limitations, Key tables cannot be loaded in multi-threaded mode. If you decide to create input data files using the Maintenance Object method, consider the following:

- Create data extract(s) for a Maintenance Object data, but exclude the Key table(s) and run data upload in multi-threaded batches
- Create separate extract for the Key table(s) only and upload them in single threaded batches.

Duplicate Records

Duplicate records are not rejected during the upload. This may result in the index corruption and other issues in the target table(a).

The default SQL Loader data upload method configured in the system is Direct Path. Among the advantages of a Direct Path method are higher performance and more efficient resources utilization. Constraints are disabled during Direct Path load and as a result the duplicate PK records are not rejected.

There are two approaches to address the issue

- Clean up the duplicate records from the legacy data extract BEFORE the upload

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- Customise the default configuration and switch to the Conventional Path load method.
  - **Create custom Control File Header**: Duplicate Managed Content K1-SQLLoaderControlFileHeader .and modify to use Conventional Path Load (Consult SQL Loader documentation for more detailed information).
  - **Modify Conversion Instructions** (Conversion Task Type): specify SQL Loader Control File Header created above
  - **Regenerate Conversion Artifacts**

CLOB Data Size

The maximum size of the CLOB data included in the main data file is 10K. If converted CLOB data size is expected to be larger than 10K, create secondary data files.

CLOB Data - XML

The XML data formatted using new line characters cannot be uploaded as part of the primary data file. If your CLOB data includes formatted XML, you should create secondary data file(s) for CLOB columns.

Conversion Orchestration

This section provides information on orchestrating a data conversion.

- Input and Output File Location
- Understanding Load Data Process
- Understanding the Conversion Orchestration Process

Input and Output File Location

The following locations has to be defined in order to support legacy data upload:

- File location for input data files upload
- File location for SQL Loader output files and also for archived input data files

See Object Storage chapter for more details on how to define the file location.

Understanding Load Data Process

The setup of the batch controls that is necessary to support data conversion and legacy data extract upload is described in Data Load Batch Controls .

The following sections explain the process of legacy data extract upload with SQL loader.

- Load Data Batch Run Parameters
- Multi-Threading
- Load Outcome â€“ Log, Bad and Rejected Files
- Interrupted Load
- Tables Cleanup and Index Maintenance
- Load Performance Tuning

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Load Data Batch Run Parameters

The data upload batch is processing single target object â€“ Table or Maintenance Object. The data extract may be supplied in one or multiple files, created and named according to the Input File instructions for a Staging Table and Maintenance Object .

The process is multi-threaded and optimized for the parallel load.

Using the batch parameters you can control:

- Level of logging
- Data extract retention
- Resume the interrupted load
- Maximum number of load errors

Multi-Threading

The process is threading by dividing the multiple data files between the threads. Each thread in turn, is processing its files one by one.

The exception is Key Tables. They are index-organized tables and have to be loaded in the single thread, due to the SQL Loader restrictions.

Load Outcome â€“ Log, Bad and Rejected Files

SQL Loader output files are available for download after each run . Refer to Input and Output File Location for details. To ensure file name uniqueness, the output file names are concatenated with the current timestamp.

- **Log file** contains the information about the run, including number of record processed, errors encountered and other useful information. The level of logging is controlled by the batch parameter ***log*** .
- **Bad** and **Rejected** files contain the records that were rejected by either the SQL Loader or the database. If the errors are not extensive and could be fixed manually, these files can be edited, renamed and used as an input again.

Interrupted Load

The data load process can be re-started. Once SQL Loader reached the maximum number of errors allowed for the run, it records the position of the last record in error in the log. The restarted load begins pulling the data from the file after skipping certain number of records.

In order to continue processing interrupted load, perform the following steps:

- Retrieve the log file. Find statement '*Specify SKIP=* ***n*** *when continuing the load .'* in the log file.
- Examine the log file and determine whether the problems with the data are easily amendable. Retrieve .bad and .rejected files from the same location where SQL Loader log files are found, review the problem and decide whether the entire extract has to be corrected or the upload should continue forward.
- Re-upload the input data file to the server
- Submit the batch once again, this time specifying the ***n*** as a ***skip*** batch parameter

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Simillar approach can be utilised to recover from the partial data upload. Note that in order to provide an additional safeguard for your effort and allow recovery it is recommended to create the data extract with records ordered by the primary key. This technique will allow you to determine the portion of the remainder of the un-uploaded data and make decision on the subsequent actions. If you are uploading large volumes of data and the interruption happened toward the end of the upload process it could be beneficial to complete the upload rather than to cleanup and start over.

Consider the following scenarios:

- Data Upload batch process ended abnormally due to an unrecoverable event such as software malfunction. In this case neither SQL loader nor the batch process are able to end gracefully and report the number of records processed.
- Data Upload batch process encountered a legitimate error and the batch thread and the entire batch run is now in error status.
- The SQL Loader process ended with fatal error that prevented it to log the "skipped" option properly and it is not found anywherein the SQL Loader log

If you decied to proceed with recovery, perform the following steps:

- Query the table and determine the primary key of the last record that was sucessfully uploaded - this would be possible if the data in the input file was ordered
- Then determine the position of this record in the data file
- Finaly, submit the batch once again and use the ***skip*** batch parameter to resume the load from this position

Tables Cleanup and Index Maintenance

The SQL Loader runs in parallel mode in order to maximize performance. Therefore the target tables are not emptied prior to the data insertion and must be done explicitly, by running corresponding batch jobs.

Indexes are disabled during the data upload and then need to be re-built afterwards. The product provides batch processes that support index disabling and re-building indexes and gathering table statistics.

Most of the larger volume tables in the application are partitioned. The partitioned indexes cannot be disabled implicitly by the data upload process and should be disabled implicitly before running the upload.

If your are migrating an existing on-premise Oracle Enterprise Utilities customer to the cloud, the migration requirements may include the data in the custom tables. On cloud, these tables reside in the Customer Modification schema. The product provides the dedicated batch controls to operate on the Customer Modification schema.

- Use batch control ***K1-SCLTB*** to truncate tables in **Staging** area and batch control ***K1-CLNTB*** to truncate tables in **Production**. Use batch control ***K1-CLNCM*** to truncate tables in Customer Modification schema.
- Use batch control ***K1-SDSIN*** to disable indexes in **Staging** area and batch control ***K1-DRPIN*** to disable indexes in **Production**. Use batch control ***K1-DRICM*** to disable indexes on tables in the Customer Modification schema.
- Use batch control ***K1-RIUSS*** to rebuild indexes and/or update table statistics in Staging and ***K1-RIUSP*** to perform the same in **Production**. Use batch control ***K1-RUSCM*** rebuild indexes and/or update statistics on tables Customer Modification schema.

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- Use batch control ***K1-CLNKY*** to truncate **Key Reference** tables in **Staging** area
- Use batch control ***K1-CLNRT*** to truncate **XML Resolution** tables in Staging Area
- Use batch process ***K1-SDSTG*** to disable Triggers in **Staging** and batch control ***K1-PDSTG*** to disable triggers in **Production**
- Use batch process ***K1-SENTG*** to enable Triggers in **Staging** and batch control ***K1-PENTG*** to enable triggers in **Production**

Supported scenarios include:

- **Truncate Specific Table or Maintenance Object**: In order to truncate the specific table, submit the corresponding batch job, specifying the `table` parameter. In order to truncate the data stored in a specific Maintenance Object, submit the corresponding batch job, specifying the `maintenanceObject` parameter. The process will also disable indexes in the truncated tables.

  > **Note**
  >
  > If the truncated table's metadata defines a Key table, the Key table gets truncated too.

