Oracle
Public Sector Revenue Management

Administrative User Guide

Release 2.5.0.0.0

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Contents

Chapter 1

Oracle Public Sector Revenue Management Administration

The topics in this section describe how to administer the Oracle Public Sector Revenue Management application.

Framework Administrative User Guide

The topics in this section describe how to administer the Oracle Utilities Application Framework.

Defining General Options

This section describes control tables that are used throughout your product.

Defining Installation Options

The topics in this section describe the various installation options that control various aspects of the system.

Installation Options - Main

Select **Admin** > **General** > **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 **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.
- 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**.

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.

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, zone types, 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.

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** > **General** > **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.

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).

Installation Options - Algorithms

Select **Admin** > **General** > **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. Click *here* to see the algorithm types available for this system event.
Geocoding Service	Optional	Algorithms of this type use Oracle Locator to retrieve latitude and longitude coordinates using address information. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.
Ldap Import	Optional	Algorithms of this type are called for operations on users, groups, and group memberships after they have been processed. Click *here* to see the algorithm types available for this system event.
Ldap Import Preprocess	Optional	Algorithms of this type are called to preprocess data retrieved from LDAP. Click *here* to see the algorithm types available for this system event.
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* dashboard zone when the user ask for the next assignment. Click *here* to see the algorithm types available for this system event.
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-

System Event	Optional / Required	Description
		line reporting pages to properly invoke the reporting tool from within the system. Click *here* to see the algorithm types available for this system event.
SMS Receive Service	Optional	This type of algorithm is used to provide SMS receive service. Only one algorithm of this type should be plugged in. Click *here* to see the algorithm types available for this system event.
SMS Send Service	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. Click *here* to see the algorithm types available for this system event.
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". Click *here* to see the algorithm types available for this system event.
To Do Pre-creation	Optional	These types of algorithms are called when a *To Do entry* is being added. Click *here* to see the algorithm types available for this system event.

Installation Options - Accessible Modules

Select **Admin** > **General** > **Installation Options - Framework** and the **Accessible Modules** tab to view the list of accessible modules.

Description of Page

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.

> **FASTPATH:** 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** > **General** > **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. If your implementation of the product has developed implementation-specific transactions, you can populate the Release Id for the **Customer Release** entry to define the latest release of implementation-specific logic that has been applied to this environment. In order for this to work, your implementation team should populate this field as part of their upgrade scripts.

The **Release ID Suffix**, **Build Number** and **Patch Number** further describe the details of your specific product release.

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.

NOTE: **About Information**. The information on this tab is used to populate the information displayed in the *About* information for your product.

Support For Different Languages

User Language

The system provides support for 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.

NOTE: Normally, setting up the system for another language 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.

The following steps are required to support a new language:

1. **Define a language code and indicate that it is enabled.** For details on this procedure, see *Defining Languages*.
2. **Copy descriptions of all language-enabled tables from an existing translation (e.g., English).** The copied values act merely 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.
3. **Apply the language pack.** If the product supplies a language pack with translations for the system metadata descriptions, follow the instructions provided with the language pack to add the translated text.
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.

   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.

Additional Topics

Your product may support additional uses for language. For example, in Oracle Utilities Customer Care and Billing, you can define each customer's language. This allows you to send bills and other correspondence in each customer's preferred language. For more information, navigate to the index entry **Languages, Customer Language**.

Defining Languages

A language code exists for every language spoken by your users. The system uses this code to supply information to users in their respective language. Select **Admin** > **General** > **Language** to define a language.

Description of Page

Enter a unique **Language Code**. If you are applying a language pack provided by the product, use the language code designed by the language pack.

Enter the **Description** for the language. Typically this should be the name of the language in that language.

Turn on **Language Enable** if the system should add 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* dashboard zone. In addition, the login page for the application displays all the languages that are enabled, allowing the user to toggle the login instructions in that language.

> **NOTE:** 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 following two fields control how the contents of grids and search results are sorted by the Java virtual machine (JVM) on your web server:

- The **Locale** is a string containing three portions:
  - ISO language code (lower case, required)
  - ISO country code (upper case, optional)
  - Variant (optional).
- Underscores separate the various portions, and the variant can include further underscores to designate multiple variants. 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**.

The following are examples of valid locales:

- en_US (this is for American English)
- en_AU (this is for Australian English)
- pt_BR (this is for Brazilian Portuguese)
- fr_FR_EURO (this is for European French)
- ja_JP (this if for Japanese)

In addition, the Java collation API can take a **Collator Strength** parameter. 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.

Please see *http://java.sun.com/j2se/1.3/docs/guide/intl/locale.doc.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**.

Owner indicates if this language is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a language. This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_LANGUAGE*.

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

To add or review Country definitions choose **Admin** > **General** > **Country** > **Search**.

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 turning on an address field, you make that field available everywhere addresses for this country are used in the system. You can enter your own descriptions for the labels that suffix each switch; these labels will appear wherever addresses are maintained in the system.

> **NOTE:** For any country where the **State** switch is checked, 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.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_COUNTRY*.

Country - States

To maintain the states located in a country, choose **Admin** > **Country** > **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** > **Financial** > **Currency** to define the currency codes in which financial information is denominated.

Description of Page

Enter a unique **Currency** and **Description** for the currency.

Use Currency **Symbol** to define the character that prefixes currency amounts in the system (e.g., $ for U.S. dollars).

Enter the number of **Decimals** that will appear in the notation for the currency.

> **NOTE:** Please contact your specific product to verify whether it supports a currency with more than 2 decimals.

The **Currency Position** indicates whether the currency symbol should be displayed as a **Prefix** or a **Suffix** to the currency amount.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_CURRENCY_CD*.

Defining Time Zones

The following topics describe how to design and set up time zones.

Designing 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.

It is recommended that all time sensitive data is stored in the standard time (also called 'physical 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 shifting of data that may be stored in different 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.

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.

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.

> **NOTE:** **Date and time in business object schemas.** When defining date / time fields in a BO schema, schema attributes can be used to define whether or not data should be stored in standard time for the base time zone or if it should be stored in the standard time of another time zone (related to the data). In addition, schema attributes can be used to indicate if the display of the time should be shifted to represent the "local time". This is used to adjust for seasonal time differences. For example, if the data is stored in the appropriate time zone, but currently daylight savings time is being

observed, the data will be shifted and shown in the “local” time. In addition, 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 Tips on the business object page for more information.

Setting Up Time Zones

Refer to *Designing Time Zones* for background information about defining time zones.

Open **Admin** > **General** > **Time Zone** > **Search** to define the time zones and their relation to the base time.

Description of Page

Enter a unique **Time Zone** and **Description** for the time zone.

Select the **Time Zone Name** from the list of Olson time zone values. This value is a reference to an external definition that allows the system to know how the time zone relates to Greenwich Mean Time and information about whether the time zone shifts for summer / winter time and when.

Indicate the **Shift in Minutes** that this time zone differs from the base time zone defined on the Installation Options. This is only applicable for the *Oracle Utility Customer Care and Billing - Interval Billing* application.

Indicate the **Seasonal Time Shift** applicable for this time zone. This is only applicable for the *Oracle Utility Customer Care and Billing - Interval Billing* application.

Default Time Zone Label and **Shifted Time Zone Label** are used for data that is sensitive to time zones and time shifting. It indicates whether the data displayed or data to be input is related to the “standard” time or the “shifted” time. For example, on a day when clocks are turned back one hour, a time entry of 1:30 a.m. needs to be labeled as either 1:30 a.m. standard time or 1:30 a.m. daylight savings time.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_TIME_ZONE*.

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** > **General** > **Seasonal Time Shift** > **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**.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_SEAS_TM_SHIFT*.

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).

To define geographic types, open **Admin** > **Geographic** > **Geographic Type**.

NOTE: Find a customer / premise using a geographic coordinate. In Oracle Utilities Customer Care and Billing there are several queries that allow you to search for customers and premises by geographic type. For example, Control Central and Meter Search allow you to search using the premise or service point geographic type. Refer to the product documentation for more information.

Description of Page

Enter an easily recognizable **Geographic Type** code and **Description**.

Define the algorithm used to validate the **Validation Format Algorithm**. If an algorithm is specified, the system will 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.

Click *here* to see the algorithm types available for this plug-in spot.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_GEO_TYPE*.

Defining Work Calendar

Workday calendars are used to ensure system-calculated dates fall on a workday. Select **Admin** > **General** > **Work Calendar** > **Search** to define a workday calendar.

Description of Page

The information on this transaction is used to define the days of the week on which your organization works.

Enter a unique **Work Calendar** and **Description**.

Turn on (check) the days of the week that are considered normal business days for your organization.

Use the collection to define the **Holiday Date**, **Holiday Start Date**, **Holiday End Date**, and **Holiday Name** for each company holiday. Holiday Start Date and Holiday End Date define the date and time that the holiday begins and ends. For example, your organization might begin a holiday at 5:00 p.m. on the day before the actual holiday.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_CAL_WORK*.

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** > **General** > **Display Profile** > **Search** to maintain display profiles.

Description of Page

Enter a unique **Display Profile ID** and **Description** to identify the profile.

Enter a **Date Format**. This affects how users view dates and how entered dates are parsed. This is a "free format" field with some rules.

- **dd** or **d** is interpreted as the day of the month. The **d** option suppresses a leading 0.
- **MM** or **M** is interpreted as the month number. The **M** option suppresses a leading 0.
- **yyyy**, **yy**, or **y** is interpreted as the year. The year can be 4 or 2 digits. The **y** option 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.

Here are some examples of date formats.

Format	Displayed / entered as
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 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 and the letter ‘H’ is used for dates that fall within the *Heisei* 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 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**. This is a "free format" display with some rules.

- **hh** or **h** is interpreted as the hour, 1-12; **KK** or **K** is interpreted as the hour, 0-11; **HH** or **H** is interpreted as the hour, 0-23; **kk** or **k** is interpreted as the hour, 1-24. The **h**, **K**, **H**, and **k** options suppress a leading 0.
- **mm** or **m** is interpreted as the minutes. The **m** option suppresses a leading 0.
- **ss** or **s** is interpreted as the seconds. The **s** option suppresses a leading 0.
- **a** is interpreted to mean display **am** or **pm** (only needed when the hour is entered in **hh**, **h**, **KK** or **K** formats). If an **am** or **pm** is not entered, it defaults to **am**.

Here are some examples of time formats.

Format	Displayed / entered as
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

- "**,**" (comma). Large numbers group by threes separated by a comma, for example 1,000,000.
- "**.**" (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.
- **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.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_DISP_PROF*.

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 a master configuration record.

Navigate using **Admin** > **System** > **Master Configuration.** You are shown a list of master configuration business objects. Find the entry for **Hijri to Gregorian Date Mapping**. Click the add icon if there is no record yet. Click the broadcast icon to view an existing record or the edit icon to modify an existing 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** > **General** > **Phone Type**.

Description of Page

Enter a unique **Phone Type** and **Description** for each type of phone number you support.

Select an appropriate **Phone Number Format Algorithm** for each **Phone Type**. This algorithm controls the format for entry and display of phone numbers. Click *here* to see the algorithm types available for this plug-in spot.

Use **Phone Type Flag** to define if this type of phone number is a **Fax** number. Defining which phone type is used for facsimile transmittal is only pertinent if your product supports routing of information via fax. For example, in Oracle Utilities Customer Care and Billing, the system may be configured to fax a bill to a customer.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_PHONE_TYPE*.

Setting Up Characteristic Types & Values

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. Using the characteristic type approach allows you to add new fields to objects without changing the database. There are some pages in the system that support a generic list of characteristics. For those pages, no changes are required for users to view and maintain characteristics. Other pages are business object oriented pages and their maintenance and display are controlled by the UI maps defined for the business objects. In those pages the display / maintenance of the characteristics are driven by the design of the business object and its maps.

The topics in this section describe how to setup a characteristic type.

There Are Four Types Of Characteristics

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 "skills", the information you setup on this characteristic type controls the valid values that may be specified by a user when defining another user's skills.

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.
- **Ad hoc 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.
- **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. Please be aware of the following in respect of characteristics of this type:
  - 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*.
  - The referenced table does not have to be a table within the system.
  - Not all entities that support characteristics support foreign key characteristics. Refer to the data dictionary to identify the entities that include the foreign key characteristic columns.
- **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. Note that for references to a file, the recommendation is to use the Attachment functionality to link documents 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.
- 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. Refer to the data dictionary to identify the characteristic collections that include the search characteristic column.

> **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**.

Characteristic Type - Main

To define a characteristic type, open **Admin** > **System** > **Characteristic Type** > **Search**.

Description of Page

Enter an easily recognizable **Characteristic Type** and **Description** for the characteristic type. **Owner** indicates if this characteristic type is owned by the base package or by your implementation (**Customer Modification**).

> **CAUTION:** Important! If you introduce a new characteristic type, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Use **Type of Char Value** to classify this characteristic type using one of the following options (refer to *There Are Four Types Of Characteristics* for more information):

- **Predefined value.** Characteristics of this type have their valid values defined in the **Characteristic Value** scroll, below. For each valid value, enter an easily recognizable **Characteristic Value** and **Description**.
- **Ad hoc value.** Characteristics of this type capture free form text. If you use this option, you can optionally define the **Validation Rule** used to validate the user-entered characteristic value. Click *here* to see the algorithm types available for this plug-in spot.
- **File location value.** Characteristics of this type contain a URL. The URL can point to a file or any web site. Note that for references to a file, the recommendation is to use the Attachment functionality to link documents 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.

  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 for Internet Explorer version 7 or later, or in Firefox. 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.

- **Foreign key reference.** Characteristics of this type have their valid values defined in another table. If you choose this option, you must use **FK Reference** to define the table that controls the valid values of this characteristic type. Refer to *Setting Up Foreign Key References* for more information.

Use the **Allow Search by Char Val** to indicate if searching for an entity by this characteristic type is **Allowed** or **Not Allowed**. Refer to *Searching by Characteristic Values* for more information.