- **Truncate all Converted Tables**: In order to truncate all converted tables run the corresponding batch job without specifying either the `table` or `maintenanceObject` parameters. The process will disable indexes and truncate all tables marked for conversion in the metadata.
- **Truncate Key Reference Tables or XML Resolution Tables for Specific Table or Maintenance Object**: In order to truncate Key Reference table linked to a staging table, submit the corresponding batch job, specifying the `table` parameter. In order to truncate Key Reference tables for a specific Maintenance Object, submit the corresponding batch job, specifying the `maintenanceObject` parameter.
- **Truncate all Key Reference Tables or XML Resolution Tables**: Submit the corresponding batch job without specifying either the `table` or `maintenanceObject` parameters to truncate all Key Reference tables.
- **Disable Indexes for Specific Table or Maintenance Object**: In order to disable indexes for the specific table, submit the corresponding batch job, specifying the `table` parameter. In order to disable indexes for the specific Maintenance Object's tables, submit the corresponding batch job, specifying the `maintenanceObject` parameter.
- **Disable Indexes for all converted Tables**: In order to disable indexes on all converted tables run the corresponding batch job without specifying either the `table` or `maintenanceObject` parameters. The process will disable indexes and truncate all tables marked for conversion in the metadata.

> **Note**
>
> You should not use conversion batch processes to truncate and/or alter indexes on the batch and batch job stream-related tables. Attempt to cleanup the batch job history or reset sequences may render the system un-operational.

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Load Performance Tuning

The data specifics â€“ volumes, structure and other aspects â€“ may justify customizing the default configurations for all or some tables.

The SQL Loader is processing data according to the Control File. The fragment that contains general load parameters is stored as Managed Content that is referenced on the Conversion Task Type.

You can create new Managed Content, configure the Conversion Task Type and specify the new settings on Conversion Master Configuration, for all or specific Tables or Maintenance Objects.

Understanding the Conversion Orchestration Process

The following sections provide information on general aspects of conversion orchestration.

Enabling Conversion

Conversion activities are possible as long as conversion is enabled in the environment. The authorized Conversion Administrator may run the corresponding batch job to enable conversion.

Switching between Staging and Production Schemas

In the environment enabled for conversion, the online application is running against the database schema that contains synonyms pointing to either Staging or Production tables.

The switching is possible only while Conversion is Enabled

Navigate to **Admin > Conversion Support > Switch Schema** to switch the synonyms, .

The current schema information is displayed on the sidebar zone when Conversion is enabled in the environment.

> **Note**
>
> The operation fails if there are batch processes currently in progress. Should you receive the error message while attempting to switch synonyms, please review the running batches and wait until its all completed before repeating the attempt.

Preparing for Conversion

The preparation steps include evaluating initial conversion configurations provided by the product, customizing the configurations if needed, and finally, generating conversion artifacts.

Most of the preparation should be done when the environment is running against the Production schema, except for job streams for conversion processes that are scheduled and, published when the schema is switched to Staging.

Conversion Development

The creation of the legacy data extract and rehearsal of the data load and subsequent conversion data processing is done while the environment is running against the Staging schema.

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Consider creating and scheduling the job stream for the sequence of the batch processes for both data load and following validation, key generation and insertion.

Uploading Data

SQL Loader implicitly disables the indexes in the non-partitioned tables before the upload. In the partitioned tables the indexes needs to be explicitly disabled by the batch process prior to the upload. Once the data upload is completed the indexes have to be rebuilt.

Upload has to be done in a certain order if loading single tables that belong to a Maintenance Object whose primary table is partitioned. The child tables within such Maintenance Objects contain Foreign Key constraints to the primary table's Primary Key. The primary table has to be uploaded first. The indexes should be rebuilt right after upload. The subsequent tables should be uploaded according to the Maintenance Object table's hierarchy (parent first, child next)

You may combine the table truncation, data upload and the index maintenance and statistic updates into a batch stream and create a dedicated batch job stream for each converted Table or Maintenance Object.

Conversion Run

For the mock-up, or dress rehearsal or the actual go-live conversion run you may choose to amend data load batch controls for tables/maintenance objects to improve performance:

- Reduce the logging level - set ***log*** batch parameter to NOLOG
- Do not retain input data - set ***retaininput*** batch parameter to PURGE

Disabling Conversion

After conversion is completed, the various activities such as table truncation and index maintenance should not be allowed.

Upon conversion project completion, switch the schema to Production and request that the authorized Conversion Administrator run the corresponding batch job to disable Conversion in the environment.

Enabling Incremental Conversion

Legacy data conversion may be done in stages. After the first chunk is converted and the system begins running in production, you may need to convert the next portion(s) of the data. This orchestration macro-scenario is called *incremental conversion*; it imposes certain limits and restrictions on the conversion activities and it has to be approved by the management.

If the incremental conversion has been approved, request that the authorized Conversion Administrator run the corresponding batch job to enable the incremental conversion in the environment.

Security Setup for Conversion

The services associated with data conversion are combined into the following user groups:

- **Conversion Administrators** includes the services linked to the most sensitive database operations: enable/disable conversion and switching database synonyms between production and staging schema
- **Conversion Development** includes the services associated with conversion-related configurations

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- **Conversion Operations** provides access to services associated with data load batch processes. This group could be extended to include services associated with specific table(s) or maintenance object data loads

These user groups are included in the base product. Your implementation may chose to use it as is or create a different setup.

Conversion Reconciliation Reports

Your cloud service subscription includes online database querying capabilities via Analytics Publisher and Database Actions. These can be used to create and run data reports against both production and staging schema tables. Contact your Security Administrator for the access information.

Batch Scheduler for Cloud Implementations

This chapter provides information and requirements on batch scheduler in support of Oracle Utilities Cloud implementations.

- SaaS Batch Scheduler Overview
- Scheduler Batch Stream Definitions
- Batch Scheduler Batch Control
- Scheduler Batch Stream Operations

SaaS Batch Scheduler Overview

SaaS Batch Scheduler is a feature in Oracle Utilities Cloud Service Foundation that provides a SaaS batch scheduler engine and user interfaces. It facilitates customers and implementers to define, manage and schedule stream of batch jobs to run at periodic intervals using a user friendly interface. The SaaS batch scheduler engine is responsible for scheduling and processing the stream of batch jobs. It has a processing loop that runs every X seconds(configured by default at 10 seconds) to perform these operations. In addition, users can monitor the progress of the streams, each of the steps and also perform required exception handling. The SaaS batch scheduler engine processes the stream of batch jobs per scheduled time, within that minute.

SaaS Batch Scheduler feature is supported by the following system entities:

- Scheduler Batch Stream Definition â€“ a Business Object based on the Batch Job Stream Definition maintenance object
- Batch Scheduler Batch Control â€“ a Business Object based on the Scheduler Program maintenance object

Scheduler Batch Stream Definitions

This section provides information on Scheduler Batch Stream Definitions.

- Defining a Scheduler Batch Stream Definition
- Activating a Scheduler Batch Stream Definition

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- Updating an Active Scheduler Batch Stream Definition
- Inactivating a Scheduler Batch Stream Definition
- Canceling a Scheduler Batch Stream Definition
- Deleting a Scheduler Batch Stream Definition
- Migrating Scheduler Batch Stream Definitions
- Tips For Setting Up Scheduler Batch Stream Definitions
- System Override Date Support

Defining a Scheduler Batch Stream Definition

In order to define a Scheduler Batch Stream Definition, from the **Admin** menu, select **Batch Operations**, select **Scheduler Batch Stream Definition**, and select **Add**.