The **Custom** switch is only applicable to **Predefined value** types. It indicates whether or not an implementation is allowed to add values for a characteristic type whose owner is not **Customer Modification**

- If this switch is turned on, an implementation may add characteristic values to the grid for system owned characteristic types.
- If this switch is turned off, an implementation may not add characteristic values to the grid for system owned characteristic types.

NOTE: Regardless of the value of the Custom switch, an implementation may not update or remove system owned characteristic values.

The **Characteristic Value** grid defines the valid values for a **Predefined value** type of characteristic.

The **Characteristic Value** is the unique identifier of the value.

Description is the text that is visible in the dropdowns and display when viewing this characteristic value.

Owner indicates if this characteristic value is owned by the system or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add characteristic values to a characteristic type. This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_CHAR_TYPE* in the data dictionary schema viewer.

Characteristic Type - Characteristic Entities

To define the entities (objects) on which a given characteristic type can be defined, open **Admin** > **System** > **Characteristic Type** > **Search** and navigate to the **Characteristic Entities** tab.

Description of Page

Use the **Characteristic Entity** collection to define the entities on which the characteristic type can be used. **Owner** indicates if this is owned by the base package or by your implementation (**Customer Modification**).

NOTE: The values for this field are customizable using the Lookup table. This field name is **CHAR_ENTITY_FLG**.

NOTE: For some entities in the system, the valid characteristics for a record are defined on a related "type" entity. For example, in Oracle Utilities Customer Care and Billing the meter type defines valid characteristics for meters of that type. When configuring your system, in addition to defining the appropriate entity for a characteristic type, you may also need to link the characteristic type to an appropriate entity "type". This technique is typically not followed for business object driven maintenance objects, where the business objects can be configured with the appropriate “flattened” characteristic types in the schema.

Setting Up Foreign Key Reference Information

A Foreign Key Reference defines the necessary information needed to reference an entity in 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 valid values are defined in another table (i.e., you use "foreign key reference" characteristic types). Refer to *There Are Four Types Of Characteristics* 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. Refer to *Information Description Is Dynamically Derived* for more information on how this is used.
- 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. Refer to *Navigation Information Is Dynamically Derived* for more information on how this is used.
- The name of the search page used to look for a valid entity. Refer to *Search Options* for more information.

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 description.

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**.

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 *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.
- 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.

Foreign Key Reference - Main

To setup a foreign key reference, open **Admin** > **Database** > **FK Reference** > **Search**.

CAUTION: Important! If you introduce a new foreign key reference, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Description of Page

Enter an easily recognizable **FK** (foreign key) **Reference** code and **Description** for the table.

Enter the name of the **Table** whose primary key is referenced. After selecting a **Table**, the columns in the table's primary key are displayed adjacent to **Table PK Sequence**.

Use **Navigation Option** to define the page to which the user will be transferred when they press the go to button or hyperlink associated with the referenced entity. Refer to *Navigation Information Is Dynamically Derived* for more information on how this is used.

The **Info Program Type** indicates whether the default program that returns the standard information description is **Java** or **Java (Converted)**, meaning it was converted into Java.

NOTE: Java (Converted) program types are not applicable to all products.

Use **Info Program Name** to enter the Java class / program name.

Refer to *Information Description Is Dynamically Derived* for more information on the info program is used.

NOTE: 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 *Java docs viewer*.

Use **Context Menu Name** to specify the context menu that appears to the left of the value.

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.

Use **Search Navigation Key** to define the search page that will be opened when a user searches for valid values on a user interface that is a fixed page. Refer to *Search Options* for more information.

Use **Search Type** to define the default set of search criteria used by the **Search Navigation Key**'s search page.

Use **Search Zone** to define the search zone that opens when a user searches for valid values when the foreign key reference is configured as an input field on a portal based page. Refer to *Search Options* for more information.

Use **Search Tooltip** to define a label that describes the **Search Navigation Key**'s search page.

NOTE: Search Type and Search Tooltip. These 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.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_FK_REF*.

Defining Feature Configurations

Some system features are configured by populating options on a "feature configuration". 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 topics below simply describe how to use this transaction in a generic way.

For information about specific features:

- Refer to the detailed description of each option type.
- Use the index in the online help and search for ‘feature configuration’ to find any specific topics describing feature options in the administration guide.

You can create options to control features that you develop for your implementation. To do this:

- 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.

Feature Configuration - Main

To define your feature configuration, open **Admin** > **System** > **Feature Configuration** > **Search**.

Description of Page

Enter an easily recognizable **Feature Name** code.

Indicate the **Feature Type** for this configuration. For example, if you were setting up the options for the batch scheduler, you'd select **Batch Scheduler**.

> **NOTE: You can add new Feature Types**. Refer to the description of the page above for how you can add Feature Types to control features developed for your implementation.

> **NOTE: Multiple Feature Configurations for a Feature Type.** Some Feature Types allow multiple feature configurations. The administration documentation for each feature will tell you when this is possible.

The **Options** grid allows you to configure the feature. To do this, select the **Option Type** and define its **Value**. Set the **Sequence** to **1** unless the option may have more than value. **Detailed Description** may display additional information on the option type.

> **NOTE: Each option is documented elsewhere.** The administration documentation for each feature describes its options and whether an option supports multiple values.

> **NOTE: You can add new options to base-package features**. Your implementation may want to add additional options to one of the base-package's feature types. For example, your implementation may have plug-in driven logic that would benefit from a new option. To do this, display the lookup field that holds the desired feature's options. The lookup field's name is **xxxx_OPT_TYP_FLG** where **xxxx** is the identifier of the feature on the **EXT_SYS_TYP_FLG** lookup value. For example, to add new batch scheduler options, display the lookup field **BS_OPT_TYP_FLG**.

Feature Configuration - Messages

If the feature exists to interface with an external system, you can use this page to define the mapping between error and warning codes in the external system and our system.

Open this page using **Admin** > **Feature Configuration** > **Search** and navigate to the **Messages** tab.

Description of Page

For each message that may be received from an external system, define the **Feature Message Category** and **Feature Message Code** to identify the message.

A corresponding message must be defined in the *system message* tables. For each message identify the **Message Category** and **Message Number**. For each new message, the Message Category defaults to **90000** (because an implementation's messages should be added into this category 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. Only one master configuration may exist for a given business object.

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 configuration 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.

Setting Up Master Configurations

To set up a master configuration, open **Admin** > **System** > **Master Configuration**.

The topics in this section describe the base-package zones that appear on the Master Configuration portal.

Master Configuration

The Master Configuration List zone lists every category of master configuration.

The following functions are available:

- Click a broadcast button to open other zones that contain more information about the adjacent master configuration.
- Click the **Add/Edit** button to start a business process that updates the master configuration.

Master Configuration Details

The Master Configuration Details zone contains display-only information about a master configuration.

This zone appears when a master configuration has been broadcast from the Master Configuration zone.

Please see the zone's help text for information about this zone's fields.

Miscellaneous Topics

The following sections describe miscellaneous system wide topics.