A Scheduler Batch Stream Definition includes specifying the batch jobs and the order in which they should be run as "Stream Steps", the user to use to run these batch jobs and a "Schedule" to state when and how often the batch job stream should run. Batch jobs can be setup to run in sequence or in parallel fashion or a combination of both.

Business Date: A Scheduler Batch Stream Definition can be optionally configured to run on a particular business date. When a business date is specified, each of the batch jobs in the stream run with the business date set. The business date can be either a specific business date or a variable business date. For example, business date set to run a day before current date. This ensures every time the stream runs the batch jobs in the stream run with current date -1.

Run On Activate: A Scheduler Batch Stream Definition can also be optionally configured to run as soon as it's activated.

Start Schedule Date/Time: It can optionally be configured to specify schedule to be effective in the future by setting a date/time to start schedule. If the start schedule date/time is not provided then the schedule on the Scheduler Batch Stream is effective as of current date.

The batch job to run for each stream step can be either specified directly or via a "Batch Scheduler Batch Control". A Batch Scheduler Batch Control enables setting custom batch parameters on a Batch Control. When a batch job is submitted for a stream step that has Batch Scheduler Batch Control specified on it, the custom batch parameters are used on the submitted batch job. Refer to Configuring a New Batch Scheduler Batch Control for more details.

A Stream step includes specifying the following details

- Step Name: the name of the step
- Batch Control: the batch control to run for that step.
- Thread Count: the number of threads to use to run this step's batch control
- Batch Scheduler Batch Control: the batch scheduler batch control to use for that step. Either a batch control or batch scheduler batch control can be specified but not both
- Step Conditions: specifies when the current step should run. It includes the following details
  - Step Name: the step that should have run prior to current step
  - Step Status: the status the prior step should be in when its finished

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- Step Condition: indicates how (And/Or) prior step should combine with next subsequent step conditions. For example, if step C should execute after step B and A have ended, then step C's has two step conditions 1)A Ended And 2)B Ended.

> **Note**
>
> There can be stream configurations where a step is specified and no steps run after the specified step runs. This is not a common scenario and a warning is logged on the Log tab to adjust stream configuration, if needed.

A Scheduler Batch Stream Definition's schedule can be specified using various frequencies.

- Daily, By Minutes: run every "x" minutes every day except on specified excluded days
- Daily, By Time: run at certain times every day except on specified excluded days
- Monthly, By Month Day Number: run on a specific day of the month, at specified time
- Monthly, By Week Days: run on days of a specific week in a month, at specified time
- Weekly: run every "x" weeks on specific days, at specified time
- Yearly, By Month Day Number: run on a day of the month, at given time in specified months
- Yearly, By Week Days: run on days of a specific week, at given time in specified months
- Custom: run on a specific date at specified time

A Scheduler Batch Stream Definition can be setup to have level of service algorithms. Following three level of service algorithm types are supported.

- Stream Run has failed.
- Scheduler Batch Stream not started X minutes.
- Scheduler Batch Stream Job Ran Too long (Relative Run).

A Scheduler Batch Stream Definition can also be created without defining a schedule. When activated, it remains activated without a schedule and can be used for any manual runs.

There are custom ways in which a scheduler batch stream definition can be setup. This involves creating a Batch Scheduler Batch Control. Refer to Tips For Setting Up Batch Job Stream Definitions and Batch Scheduler Batch Control for more information.

Activating a Scheduler Batch Stream Definition

Once the Scheduler Batch Stream Definition is ready, it can be activated in the SaaS batch Scheduler to run at periodic intervals by transitioning the Scheduler Batch Stream Definition to Active state. An activated Scheduler Batch Stream Definition is called a Scheduler Batch Stream. A Scheduler Batch Stream runs based on the schedule defined on it.

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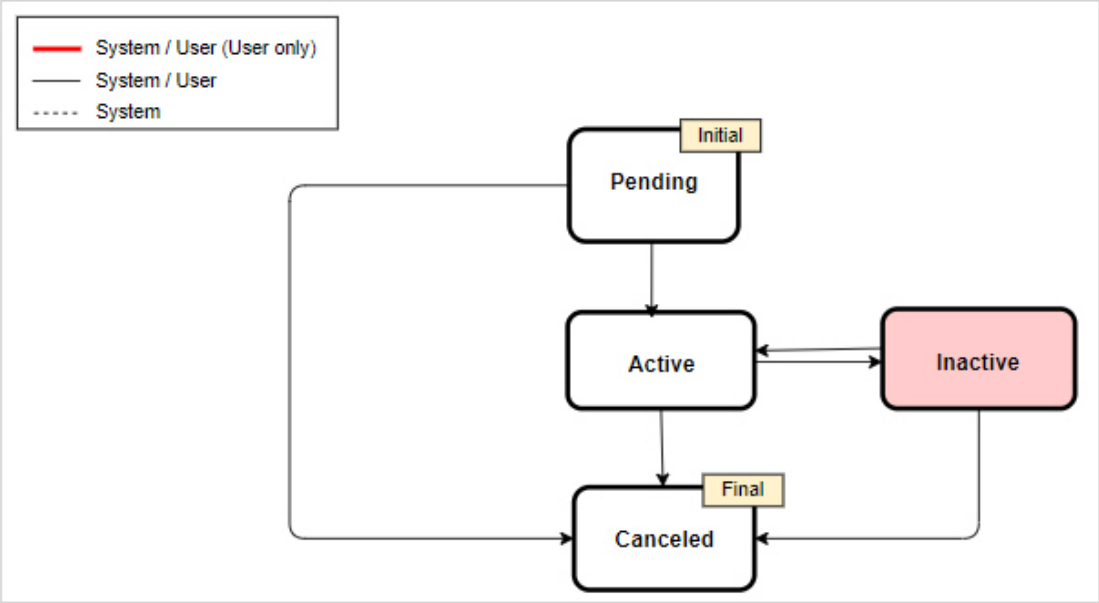

By default, every batch job in a Scheduler Batch Stream Definition is internally setup to run in such a way that if that batch job fails the Scheduler Batch Stream run stops execution. User then has an option to fix the issue and re-start the stream.

Updating an Active Scheduler Batch Stream Definition

A Scheduler Batch Stream Definition can be changed while in Active state. While active, any changes made to the Scheduler Batch Stream Definition are reflected on the next Scheduler Batch Stream run.

Changes to a Scheduler Batch Stream Definition can be made by editing it or using the edit options in the Scheduler Batch Stream Definition steps tab.

Inactivating a Scheduler Batch Stream Definition

A Scheduler Batch Stream Definition can be stopped from running further by inactivating it. Once inactivated, the SaaS batch scheduler stops scheduling and processing the scheduler batch stream definition. This is useful in situations where the stream needs to stop running temporarily for a brief period of time.

A Scheduler Batch Stream Definition can be re-activated back for scheduling and running in the future.

Canceling a Scheduler Batch Stream Definition

A Scheduler Batch Stream Definition can be canceled so that it no longer runs. If a scheduler batch stream run is ongoing when the scheduler batch stream definition is canceled, a warning is used. Canceling a scheduler batch stream definition has no impact on that currently ongoing run. User has the option to continue with the cancelation of the scheduler batch stream definition and let the scheduler batch stream run or navigate to the scheduler batch streams operations portal to cancel the currently ongoing run and then cancel the scheduler batch stream definition. Canceled scheduler batch stream definitions are allowed to be deleted.

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Deleting a Scheduler Batch Stream Definition

A Scheduler Batch Stream Definition can be deleted in Pending, Inactive and Canceled states. In case of deleting an Inactive or a Canceled scheduler batch stream definition, respective scheduler batch stream runs are also deleted.