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

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 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 a menu are suppressed, the menu itself (***Menu*** or ***Admin*** *menu*) is suppressed in the application toolbar.

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**.

Changing the values of the global context typically cause data displayed in zones on the dashboard 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

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.

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.

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. In addition to the web server's cache, information is also cached on each user's browser.

Server Cache

The cache is populated the first time any user accesses a page that contains cached information. For example, consider a control table whose contents appear in a dropdown on various pages. When a user opens one of these pages, the system verifies that the list of records exists in the cache. If so, it uses the values in the cache. If not, it accesses the database to retrieve the records and saves them in the cache. In other words, the records for this control table are put into the cache the first time they are used by any user. The next user who opens one of these pages will have the records for this control table retrieved from the cache (thus obviating the database access).

The following points describe the type of data that is cached on the web server:

- **Field labels**. This portion of the cache contains the labels that prefix fields on the various pages in the system.
- **System information**. This portion of the cache contains installation and basic information about the various application services (e.g., the URL's that are associated with the various pages).
- **Menu items**. This portion of the cache contains the menu items.
- **Dropdown contents**. This portion of the cache contains the contents of the various dropdowns that appear throughout the system.
- **XSL documents**. This portion of the cache contains each page's static HTML.
- **Portal information**. This portion of the cache contains information about which zones are shown on the various pages.

The contents of the cache are cleared whenever the web server is "bounced". This means that fresh values are retrieved from the database after the application server software is restarted.

If you change the database after the cache is built and the information you changed is kept in the cache, users may continue to see the old values. If you don't want to bounce your web server, you can issue one of the following commands in your browser's URL to immediately clear the contents of the cache (a separate command exists for each type of data that is held in the cache):

- **flushAll.jsp?language=<language code>**. This command flushes every cache described below.
- **flushDropdownCache.jsp?language=<language code>**. This command flushes all objects in the dropdown contents associated with a given language (note, the **language code** is defined on the *Language* control table). Use this whenever you change, add or delete values to/from control tables that appear in dropdowns. Unlike the above caches, the objects in the dropdown cache are flushed automatically every 30 minutes from the time they are first built.
- **flushDropDownField.jsp?language=<language code>&key=<field>** If you want to flush the values in a specific drop-down field in the cache, specify the <*field*> using this command.
- **flushMenu.jsp**. This command flushes the menu cache. Use this command if you change menu data.
- **flushMessageCatalog.jsp**. This command flushes the field labels. Use this whenever you add or change any labels (this is typically only done by implementers who have rights to introduce new pages).
- **flushMessaging.jsp**. This command flushes messages.
- **flushNavigationInfo.jsp**. This command flushes the navigation information in the cache.

- **flushPortalMetaInfo.jsp**. This command flushes the portal information cache. Use this command whenever you change any portal zone meta-data.
- **flushSystemLoginInfo.jsp**. This command flushes the system information cache. Use this whenever you change navigation options, cached information from the installation record, or if you change an application service's URL.
- **flushUI_XSLs.jsp**. This command flushes the XSL document cache. Use this command if you change user interface meta-data. Also use this command whenever you change or introduce new zones.

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 (i.e., you cannot wait for 30 minutes)

You would issue the following command in your browser's address bar: **http://OU-Production:7500/flushDropdownCache.jsp?language=ENG**. Notice that the command replaces the typical cis.jsp that appears after the port number (this is because these commands are simply different JSP pages that are being executed on the web server).

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:

- 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.

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.

Batch Cache

When submitting a batch job, the batch component uses a caching mechanism using a Hibernate data cache. The tables whose records are included in this cache are configured using the Caching Regime value of **Cached for Batch**. Refer to *Table - Main* 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. If there is a change in cached data that should be available for the next batch job, either the thread pool worker must be restarted or alternatively, the **F1–FLUSH** (Flush all Caches) background process can be submitted. This background process receives the thread pool name as input. It will flush the data cached for batch for that thread pool.

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.

When in this mode certain debugging oriented tools become available right below the main toolbar.

- **Start Debug** starts a logging session. During this session the processing steps that you perform 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.
- **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.
- Checking the **Global Debug** indication starts various tracing options.

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.

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. Such restriction may be called for in production environments.

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 **Admin** > **User** > **Search**, page. On the **Characteristics** tab, 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.

Advanced 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 the Zone Tips context zone available in the Dashboard on the Zone portal.

Defining Security & User Options

The contents of this section describe how to maintain a user's access rights.

The Big Picture of Application Security

The contents of this section provide background information about application security.

Application Security

The system restricts access to its transactions as follows:

- An *application service* may be associated with every securable function 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.
  - 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 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.
  - Menu items may define an application service. Use this technique for the following scenarios:
    - Suppress a menu item if the underlying application security for the transaction does not provide enough fine grained control. 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 underlying security settings for To Do Entry should grant Add access to these users given that the special BPA will still add a record. To suppress the base Add dialogue, link a special application service and access mode for the base supplied menu item for To Do Entry Add. Then define a menu entry for the new special BPA for adding.
    - Suppress the add option if a user does not have add security for the object. By default the product does not suppress the add function if a user does not have add access to the object. Rather, the user is prevented from adding the record at the back-end. If your implementation would like to suppress the icon, link the object's application service and the Add access mode to the Add menu item.
  - Zones define an application service
    - 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 defines the same application service as its portal. In special cases, such as the zones on the Dashboard, 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. Security for these zones is not checked by the product as they are used for internal purposes.

    - 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.
- Other configuration tool objects are securable but the base product typically does not supply special application services for each object. An implementation may supply custom application services and link them to the appropriate record:
    - 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.
    - 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 are configured with a default application service, which may be overridden by an implementation.
- Users are granted access to application services via *user groups*. For example, you may create a user group called Senior Management and give it access to senior manager-oriented pages and portals.
    - When you grant a user group access to an application service with multiple access modes, you must also define the access modes that are allowed. Often the access modes correspond to an action on a user interface. For example, you may indicate a given user group has **inquire**-only access to an application service, whereas another user group has **add**, **change**, **cancel** and **complete** access to the same service. Refer to *action level security* for more information.
    - If the application service has *field level security* enabled, you must also define the user group's security level for each secured field on the transaction.
    - And finally, you link individual *users* to the user groups to which they belong. When you link a user to a user group, this user inherits all of the user group's access rights.

CAUTION: Menus may be suppressed! If all menu items on a menu are suppressed, the menu is suppressed.

Action Level Security

When you grant a user group access to an *application service*, you must indicate the actions to which they have access.

- For application services that only query the database, there is a single action to which you must provide access - this is called **Inquire**.
- For application services that can modify the database, you must define the actions that the user may perform. At a minimum, most maintenance transactions support **Add**, **Change**, and **Inquire** actions. Additional actions are available depending on the application service's functions.

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 special 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 special actions, you must also give the user access to the **Inquire** and **Change** actions.

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).

NOTE: Field level security logic is added to user exits. Refer to the Public API chapter of the Software Development Kit Developer Guide for more information on how to introduce field-level security logic into an application service's user exits.

Even though the validation of a user's field-level security rights requires programming, 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).

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.

Encryption and Masking

"Encryption" refers to encrypting data stored in a database using an encryption key.

"Masking" refers to overwriting all or part of a decrypted field value with a masking character before it is presented to a user (or an external system) without the appropriate security access. For example, an implementation can mask the first 12 digits of a credit card number with an asterisk for users who do not have security rights to see credit card numbers. This section is describing defining masking rules that may be applied to data for display on the user interface.

Multiple masking rules. 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. In addition, some user groups may be allowed to see certain fields unmasked.

Masking happens after decryption. It is obvious, but worth emphasizing, that only decrypted data can be masked. This means that if a user does not have authority to retrieve decrypted data then masking is not relevant because the data to be masked would be encrypted.

The topics in this section describe how to mask field values.

Identify the Fields to Be Masked

Your implementation should list every field on every page and inbound web service request that requires masking

Classify each field into one of the following categories:

- An element that is retrieved by invoking a business object, a business service, or a service script

- A field that is retrieved by invoking a page service
- A field that is retrieved by invoking a search service
- An ad hoc characteristic type's value

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.

Masking applies to strings. Only fields with a data type of String can be masked.

List members that contain different "types". Consider a page with a list that contains a person's phone numbers. You can set up the system so that a person's home phone has different masking rules than their work number. If your implementation has this type of requirement, the list of masked fields should contain an entry for each masking rule.

Create a Security Type For Each Logical Field

Examine the list of masked fields and look for "logical fields".

For example, assume your list contains the following masked fields:

- The Person - Main page retrieves information using the person page service. This page contains a grid that contains the various forms of ID associated with the person. Entries in the grid with an ID Type of "Social Security Number" are subject to masking.
- The Control Central - Main page retrieves data by invoking a search service. This service shows a person's primary form of ID in the search results. If a person's primary ID is their social security number then it is subject to masking.
- The Control Central - Account Information page contains a map zone that retrieves data by invoking a service script. One of the elements in this script's schema holds the person's social security number and it is subject to masking.

In the above example, there is a single "logical field" associated with the three secured elements: the social security number.

Examine your list and define the distinct logical fields. For each one, create a security type with two authorization levels:

- **1** - Can only see the element masked
- **2** - Can only see the element unmasked

You should 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.

Create An Algorithm For Each Security Type

A masking algorithm must be created for each 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 the algorithm type *F1-MASK* whose parameters are designed to handle most masking needs. This algorithm type's parameters are described below to provide the complete picture of how to control how a field is masked and who can see it unmasked:

- **Masking Character:** Enter the character used to overwrite a field's value for users who can only see masked values.
- **Number of Unmasked Characters:** If some of the field value should remain unmasked at the end of the string, enter the number of unmasked characters.
- **Unmasked Characters**: If some characters in a field value should never be masked, enter them. For example, if a phone number can contain dashes and parenthesis and you don't want these characters masked, you would enter `-()..`

- **Application Service:** Enter the application service that you created above.
- **Security Type:** Enter the security type that you created above.
- **Authorization Level:** Enter the authorization level that a user must have to see this field unmasked. If you followed the recommendations above, this will be **2**.

Create A Feature Configuration For Each Secured Element

Create a feature configuration with a Feature Type of **Data Masking**.

Add an option for every field that you defined in *Identify The Fields To Be Masked.*

Each field's option value will have an **Option Type** of **Field Masking** and a **Value** that references the respective algorithm defined above. In addition, the Value will contain mnemonics that differ depending on how the field is retrieved.

NOTE: Only fields defined as strings are supported.

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.
  - 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 the CLOB of a table as a single element, the element in the 'where' clause must map to the same CLOB 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.
  - 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 via a search service call, indicate the search name and the appropriate field to mask along with the masking algorithm. 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 View Source. Search for ServiceName. The service name is listed there. To find the field name to mask, go back to the search window and right click on the results area and choose View Source. Look for the Widget Info section and find the field name in the SEARCH RESULTS (do not include the $). Note, the "where" statement can only apply to fields that are also part of the search results.

Grant Access Rights To The User Groups

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 users should see the security type's field values unmasked, set the authorization level to 2; otherwise set it to 1. Refer to *User Group - Application Services* for the transaction used to link a user group to an application service.

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.

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.

The Base Package Controls One User, One User Group, And Many Application Services

When the system is initially installed, the following information is delivered:

- Application services for all secured transactions, maintenance objects, business objects, business services, scripts and zones in the base package.
- A user identified by the user id **SYSUSER**.
- A user group identified by the user group code **ALL_SERVICES**. This user group is associated with all supported application services delivered with the base product. This user group is given access to all access modes for all application services (i.e., all actions on all transactions).
- The user **SYSUSER** is linked to the **ALL_SERVICES** user group. This means that this user has access to all transactions and all actions.

NOTE: An implementation may use the User Enable setting on the user record to disable SYSUSER so that it is not available as a valid user in the application.

When you receive an upgrade:

- New application services are delivered for the new transactions, business objects, zones introduced in the release.
- Existing application services are updated with changes in their access modes (e.g., if a new action is added to a transaction, its application service is updated accordingly).
- The **ALL_SERVICES** user group is updated so it can access the new / changed application services.

CAUTION: Important! You cannot change or remove the information delivered for **ALL_SERVICES**. This information is owned by the base package. It is provided so that an "initial user" has access to the entire system and can setup user groups and users as per your organization's business requirements. It is not recommended to provide your own users with access to the **ALL_SERVICES** user group. Rather, create user groups that are appropriate for the organization's business requirements and define user access to these user groups. If you introduce new transactions, configure them for the appropriate custom user groups.

Importing Security Configuration from an External Source

The product provides support for importing security information from an external source:

- 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.

  FASTPATH: 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.

  FASTPATH: For more information refer to *Oracle Identity Manager Integration*.

The Big Picture of 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.

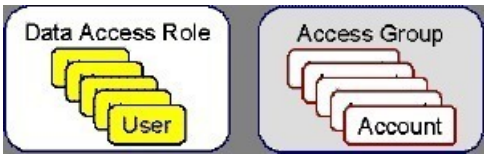
By granting a user access rights to an account, you are actually granting the user access rights to the account's bills, payment, adjustments, orders, etc.

The topics in this section describe basic row level security objects.

FASTPATH: Refer to your product’s documentation for more information on row level security, if applicable.

Access Groups, Data Access Roles and Users

We'll use an example from Oracle Utilities Customer Care and Billing to describe how access groups and roles are used to restrict access to accounts. The following diagram illustrates the objects involved with account security:



An **Access Group** defines a group of **Accounts** that have the same type of security restrictions. A **Data Access Role** defines a group of **Users** that have the same access rights (in respect of access to accounts). 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 accounts in the access group.

The following points summarize the data relationships involved with account security:

- An account references a single **access group**. An **access group** may be linked to an unlimited number of **accounts**.
- A **data access role** has one or more **users** associated with it. A **user** may belong to many **data access roles**.
- A **data access role** may be linked to one or more **access group**. An **access group** may be linked to one or more **data access roles**.