Migrating Scheduler Batch Stream Definitions

Scheduler Batch Stream Definitions can be migrated to other environments using the Content Migration Assistant (CMA) process or the Process Automation Tool.

Scheduler Batch Stream Definitions and Batch Scheduler Batch Controls are added in the target environment in the same status as the source environment. That is active scheduler batch stream definitions are added as active.

A Scheduler Batch Stream Definition should be marked as Inactive in source environment before migrating to target environment if it should not run as soon as it's migrated.

> **Note**
>
> If a Scheduler Batch Stream is already scheduled in target environment and has next scheduled run date/time populated and the migration from source environment results in the stream having a different schedule, the new schedule will not be picked up by SaaS batch scheduler until the next run happens on the previously scheduled time. In order for the new schedule to take effect immediately, the scheduling details of the stream definition can be edited which resets the next scheduled run date/time so SaaS batch scheduler can re-determine next scheduled run date/time per new schedule.

Tips For Setting Up Scheduler Batch Stream Definitions

Configuring scheduler batch stream definitions to avoid open-ended stream issue

The scheduler batch stream definitions should always be configured such that the stream "ends" only once all the steps in the stream are completed either by configuring it on the "end of stream" step condition or by defining the inter-dependencies between the steps. This ensures the scheduler batch stream run execution does not stop in the middle of the stream.

Transferring batch job stream definitions to SaaS batch scheduler

Customers that are upgrading from prior cloud releases using Oracle Scheduler are recommended to plan transfer and migration of existing batch job streams definitions to SaaS Batch Scheduler. The recommended steps are:

- (Optional Step) Migrate existing batch job stream definitions from production environment to any pre-prod environment.
- In any pre-prod environment, use the transfer option to move the existing batch job stream definition to scheduler batch stream definition (new object for SaaS Batch Scheduler).
- Perform thorough testing of newly created scheduler batch stream definitions.
- Before migrating to the target environments, the batch job stream definitions in the target environment should be canceled(if needed) and deleted.

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- Migrate the newly created scheduler batch stream definitions by using Content Migration Assistant (CMA) to production. Migration Plans for scheduler batch stream definitions are available for review.

Jobs that run past midnight must have same business date as other jobs in a stream

In situations where a scheduler batch stream runs too long and has some jobs run past midnight, all jobs in the scheduler batch stream can be set to run with same business date. Set the business date option value on the scheduler batch stream definition to 'SYSDATE' and the scheduler engine processes all the steps in the scheduler batch stream with same date when the scheduler batch stream started.

How to split a big stream into multiple smaller stream

If the Scheduler Batch Stream Definition is too long with many jobs to run, it can be split into multiple smaller streams such that one stream runs after the other. This can be done using a new batch control K1-RNSBS (Run Scheduler Batch Stream). Create a Batch Scheduler Batch Control for every sub stream, specify the batch control as K1-RNSBS, batch parameter name as the sub stream name. Use this Batch Scheduler Batch Control as a last step on the previous stream before it ends so that as soon as the previous stream's steps are completed, the last step will initiate the new sub stream. For example, if you have a stream with jobs A,B,C,B,E,F,G,H. Split the stream into stream 1 with A,B,C,D and stream 2 with E,F,G,H. Create a Batch Scheduler Batch Control with batch control K1-RNSBS, batch parameter name as stream 2. On stream 1 after step D, define a new step that invokes the created Batch Scheduler Batch Control. Note that there are no dependencies between sub-streams. That is each sub stream would be kicked off by the new batch control to run on it's own and the stream that called the sub stream does not wait for it to finish. So such configuration is to be used with only those steps that run in parallel.

> **Note**
>
> Sub-streams follow the main stream's schedule. Schedule on a sub-stream is generally not supported.

How to configure scheduler batch stream definitions to run only on OUAF working calendar dates

To setup Scheduler Batch Stream Definition to run only on working days, use the batch control K1-CWCEL. Create a Batch Scheduler Batch Control with this batch control, batch parameter Work Calendar set to required work calendar, Verify that **Run On Business Day** is set to true. Use this Batch Scheduler Batch Control as the first step to run on the stream. Define the stream to end if this step fails. Define the stream's subsequent step to execute if this step succeeds. When the stream runs on a scheduled day, the first step checks if the day falls on a working day as per the work calendar. If the day is not a working day then the stream ends execution ensuring stream runs only on desired dates.

Scheduler batch stream definitions that check existence of a file

In situations where a scheduler batch stream definition needs to check if a file has been uploaded/created by another process before it can continue with rest of it's processing, a special batch program K1-OSCFE is available. A stream step can be introduced referring to this new batch program with parameter specifying which object storage bucket to check the file in and also status to return if the file does not exist. This stream step can be added right before the step that has dependency on checking the existence of the file and continue processing or not.

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Handling scheduler batch stream definitions inter-dependencies

In situations where a scheduler batch stream should not run when another scheduler batch stream is running, the inter-dependencies between such scheduler batch stream definitions can be configured by using a special batch program K1-CKCCR. Following steps are needed to setup such configuration.

- The new batch program accepts two parameters script name and script data. Write a CM script that checks whether a dependent job stream is running. If it's running, then the script should terminate with an error.
- On the scheduler batch stream that needs to be paused/hold if another job stream is running, add a new stream step as the first step of the job stream. Use the new batch program on the first step(by setting the CM script as the input parameter) or create a batch scheduler batch control if the batch control is to be used across many job streams with different CM service scripts as input parameters. Set the dependent job stream name as the script data parameter.
- Update the "End Of Stream" step condition such that if first step has failed, end the stream. This ensures the scheduler batch stream does not run if the other dependent scheduler batch stream is already running.
- Update the step(s) intended to execute after the first step, the step condition that if first step succeeded only then these steps should continue.

> **Note**
>
> The special batch program is not restricted to only these situations. It can be used in many custom scenarios by writing the corresponding CM script that terminates if a desired situation is met.

System Override Date Support

This section provides information on system override date support.

A System Date can be overridden at either system level or user level or both. SaaS Batch Scheduler supports the system date override at system level only. The scheduler batch streams are scheduled and processed including submitting batch jobs on the stream steps per system date override. Any online operations performed by user on the scheduler batch stream operations portal such as skip, pause, cancel etc are also processed per system date override.

> **Note**
>
> When system date is overridden, scheduler batch stream definitions that are already scheduled and have next scheduled date set on them do not automatically get the new scheduled date per the overridden system date. This means the next run would be per the current date/time. The overridden system date reflects on the subsequent runs after the scheduler batch stream runs once. If the system override date needs to take effect immediately, the stream's schedule can be updated. This reset/blanks out the next scheduled run so it gets determined immediately per system overridden date.

Batch Scheduler Batch Control

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This section provides information on using batch scheduler batch controls.

- Configuring a New Batch Scheduler Batch Control

Configuring a New Batch Scheduler Batch Control

In order to configure a new Batch Scheduler Batch Control, from the **Admin** menu, select **Batch Operations**, and select **Batch Scheduler Batch Control**. Use the **Batch Scheduler Batch Control** portal to search for and view existing batch scheduler batch controls.

A Batch Scheduler Batch Control is an entity that holds details of a batch control. Typically a scheduler batch stream definition is defined with batch control specified directly on it. In this case the batch parameters on the batch control are used in batch job submissions. A Batch Scheduler Batch Control can be created when batch parameters need to be customized different from the default batch parameters. The Batch Scheduler Batch Control can then be used on the Scheduler Batch Stream Definition. Only active batch scheduler batch controls can be used on the Scheduler Batch Stream Definition.

Scheduler Batch Stream Operations

The **Scheduler Batch Stream Operations** portal provides an overview of scheduler batch streams that are currently running or suspended or completed within the last week.