If you use row level security, setting up your access roles and groups can be easy or challenging - it all depends on your organization's requirements. Refer to the product's **Administration Guide - Implementing Account Security** for several case studies. These case studies provide examples of how different requirements can be implemented using these concepts.

Defining Application Services

An application service exists for every transaction in the system. Please refer to *Application Security* for a description of how application services are used when you grant user groups access rights transactions.

CAUTION: Important! If you introduce a new application service, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Application Service - Main

Select **Admin** > **Security** > **Application Service** to define an application service.

Description of Page

Enter a unique **Application Service** code and **Description** for the application service.

Indicate the application service's various **Access Modes** (i.e., actions). Refer to *Action Level Security* for more information about the significance of these fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *SC_APP_SERVICE*.

Application Service - Application Security

Use the Application Security portal to set up security for an application service.

Open this page using **Admin** > **Security** > **Application Service**, and then navigate to the **Application Security** tab.

This section describes the available zones on this page.

Application Service Details zone. The Application Service Details zone contains display-only information about the selected application service, including the Access Modes for the application service and its security type.

User Groups with Access zone. The User Groups with Access zone lists the user groups that have access to the application service. The following actions are available:

- Click the **Description** link to navigate to the User Group - Users page for the adjacent user group.
- Click **Deny Access** to remove the user group's access rights from the selected Application Service.
- Use the search filters to display the user groups that contain a specific user.

User Groups without Access zone. The User Group without Access zone lists the user groups that do not have access to the application service. The following actions are available:

- Click the **Description** link to navigate to the User Group - Users page for the user group.
- Click **Grant Access** to navigate to the User Group - Application Services page for the user group. The page is automatically positioned at the selected application service.
- Use the search filters to display the user groups that contain a specific user.

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 logic to user exits. Refer to *Field Level Security* for more information on how security types are used to define field level security.

Security Type - Main

Select **Admin** > **Security** > **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**.

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 using *User Group - Application Service*.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_SC_TYPE*.

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).

User Group - Main

Select **Admin** > **Security** > **User Group** to view the application services to which a user has access.

CAUTION: Application services may not be changed or removed from the **ALL_SERVICES** user group. Refer to *The Base Package Controls One User, One User Group, And Many Application Services* for an explanation.

Description of Page

Enter a unique **User Group** code and **Description** for the user group.

Owner indicates if this user group is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a user group. This information is display-only.

The **Application Services** grid displays the various application services to which users in this group have access. Please note the following in respect of this grid:

- Use the **Application Service** search to restrict the application services displayed in the grid. For example, if you only want to see application services that start with the word "field", you can enter this word and press enter.
- To add additional application services to this user group, navigate to the *User Group - Application Services* page and click the add icon.

- To remove or change this user group's access to an application service, click the go to button adjacent to the respective application service. This will cause you to be transferred to the *User Group - Application Services* tab where you should click the - icon to remove the application service from the user group.
- Note, **Owner** indicates if this user group / application service relationship is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an application service to the user group. This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *SC_USER_GROUP*.

User Group - Application Services

Select **Admin** > **Security** > **User Group** and navigate to the **Application Services** tab to maintain a user group's access rights to an application service.

> **NOTE:** **Important!** When you grant a user group access rights to an application service, you are actually granting all users in the user group access rights to the application service.

Description of Page

The **Application Service** scroll contains the application services to which the **User Group** has access.

> **NOTE:** You can also use Main page to select the application service for which you wish to change the access privileges. To do this, simply click the go to button adjacent to the respective application service.

To add additional application services to this user group, click the + icon and specify the following:

- Enter the **Application Service ID** to which the group has access.
- Define the **Expiration Date** when the group's access to the application service expires.

Define the **Access Modes** that users in this group have to the **Application Service**. When a new application service is added, the system will default all potential **Access Modes** associate with the **Application Service**. You need only remove those modes that are not relevant for the **User Group**. Refer to *Action Level Security* for more information about access modes.

> **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.

If you require additional security options, often referred to as "field level" security, then you use **Security Type Code** and assign an **Authorization Level** to each. When a new application service is added, the system will display a message indicating how many security types are associated with this application service. Use the search to define each Security Type Code and indicate the appropriate Authorization Level for this user group. Refer to *Field Level Security* for more information about security types.

User Group - Users

Select **Admin** > **Security** > **User Group** and navigate to the **Users** tab to maintain the users in a user group.

Description of Page

The scroll area contains the users who are part of this user group.

NOTE: Keep in mind that when you add a **User** to a **User Group**, you are granting this user access to all of the application services defined on the **Application Services** tab.

The following fields are included for each user:

- Enter the **User** ID of the user.
- Use **Expiration Date** to define when the user's membership in the group expires.
- **Owner** will be **Customer Modification**.

NOTE: You can also add a user to a user group using *User - Main*.

Defining Access Groups

FASTPATH: Refer to *The Big Picture of Row Security* for a description of how access groups are use 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. Select **Admin** > **Security** > **Access Group** to define your access groups.

Description of Page

Enter a unique **Access Group** code and **Description** for the data access group.

Use the **Data Access Role** collection to define the data access roles whose users have access to the access group's accounts (or other 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 accounts (or other objects) linked to the access groups. Refer to *Access Groups, Data Access Roles and Users* for more information.

NOTE: You can also use *Data Access Role - Access Group* to maintain a data access role's access groups.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ACC_GRP*.

Defining Data Access Roles

FASTPATH: 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:

- 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

Select **Admin** > **Security** > **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. Refer to *Access Groups, Data Access Roles and Users* for more information.

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.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_DAR*.

Data Access Role - Access Group

Select **Admin** > **Security** > **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. Refer to *Access Groups, Data Access Roles and Users*for more information.

NOTE: You can also use *Access Group - Main* to maintain an access group's data access roles.

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** > **Security** > **User**.

The user maintenance transaction is the same transaction invoked when the user launches *Preferences*.

User Interface Tools

This section describes tools that impact many aspects of the user interface.

Defining Menu Options

The contents of this section describe how you can add and change menus.

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.

NOTE: Security and menus. Refer to *Application Security* 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.

Menu - Main

This transaction is used to define / change any menu in the system. Navigate to this page using **Admin** > **System** > **Menu**.

Description of Page

Enter a meaningful, unique **Menu Name**.

Owner indicates if this menu line is owned by the base product or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a menu line. This information is display-only.

The **Flush Menu** button is used to flush the cached menu items so you can see any modified or newly created menus. Refer to *Caching Overview* for more information.

Menu Type defines how the menu is used. You have the following options:

- **Admin** is one of the menus that appears in the Application Toolbar. It is a special type of menu because *admin menu* items can be grouped alphabetically or by functional group. Refer to the description of Admin Menu Order on *Installation Options - Framework* for more information about admin menu options.
- **Context** refers to a *context menu*.
- **Main** is another menu that appears in the Application Toolbar that is simply titled *Menu*.
- **Page Action Menu** defines buttons that appear in the *Page Title Area*.
- **Submenu** defines a menu group that appears when an Application Toolbar menu is selected. for the Admin menu, this is only visible when it's organized functionally.
- Enter **User Menu** refers to the menu items that appear on the *user menu*; for example, User Preferences.

Description provides a description of the menu. Note that this is not the text used when displaying a menu option.

Sequence is only enabled for the **Main** and **Admin** menu types.

The grid contains a summary of the menu's lines. Besides the standard add and delete icons available in a grid, the following information is displayed:

- **Menu Line ID** is the unique identifier of the line on the menu. This information is display-only. Before the menu line id is a Go To icon that allows a user to drill into the Menu Items for the displayed menu line.
- **Sequence** is the relative position of the line on the menu. Note, if two lines have the same **Sequence**, the system organizes the lines alphabetically (based on the **Long Label**, which is defined on the next tab).

  NOTE: 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).

- **Navigation Option / Submenu** contains information about the line's items. If the line's item invokes a submenu, the submenu's unique identifier is displayed. If the line's item(s) invoke a transaction, the description of the first item's *navigation option* is displayed.
- **Long Label** is the verbiage that appears on the menu line.
- **Item Count** is the number of menu items on the line.
- **Owner** indicates if this menu line is owned by the base product or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a menu line. This information is display-only.

NOTE: Adding menu lines to base owned menus. An implementation may choose to add custom menu lines along with its menu item (or items) to a base owned menu.

Refer to the description of *Menu Items* for how to add items to a menu line.

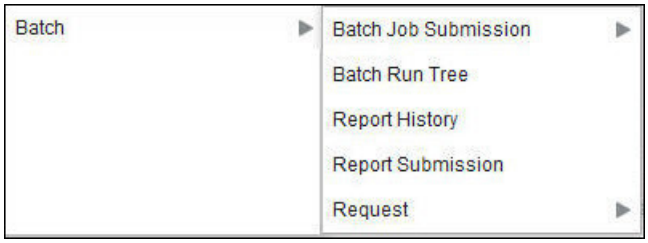
Menu - Menu Items

Once a menu has lines (these are maintained on the main page), you use this page to maintain a menu line's items.

Each menu line can contain one or two menu items. The line's items control what happens when a user selects an option on the menu.

There are two types of menu lines that define a single menu item: one type causes a submenu to appear; the other type causes a transaction or script to be invoked when it's selected.

- The following is an example of a menu line with a single item that opens a submenu:



- The following is an example of a menu line with a single menu item that launches a transaction or script:

A menu line that defines two menu items is used to provide an Add option and a Search option for the same type of object. In this case each menu item defines a transaction or script to be launched. The menu is rendered with the Add and Search options displayed. The following is an example of a menu line with two menu items.

Navigate to this tab by clicking the Go To button adjacent to a menu line from the Main tab.

Description of Page

Menu Name is the name of the menu on which the line appears. **Menu Line ID** is the unique identifier of the line on the menu. **Owner** indicates if this menu is owned by the base product or by your implementation (**Customer Modification**). This information is display-only.

The **Menu Line Items** scroll contains the line's menu items. The following points describe how to maintain a line's items:

- **Menu Item ID** is the system assigned unique identifier of the item.
- **Owner** indicates if this item is owned by the base product or by your implementation (**Customer Modification**).
- If the menu item should invoke a submenu:
  - Use **Sub-menu Name** to identify the menu that should appear when the line is selected
  - Use **Long Label** to define the verbiage that should appear on the menu line
  - Populate the **Override Label** to override the long label of a base product owned sub-menu.
- If the item should invoke a transaction or BPA script:

- Use **Sequence** to define the order the item should appear in the menu line (we recommend this be set to **1** or **2** as a menu line can have a maximum of 2 menu items). The “search” menu item should be defined as sequence 1 and the “add” menu item as sequence 2 given that the label of the “search” menu item is used for the menu line’s label.
- Use **Navigation Option** to define the transaction or script to open. Refer to *Defining Navigation Options* for more information.
- For a menu line that includes two items — one for Add and one for Search, if one of the items includes configuration for **Image GIF Location and Name** , the system assumes that this represents the Add. This functionality is a carry over from earlier releases where the Add function rendered in the menu with a “+” image, which also identified the item that represents the Add. If neither item includes Image configuration (because it is no longer needed for rendering the menu), the system relies on the order of the items as mentioned above. The first item is the “search” and the second item is the “add”.
- **Image Height**, **Image Width** and **Balloon Description** are not applicable at this time.

- Use the **Long Label** to define the text to appear on the menu entry. Note that when a menu line defines two menu items, the long label on the search entry is used to build the menu entry text. The label long on the menu line that defines the Add option is information only.
- The **Override Label** is provided in case you want to override the base-package's label.
- Use **Application Service** and **Access Mode** to easily suppress a menu item for one or more users. Refer to *Application Security* for more information.

The Big Picture of 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. On the **Main** tab, you can only maintain the brief message. If you need to update a message's long description, you must display the message on the **Details** tab.

NOTE: You cannot change the product’s text. 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, display the message on the **Details** tab and enter your desired verbiage in the "customer specific" fields (and flush the *cache*).

Defining System Messages

The contents of this section describe how to maintain 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.

Message - Main

Select **Admin** > **System** > **Message** to maintain a message category and its messages.

Description of Page

To add a new message category, enter a **Message Category** number and **Description**.

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 specify Customer Specific Message Text. Note that even for message categories 80000 and higher, message numbers lower than 1000 are reserved for common base product messages.

NOTE: **Owner** indicates if this message category is owned by the base product or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a category. This information is display-only.

To update a message, you must first display its **Message Category**. You can optionally start the message grid at a **Starting Message Number**.

To override the message text or detailed description of messages owned by the base product, click on the message's go to button. When clicked, the system takes you to the **Details** tab on which you can enter your implementation's override text.

The following points describe how to maintain messages owned by your implementation:

- Click the - button to delete a message.
- Click the + button to add a new message. After clicking this button, enter the following fields:
- Use **Message Number** to define the unique identifier of the message within the category.
- Use **Message Text** to define a basic message. You can use the %n notation within the message text to cause field values to be substituted into a message. For example, the message text **The %1 non-cash deposit for %2 expires on %3** will have the values of 3 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).

  NOTE: The system merges whatever values are supplied to it. Therefore, if a programmer supplies a premise address as the second merge parameter in the above message, this address is merged into the message (rather than the customer's name).

- **Owner** indicates if this message number is owned by the base product or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a message. This information is display-only.
- Click the go to button to enter a detailed description of the message. Clicking this button transfers you to the **Details** tab.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_MSG*. In addition, messages are used throughout the system for error messages and other system messages.

Message - Details

Select **Admin** > **System** > **Message** and navigate to the **Details** tab to define detailed information about a message.

NOTE: **Drilling in from the Main tab.** Rather than scrolling through the messages, you can display a message by clicking the respective go to button in the grid on the main tab.

Description of Page

The **Message Collection** scroll contains an entry for every message in the grid on the Main tab. It's helpful to categorize messages into two categories when describing the fields on this page:

- Product messages
- Implementation-specific messages (i.e., a message added to **Message Category** 80000 or greater)

For product messages, you can use this page as follows:

- If you want to override a message, specify **Customer Specific Message Text**.