To navigate to Scheduler Batch Streams Operations portal, from the **Admin** menu, select **Batch Operations**, and select **Scheduler Batch Stream Operations**.

By default the Running Search By option is displayed where streams that are running can be searched. Broadcast any of the stream run for more information on status of each of its steps.

Two more Search By options are available to search the scheduler batch streams â€” 1. Suspended 2. Completed

Running Search By Option: This option displays Scheduler Batch Stream runs that are In Progress, Stopping, Pausing or Canceling statuses. Refer to Monitoring A Running Scheduler Batch Stream for more information.

Suspended Search By Option: This option displays Scheduler Batch Stream runs that are Failed, Stopped or Paused statuses. Refer to Monitoring A Suspended Scheduler Batch Stream for more information.

Completed Search By Option: This option displays Scheduler Batch Stream runs that are Ended or Canceled statuses. Refer to Monitoring A Completed Scheduler Batch Stream for more information

- Monitoring a Running Scheduler Batch Stream
- Monitoring a Suspended Scheduler Batch Stream
- Viewing a Completed Scheduler Batch Stream
- Handling Exceptions

Monitoring a Running Scheduler Batch Stream

A Scheduler Batch Stream is considered Running if it is one of the following statuses.

- In Progress

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- Stopping
- Pausing
- Canceling
- Ending

You can monitor the progress of a running Scheduler Batch Stream by broadcasting it from the Running search by option search results. The broadcasted zone **View Stream Steps** shows progress of the stream such as what steps have already completed and their status, what is the currently running step(s) along with steps that have not yet started. You can monitor the progress of the stream by refreshing the page or by configuring the page to refresh automatically. To configure automatic page refresh, refer to the **User Portal Preferences** for this portal.

The **View Streams Steps** zone also has information on when the step started and completed, the duration the step ran for and the option to view the batch job run. Clicking on the **View** button displays the batch run details of the batch job.

> **Note**
>
> A stream is set to Ending status if stream is In Progress and the End Of Stream step has ended. This means some of the steps are still either in In Progress or Submitted status. An Ending stream is set to Ended status once no more steps are In Progress or Submitted status.

Stream Operations

When performing operations on a scheduler batch stream, the operation is not immediately processed real-time. User can only make a request for a **desired** operation. SaaS Batch Scheduler processes these requests and updates scheduler batch stream run accordingly.

Following operations are allowed on the Running scheduler batch streams.

- *Cancel:* A scheduler batch stream run can be canceled while in In Progress or Pausing state. When this operation is performed, scheduler batch stream is set to Canceling status. SaaS Batch Scheduler processes these requests and submits a cancellation request to cancel the underlying batch job. Once the underlying batch job is canceled, the scheduler batch stream is set to Canceled status. A Canceled scheduler batch stream is removed from this Running streams list and is displayed on the Completed streams list.
- *Stop:* A scheduler batch stream run can be stopped while in In Progress state. When this operation is performed, scheduler batch stream is set to Stopping status. SaaS Batch Scheduler processes these requests and submits a cancellation request to cancel the underlying batch job. Once the underlying batch job is canceled, the scheduler batch stream is set to Stopped status. A Stopped scheduler batch stream is removed from this Running streams list and is displayed on the Suspended streams list

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> **Note**
>
> Note the difference between canceling a scheduler batch stream and stopping a scheduler batch stream. Canceling a scheduler batch stream cancels the steps in progress and cancels the scheduler batch stream so rest of the stream steps do not run permanently. Stopping a scheduler batch stream stops/cancels the stream steps that are In Progress and stops the stream execution temporarily. A stopped stream can be re-started from the Suspended Streams list on the Scheduler Batch Streams Operations Suspended Search By Option. Re-starting a stopped stream re-starts the steps that were stopped and submits the batch jobs associated with those steps to continue rest of the processing of the scheduler batch stream.

- *Pause:* A scheduler batch stream can be paused while In Progress state. The scheduler batch stream is set to Pausing status. SaaS Batch Scheduler processes these requests and pauses the scheduler batch stream once stream steps that are In Progress have completed. While the steps are In Progress, the scheduler batch stream is set to Pausing status. Once steps are complete, the scheduler batch stream is set to Paused status. If the stream steps that are In Progress are the last set of steps to be processed, then there are no steps remaining to pause the scheduler batch stream. Scheduler batch stream is not Paused and completes processing.

> **Note**
>
> Note the difference between stopping a scheduler batch stream and pausing a scheduler batch stream. Stopping a scheduler batch stream cancels the steps that are in progress and stops the stream execution temporarily. Pausing a scheduler batch stream, the steps In Progress continue execution and complete and stream is paused after that. Rest of the stream execution is on hold temporarily.

- *Interrupt:* An interrupt operation is used when the scheduler batch stream is stuck in In Progress state for long period of time and is not progressing. When used, the interrupt operation cancels the steps that are currently In Progress and re-submits the batch jobs on those steps so that the rest of the steps in the scheduler batch stream can be processed.

Stream Step Operations:

- *Skip:* A stream step(s) can be skipped by using the skip multi-action button on this zone. Only steps that are in "Not Submitted" state can be skipped.

The stream steps can be in one of the following states:

- Not Submitted
- Submitted
- In Progress
- Ended
- Skipped

Monitoring a Suspended Scheduler Batch Stream

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A Scheduler Batch Stream is considered suspended if it's stopped running temporarily. A Scheduler Batch Stream is considered Suspended if it is one of the following statuses.

- Failed
- Stopped
- Paused

You can monitor the progress of a suspended Scheduler Batch Stream by broadcasting it from the Suspended search by option search results. The broadcasted zone **View Stream Steps** shows progress of the stream such as what steps have already completed and their status, what is the currently running step(s) along with steps that have not yet started. You can monitor the progress of the stream by refreshing the page or by configuring the page to refresh automatically. To configure automatic page refresh, refer to the **User Portal Preferences** for this portal.

The **View Stream Steps** zone also has information on when the step started and completed, the duration the step ran for and the option to view the batch job run. Clicking on the **View** button displays the batch run details of the batch job.

Stream Operations

When performing operations on a scheduler batch stream, the operation is not immediately processed real-time. User can only make a request for a **desired** operation. SaaS Batch Scheduler processes these requests and updates scheduler batch stream run accordingly.

Following operations are allowed on the Running scheduler batch streams.

- *Resume:* A scheduler batch stream run can be resumed from Paused state. When this operation is performed, scheduler batch stream is set to In Progress status. SaaS Batch Scheduler processes these requests and starts processing the rest of the steps in the scheduler batch stream. A resumed scheduler batch stream is removed from this Suspended streams list and is displayed on the Running streams list.
- *Restart Stream:* A scheduler batch stream run can be restarted while in Failed or Stopped state. When this operation is performed, scheduler batch stream is set to In Progress status. SaaS Batch Scheduler processes these requests and starts processing the rest of the steps starting with Failed or Stopped steps. A restarted scheduler batch stream is removed from this Suspended streams list and is displayed on the Running streams list
- *Cancel:* A scheduler batch stream run can be canceled while in any one of the Suspended states. When this operation is performed, scheduler batch stream is set to Canceling status. SaaS Batch Scheduler processes these requests and in case of Failed scheduler batch stream, submits a cancellation request to cancel the underlying batch job. Once the underlying batch job is canceled, the scheduler batch stream is set to Canceled status. A Canceled scheduler batch stream is removed from this Running streams list and is displayed on the Completed streams list.

Stream Step Operations:

- Skip: A stream step(s) can be skipped by using the skip multi-action button on this zone. Only steps that are in "Not Submitted" state can be skipped.

The stream steps can be in one of the following states:

- Not Submitted
- Submitted

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- Ended
- Failed
- Stopped
- Skipped

Viewing a Completed Scheduler Batch Stream

A Scheduler Batch Stream is considered Completed if it is one of the following statuses.

- Ended
- Canceled

You can view completed Scheduler Batch Stream by broadcasting it from the Completed search by option search results. The broadcasted zone **View Stream Steps** shows status of the stream such as what steps have already completed and their status, what is the currently running step(s) along with steps that have not yet started. You can monitor the progress of the stream by refreshing the page or by configuring the page to refresh automatically. To configure automatic page refresh, refer to the **User Portal Preferences** for this portal.

The **View Stream Steps** zone also has information on when the step started and completed, the duration the step ran for and the option to view the batch job run. Clicking on the **View** button displays the batch run details of the batch job.

The stream steps can be in one of the following states:

- Not Submitted
- Submitted
- Ended
- Failed
- Skipped
- Canceled

Handling Exceptions

Errors in Scheduler Batch Stream

A batch job submitted as part of a Scheduler Batch Stream can run into error with one of its threads being in error. It could be because of business scenario or environment issue etc. In such a case, the corresponding Scheduler Batch Stream stops execution and its step ends in failed state. The cause for the failure is noted on the Additional Details column on the stream step. You can fix the issue and restart the stream via the multi-select **Restart Stream** option on

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the scheduler batch stream operations completed query option. Restarting a stream will result in the Scheduler Batch Stream continuing execution from the step that failed and finish through to end.

> **Note**
>
> Once a Scheduler Batch Stream fails, its future scheduled runs no longer execute until the failed run is addressed.

Scheduler Batch Stream stuck in running status

A Scheduler Batch Stream can be stuck in Running status as one of its steps is in running status for too long. In this situation there are various options.

Cancelling a scheduler batch stream: The corresponding batch job submission is stuck in pending status as the thread pool name set on the batch control is invalid. In such case, the running Scheduler Batch Stream can be cancelled via the multi-select **Cancel** option. The thread pool name can then be set to a valid value and the Scheduler Batch Stream can be submitted manually via the **Run Manually** option on the Scheduler Batch Stream Definition or wait until it's scheduled to run next.

Interrupting a scheduler batch stream: The corresponding batch job submission is stuck in started status while the respective batch run or batch threads have ended. In this case, the running scheduler batch stream can be interrupted via the multi-select **Interrupt** option. This sets the scheduler batch stream and respective steps in the "Failed" state. The **Restart Stream** multi-select option can then be used to re-start the stream to continue execution from the step that failed and complete processing of stream.

Batch Queues Overview

Batch Queues is a new portal where users can view the status and progress of various batch jobs in the system. The portal provides visibility for users into what batch jobs are queued or running on existing thread pools DEFAULT and NOCACHE.

Users can view each of the batch job's details and broadcast them to view list of threads, their status and records details.

The list of batch jobs can be filtered by status, thread pool and batch control to view desired batch jobs.

Batch Alerts

This chapter provides information and requirements on batch alerts in support of Oracle Utilities Cloud implementations.

- Batch Alerts Overview
- Alerting On A Batch Job Stream
- Alerting On A Batch Job

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Batch Alerts Overview

Batch Alerts provide alerting and monitoring mechanisms for batch and batch job streams. Alerts are raised when desired batch jobs or batch job streams do not perform as expected.

Currently there are few level of service algorithms on batch controls to indicate how the corresponding batch jobs are doing.

New level of service algorithms are now introduced on the batch controls.

In addition, level of service algorithms are introduced on batch job streams to determine overall health of batch job streams.

New installation options health check algorithms are introduced for health component batch and batch job stream. Each health component's health check algorithm will invoke their level of service algorithms and return the overall results

Overall results from health check algorithms are displayed on the health check portal for monitoring purposes to view overall health of the system.

To receive alerts on overall health of the system, use the alert probe - bash script external utility that probes the system and sends email notifications to configurable set of email addresses.

The alert probe can be run on windows or linux machines. Alerts can be customized for errors and warnings. A paging alert is sent in case of errors. A non-paging alert is sent in case of warnings.

The frequency at which alerts are raised is configurable.

> **Note**
>
> The alert probe is provided on an use-as-is basis, no support is provided for it.

Alerting On A Batch Job Stream

To receive alerts on an active batch job stream, edit the batch job stream and add the desired level of service algorithm on it.

> **Note**
>
> Only algorithm types are delivered for Batch job stream level of service algorithms. A corresponding algorithm must be created before it can be added onto the batch job stream

Following level of services are currently supported on batch job streams

- Batch Job Stream has not started within 'X' minutes

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- Batch Job Stream has failed
- Batch Job Stream ran too long (relative run)

Alerting On A Batch Job

Additional level of services are included on batch job that will be part of alerting mechanism

- Batch Job has processed low number of records
- Batch Job throughput is too low
- Batch Job ran too long (relative run)
- Batch Job has not started within 'X' minutes

ILM Dashboard for Cloud Implementations

This chapter provides information on ILM Dashboard in support of Oracle Utilities Cloud implementations.

- ILM Dashboard Overview
- ILM Dashboard - Main Tab
- ILM Dashboard - Partitions Tab
- ILM Dashboard - Drop A Partition

ILM Dashboard Overview

ILM Dashboard is a feature that provides an all-in-one portal to view Information Lifecycle Management (ILM) configurations and manage ILM tasks in one place. ILM Dashboard has two tabs - Main tab and Partitions tab.

Main tab displays information on current ILM configuration, if any, current retention period of maintenance objects and status of ILM batch processes

Partitions tab displays information on current partition data in the system for all maintenance objects including the sub-partition data.

ILM Dashboard - Main Tab

The ILM Dashboard - Main tab has information on current ILM configurations, retention period on maintenance objects and ILM batch processes current status.

ILM Configuration: Displays the current ILM configuration in the system as well as the default retention period for all ILM eligible maintenance objects.

Retention Period Overridden Maintenance Objects: Displays the list of ILM eligible maintenance objects where the retention period is overridden and their current retention period.

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ILM Batch Jobs Status: Displays the list of ILM Batch Controls and their latest batch job/run details. ILM Batch Controls that never ran even once are displayed first followed by the ones that ran in descending order of their last run date/time.

ILM Batch Runs: Displays the batch runs for the ILM batch control that was broadcasted on the "ILM Batch Jobs Status" zone. The batch runs are displayed sorted by end date/time with recently ended ones displayed first. Each run's first three batch parameter values are displayed on it's run. Customers can navigate to respective batch job submission page to view list of all parameters and their values.

ILM Dashboard - Partitions Tab

The ILM Dashboard - Partitions tab displays information on current partitions in the system for all maintenance objects that are ILM enabled.

Maintenance Objects: Displays a drop down with list of maintenance objects that are ILM enabled. Selecting a maintenance object displays the maintenance object along with it's partition information such as all partitions Total Size (In GB) and Total Records Based On Last Stats. If no maintenance object is selected, all maintenance objects are displayed along with their partition information.

Checking the PMAX partitions with data displays only those maintenance objects and their PMAX partitions information that have data in the PMAX partitions. If a maintenance object and PMAX partitions with data is selected, only the PMAX partitions information of the PMAX partitions that have data in it are displayed for the selected maintenance object.

Partitions: Displays list of partitions and their details for the selected maintenance object. The partitions are sorted by partition name latest month first. By default, the last twelve months and Pmax partition are displayed by default. User can further search for historical partitions using the filter options upto last four years.

For each partition, it's Compression Type is displayed. Compression Type for each displays "Refer Sub-partition" if the partition does not have compression but one of the sub-partitions does.

For a maintenance object, at any given time, the oldest partition can be requested to be dropped via the "Drop Partition" button. A new "Partition Drop Request" object is then created for this request to go through the approval process. Refer to Dropping A Partition for more information on request to drop partitions and it's approval process.

Sub-partitions: Displays list of sub-partitions and their details for the selected partition. The sub-partitions are sorted by sub-partition name latest month first.

Partition Drop Requests: Displays list of partition drop requests along with it's current status and applicable actions for the current user. Only displayed if there are partition drop request records. Displays partition drop requests for the selected maintenance object, if none is selected then all partition drop requests for all maintenance objects are displayed.

By default, only partition drop requests in Pending and Error status are displayed. For partition drop requests in other statuses, user can use the filter options. Refer to Dropping A Partition for additional information.

ILM Dashboard - Drop A Partition

The ILM Dashboard - Partitions tab displays information on current partitions in the system for all Maintenance Objects that are ILM enabled.

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For a Maintenance Object, at any given time, the oldest partition of the primary table can be requested to be dropped via the "Drop Partition" button by a **Requester** user. A new "Partition Drop Request" object is then created for this request in Pending status and a To Do is created for an Approver user so the request goes through the approval process.

Requesters

A user must be setup as a Requester user in order to drop a primary table's oldest partition for a selected Maintenance Object at any given point. Please refer to Administrative User Guide for more information on how to setup these users.

> **Note**
>
> A pre-requisite exists for dropping a primary table's oldest partitions with data. The crawler Batch Control associated with the Maintenance Object must be run first prior to requesting the partition drop, so that relevant data is appropriately marked for the partition to be dropped.

> **Note**
>
> When oldest partition of the primary table for a maintenance object is requested to dropped, the oldest partitions of child tables for that maintenance object are also dropped. This is based on the referenced partitions setup for the maintenance object. If the maintenance object does not have referenced partitions setup, then only the primary table's oldest partition is dropped.

The "Partition Drop Request" object is initially in Pending status and displayed to **Approver** users in the "Partition Drop Requests" zone.

Approvers

A user must be setup as an Approver user for them to approve any Partition Drop Requests.Please refer to Administrative User Guide for more information on how to setup these users.

Viewing Drop Partition Requests

Only the Requester or Approver can view Drop Partition Requests based on their access. By default, only Pending or Error Drop Partition Requests are displayed. User can use the filter critera option to display all Drop Partition Requests or search for ones with different statuses. Depending on the user's access, the available and applicable actions are displayed to the user.

When the Approver views list of Partition Drop Requests, they have the option of either approving or rejecting the request.

Approving a request results in Partition Drop Request in In Progress status and completing the To Do previously created for that Approver. A batch job submission for Batch Control K1-ILMDR (ILM Automation - Drop Partition) is also initiated to drop the requested partition. Once the partition is successfully dropped, the Partition Drop Request transitions to Completed final status. Otherwise, if there are any errors, the Partition Drop Request transitions to Error status.

Rejecting a request requires specifying a reason as to why the request was rejected. Possible reasons for rejecting a request are 1. Approver determines that partition that is requested to drop is required and so it should not be dropped. 2. Incorrect request to drop a partition was made where Requester accidentally requested wrong partition to be dropped. Once the Approver rejects the request, the Partition Drop Request transitions to Rejected final status.

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When the Partition Drop Request is in Error status, the Requester has the option to re-try the request again or cancel the request. In the case of re-try option, Requester can review the errors, take any necessary steps needed and and re-try the Partition Drop Request again. For example, if the pre-requisite step was not taken prior to requesting a partition drop, the data in the partition will not be marked for dropping. In this case, an error would be generated when the partition with that data is requested to be dropped. Requester can review the error to confirm the reason and run the crawler Batch Control associated with the Maintenance Object to mark partition data to be dropped. Once it is complete, Requester can re-try the Partition Drop Request again.

A Partition Drop Request in Pending status can be canceled by the Requester user if desired. A Requester user can also cancel the Partition Drop Request that is in Error status if they wish to not re-try the request.

Recommendations

It is recommended that dropping partitions is tested thoroughly in non-production environments first before performing the same operation in a production environment.

Tips

- Once a partition is dropped, the data is also removed from the database and there is no way to restore the data back into the environment. It is imperative that customers review the partition and the respective data before requesting and approving the Partition Drop Request.
- Customers can optionally choose to raise an SR(Service Request) to request a database copy prior to dropping a partition

Oracle Cloud Infrastructure Identity and Access Management Integration

This chapter provides information about integration with Oracle Cloud Infrastructure Identity and Access Management for Oracle Utilities cloud services.

> **Note**
>
> This section does not apply to all implementations. Contact your system administrator to confirm if your implementation includes Oracle Utilities Cloud Service Foundation and Oracle Cloud Infrastructure Identity and Access Management (IAM) integration.

- Identity and Access Management Integration Overview
- Configuring Identity and Access Management Integration

Identity and Access Management Integration Overview

Oracle Cloud Infrastructure Identity and Access Management (IAM) with Identity Domains provides identity and access management functionality for the Oracle Utilities cloud services and supports single sign on (SSO) and identity federation capabilities.

It protects both online and webservices API access to the Oracle Utilities cloud service. Refer to the Detailed Oracle Cloud Services Administration guide for the instructions on how to

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configure and manage online and API access and maintain users, groups, application roles and integration OAuth clients.

In IAM, an identity domain is provided with each service subscription. Once provisioned, the identity domain is administered exclusively by the client.

Security administrator uses identity domains to manage application users, who are given access to a one or multiple application environment(s). The security administrator may also assign another user to an administrative role in the identity domain and delegate user management privileges.

Newly created users receive an account activation email from IAM, and must reset their password.

The integration with IAM supports Just-In-Time User Provisioning.

When a user attempts to access the utility application URL, the user is redirected to an identity domain for authentication. Once the user is successfully authenticated, they are redirected back to the application and the authentication token is evaluated and validated. The system then checks if the user already exists in the application, and if not, it triggers the Just-In-Time User Provisioning logic that creates and activates the new user.

The **F1-IDMUser** business object is used for creation of new user records sourced from the external identity management integrations.

For the integration with Oracle Cloud Infrastructure Identity and Access Management, the algorithm is defined on the **F1-IDMUser** business object to determine the Template User whose information should be copied to the newly created user.

- Just In Time User Provisioning

Just In Time User Provisioning

Just-In-Time User Provisioning is a process of creating a new user record upon first successful login. The implementation may follow either one of the main approaches:

- **Just-In-Time with Coarse-Grained User Authorization** allows security administrator to immediately begin working on the authorization and access setup, while other ("business") users might wait until the proper access and authorization is configured for them in the application.
- **Just-In-Time with Fine-Grained User Authorization** provides both security administrator and the business user with instant access to the appropriate application functionality.
- Coarse-Grained User Authorization (Default)
- Fine-Grained User Authorization

Coarse-Grained User Authorization (Default)

With course-grained user authorization, Just-In-Time Provisioning creates users with two authorization levels:

- **Security and Access Administrator.**
  - **Users with an administrative role in the identity domain** are provisioned using a **Security Administrator Template User**. The user gains the access to all transactions and services related to application security and user authorization setup
- **Authenticated User**

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- **Users with no administrative role(s) in the identity domain** are provisioned using a **Minimum Access Template User**. The user gains access to *My Preferences* page only. The security and access administrator completes the authorization and access setup manually.

No additional configuration effort is needed if your implementation chose to follow this approach. The scope of the actual security access for both Security Administrator and Authenticated User is customizable. Refer to Override Default Access for more information.

Fine-Grained User Authorization

With fine-grained user authorization,Just-In-Time Provisioning creates users with multiple authorization levels, according to their Identity Domain's Group membership and based on utility application configuration:

- **Security and Access Administrator**
  - **Users with an administrative role in the identity domain** are provisioned using a **Security Administrator Template User**. The user gains the access to all transactions and services related to application security and user authorization setup
- **Business/Administrative Users** with access to a specific business and/or administrative functions in the application
  - **Users that are members of a Group in the identity domain** are provisioned using a **Template User mapped to this Group**. The user gains access to the application according to the Template User's setup.
- **Authenticated User**
  - **Users with no administrative role(s) in identity domain** and **no membership in any of the identity domain's Groups** are provisioned using the **Minimum Access Template User**. The user gains access to *My Preferences* page only. The security and access administrator completes the authorization and access setup manually.

The mapping between identity domain's Groups and Template Users is stored in theIdentity and Access Management Integration Configuration.

Configuring Identity and Access Management Integration

The integration configuration in the utility application has to be done in conjunction with the corresponding setup in the Identity and Access Management system.

- Configuring Just In Time User Provisioning
- Customizing the Integration

Configuring Just In Time User Provisioning

In order to configure user authorization for Just in Time Provisioning, perform the following steps:

- Create User Groups that represent most typical business and/or administrative roles in the application
- Create Template Users that represent typical access level for major business and/or administrative functions

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- Request your customer's identity domain Administrator to create Groups in IAM with Identity Domains that will correspond to the Template Users create above
- Setup the mapping between the identity domain's Groups and Template Users using Identity and Access Management Integration Configuration
- Template Users and User Groups
- Identity and Access Management Integration Configuration

Template Users and User Groups

- Define User Group(s) that represent the major business and/or administrative responsibilities in the application
- Define Template User(s) that represent the typical level of access to the application functionality

Identity and Access Management Integration Configuration

The Identity and Access Management Integration Configuration master configuration stores the definitions related to the integration with Oracle Cloud Infrastructure Identity and Access Management.

For Just-In-Time User Provisioning, configure the **User Provision Rules**:

- Map the Groups defined in the identity domain to the Template Users defined in the application.

Customizing the Integration

The product is delivered with out-of-the-box support for Just in Time User Provisioning with Coarse-Grained Authorization. Possible customization scopes are:

- Customize the default access level for Coarse-Grained Authorization. See Override Default Access Level for details.
- Configure the Just in Time User Provisioning with Fine-Grained Authorization.
- Override Default Access Level
- Override Logic to Determine Template User

Override Default Access Level

Both Security Administrator and Minimum Access Template Users are specified as parameters for the K1-IDCSUSRTM algorithm .

To override the default access level:

- Create new Template Users and setup user groups for default administrative access
- Create new Template Users and setup user groups for default minimum access

Create a new version of the K1-IDCSUSRTM algorithm and specify the Template Users created above as the algorithm's parameters

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Override Logic to Determine Template User

The algorithm that determines the Template User is implemented as a pre-processing algorithm that determines the Template User on the **F1-IDMUser.** business object.

To override the logic used to determine the template user:

- Create a custom algorithm type and algorithm and use custom logic to determine the Template User for provisioning.
- Deactivate the existing product algorithm and specify the custom algorithm instead. Note that the algorithm that determines the Template User should be plugged before the algorithm that populates the data from the Template User.

Oracle Cloud Object Storage

Oracle Cloud Object Storage (Object Storage) is a part of Oracle Cloud Infrastructure Storage Services.

Oracle Cloud Object Storage can be accessed and managed using Oracle Cloud Infrastructure Console or programmatically using Command Line Interface (CLI), REST APIs or Java. The Object Storage that is used by the system is owned and managed by customers.

Oracle Utilities Cloud Services use Object Storage as the file storage location for all file related integrations. Batch processes that need to read or write files as input will access Object Storage.

The system requires some configuration in order to allow it to connect to the Object Storage and have access to the files that need to be processed by it. The following chapter describes the required configuration in order to connect to Object Storage as well as provides information on how to reference files in Object Storage in batch processes.

Please refer to Oracle Cloud Infrastructure documentation for more information on Object Storage.

- File Storage Configuration for Object Storage
- Referencing Files on Object Storage

File Storage Configuration for Object Storage

In order for the system to connect to Object Storage a File Storage Extendable Lookup has to be created with the following information:

- The Oracle Cloud Infrastructure tenancy details, which can be obtained from the Oracle Cloud Infrastructure Console(available to customers who purchased Object Storage).
- The API Key that is used by the system to connect to that Object Storage.

Refer to product documentation on "File Storage" for more details.

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> **Note**
>
> - Each File Storage Location configuration refers to a combination of Object Storage Tenancy, Compartment and User ID.Since customers can choose to create many Compartments in their Object Storage, access to each such Compartment will require a separate File Storage configuration.
> - It is also recommended that each File Location configuration will reference a **different** Cloud Infrastructure User ID.This can limit, for example, the system's access to production files from a non-production environment.
> - API Keys are managed using Key Rings. Key Rings can be shared between File Storage Extendable Lookups but the Keys in these Key Rings cannot be shared across system environments. For example, keys generated for the Development environment **cannot** be used for the Testing or Production environments.Refer to the following topics in the Framework Administrative User Guide:
>
>   **External File Storage**, **Key Rings**.

Referencing Files on Object Storage

Access to files is typically required in Batch processes. Some batch processes include direct reference to the files they need to process (for input or output) while some processes rely on additional configuration (for example, the Content Migration Assistant (CMA) Import and Export processes that rely on the CMA Master Configuration Settings).

Direct Reference

Reference to Object Storage can be used anywhere that a file location is allowed. The format is:

file-storage://<File Location>/<Bucket>/<Filename.ext>

- <File-Location>: The File Storage Extendable Lookup value that is defined for that file.It should include all the details the system needs to access the Object Storage location for that file.
- <Bucket>: The equivalent of a Folder in the Oracle Cloud Object Storage.Since the folder structure in Object Storage is flat, Buckets cannot include other Buckets and therefore only one Bucket can be noted here.

CMA Master Configuration

CMA Master Configuration includes the location of files for export and import processing:

- Import Folder: should reference a file location for an Object Storage Bucket(i.e. just the file location without the a file name, for example: "file-storage://CMALocation/CMA-Files"), "CMALocation" is the File Location Extendable Lookup name.
- Export Folder: should reference a file location for an Object Storage Bucket (uch as "file-storage://CMALocation/CMA-Files").

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> **Note**
>
> In order to take advantage of the automation of migration of configuration data from one system environment to another via the Process Automation Tool, the Import and Export directories have to point to the same location!

Conversion Data Upload Processes

The batch process that loads customer data files into the cloud (K1-CNVLD) using SQL Loader has two parameters that describes where to get the input data files and where to store the output files:

- inputFileStorage: should reference a file location for an Object Storage Bucket (such as "file-storage://CONVLocation/Input"), "CONVLocation" is the File Location Extendable Lookup name.
- outputFileStorage: should reference a file location for an Object Storage Bucket (such as file-storage://CONVLocation/Output).

Maintaining Customer Code

The system supports a process to import custom Java code to be deployed in the cloud under certain use cases.

> **Note**
>
> Refer to the Cloud Services Implementation Guide for information about how to use this functionality.

The Customer Code portal allows you to review the status of the lifecycle of the process to import code and allows you to review errors that may have been received.

To view a customer code record, navigate using **Admin**, then **Implementation Tools**, then **Customer Code**. You are brought to a query portal with options for searching for customer code. Once a record has been selected, you are brought to the maintenance portal to view and maintain the selected record.

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