- You are limited to the same substitution values used in the original **Message Text**. For example, if the original **Message Text** is **The %1 non-cash deposit for %2 expires on %3** and %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; your **Customer Specific Message Text** is limited to the same three substitution variables. However, you don't have to use any substitution variable in your message and you can use the substitution variables in whatever order you please (e.g., %3 can be referenced before %1, and %2 can be left out altogether).
- If you want to override the detailed description of an error message, specify **Customer Specific Description**. Note that the system does not present detailed descriptions when warnings are shown to users. Therefore, it doesn't make sense to enter this information for a warning message.

For implementation-specific messages, you can use this page as follows:

- **Message Text** is the same Message Text displayed on the main tab.

  CAUTION: If both **Message Text** and **Customer Specific Message Text** are specified, the system will only display the **Customer Specific Message Text** in the dialog presented to the user.

- Use **Detailed Description** to define additional information about an error message. Note that the system does not present detailed descriptions when warnings are shown to users. Therefore, it doesn't make sense to enter this information for a warning message.

  CAUTION: If both **Detailed Description** and **Customer Specific Description** are specified, the system will only display the **Customer Specific Description** in the dialog presented to the user.

The Big Picture of 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. The contents of this section describe general information about portals and zones.

There Are Three Types of Portals

There are three broad classes of portals:

- **Standalone Portal**. 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 Portals.** These types of portals cannot be attached to a menu. They simply define the zones for a tab on either a standalone portal or on a “fixed” page. Please contact customer support if you need to add portals to existing transactions.
- **Dashboard Portal.** The dashboard portal is a portal that appears in the *Dashboard Area* on the user’s desktop. Its zones contain tools and information that exist on the user's desktop regardless of the transaction.

  There is only one dashboard portal. This portal and several zones are delivered as part of the base-package. Your implementation can add additional zones to this portal. Please contact customer support if you need to add zones to the dashboard portal.

Common Characteristics of All Portals

The topics that follow describe characteristics common to all types of portals.

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.

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.

  FASTPATH: Refer to *Zones May Appear Initially Collapsed When a Page Opens* for more information.

FASTPATH: Refer to *Defining Portals* for more information about this configuration.

In addition, the portal includes configuration to indicate whether or not the portal should appear on a user's portal preferences. This 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 Dashboard 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.

FASTPATH: Refer to *User — Portal Preferences* for more information about how users configure their zones.

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.

FASTPATH: 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 main (stand-alone) portal for the page. In other words, if the user has access to the page, then he 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 (stand-alone) 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).

NOTE: If you don't need to use zone security. When defining a zone, an application service is required. For zones that don’t require special security, the product provides a “default” application service (F1-DFLTS) that may be used. The expectation is that all user groups are granted access to this application service.

Common Characteristics of Stand-Alone Portals

The topics that follow describe addition characteristics specific to *stand-alone portals*.

Putting Portals on Menus

A stand-alone portal should appear as a menu item on one of your menus. The following points provide how to do this:

- Every stand-alone portal has an associated navigation option. You can see a portal's navigation option on the *Portal - Main* page.
- To add a portal to a menu, you must add a *menu item* to the desired menu. This menu item must reference the portal's navigation option. There are two ways to add a menu item:
- If the portal's navigation option doesn't currently exist on a menu, you can press the **Add To Menu** button on the *Portal - Main* page. When you press this button, you will be prompted for the menu. The system will then create a menu item on this menu that references the portal's navigation option.
- You can always use the *Menu* page to add, change and delete menu items.

NOTE: No limit. 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.

NOTE: Favorite links. 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.

Granting Access to A Portal

An *application service* is associated with each *stand-alone portal*. A user must be granted access rights to the respective application service in order to see a portal. Tab 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. However, as mentioned in Granting Access to Zones, in some scenarios, the individual zones on the portal may have different security access rights depending on the functionality.

FASTPATH: Refer to *The Big Picture Of Application Security* for information about granting users access rights to an application service.

NOTE: **Automatically created.** When you add a new stand-alone portal, the system automatically creates an application service behind the scenes. You'll need to know the name of this application service as this is what you use to grant access to the portal. The name of each stand-alone portal's application service is shown on the portal transaction.

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.

Custom Look and Feel Options

The default look and feel of the application can be customized via feature configuration and cascading style sheets. The base product is provided with a **Custom Look And Feel** *Feature Configuration* type. You may want to set up a feature configuration of this type to define style sheet and UI Map help options.

User Interface

The base product allows for the conditional inclusion of customer styles into the system style set. The custom style 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.

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.

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 of 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.

FASTPATH: Refer to the feature configuration for a detailed description of each option.

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

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** > **System** > **Zone Type** to maintain zone types.

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.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ZONE_HDL*.

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

The contents of this section describe how to maintain zones.

Zone - Main

Implementations may use the zone page to define custom zones. In addition, an implementation may override descriptions or some parameter values for base product zones.

Select **Admin** > **System** > **Zone** to create or maintain a zone.

Description of Page

Specify an easily recognizable **Zone** identifier and **Description**. Note that if this zone appears on a portal, this description acts as the zone title.

Override Description is provided if your implementation wishes to override the description of the value provided by the product.

> **CAUTION:** Important! When introducing a new zone, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Owner indicates if this zone 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. This information is display-only.

Zone Type identifies the zone type that defines how the zone functions.

Application Service is the application service that is used to provide security for the zone. Refer to *Granting Access To Zones* for more information.

The **Width** defines if the zone occupies the **Full** width of the portal or only **Half**.

> **NOTE:** Zones on the *dashboard portal* are always the width of the dashboard.

If the zone type supports help text, you can use **Zone Help Text** to describe the zone to the end-users. Note that for multi-query zones, if the multi-query zone has help text, that is displayed for any zone selected. If the multi-query zone does not

have help text, but the selected zone has help text, the selected zone's help text is displayed. Please refer to the section on *zone help text* for more information on how you can use HTML and cascading style sheets to format the help text.

Use **Override Zone Help Text** to override the product provided help text for this zone.

> **NOTE: Viewing Your Text.** You can press the **Test** button to see how the help text will look when it's displayed in the zone.

The grid contains the zone's parameter values. The Zone Type controls the list of parameters. The grid contains the following fields:

- **Description** describes the parameter. This is display-only. Note that if there is a detailed description on the zone type parameter, a question mark icon appears next to the parameter's description. Click the icon to see details related to the parameter, including tips on how to populate the parameter value.

  > **NOTE: Additional Details for Some Parameters**. There are several parameter types that have a lot of detail related to the possible configuration that cannot easily fit into the detailed description. Refer to *Common Zone Parameters for Additional Information* about these parameters.

- **Parameter Value** is the value for the parameter.
- Use **Override Parameter Value** to override the existing value for this parameter. This field is enabled when the related zone type parameter value is **Zone - Override Allowed**, and the zone is owned by the base product.
- **Owner** indicates if this parameter is owned by the base product or by your implementation (**Customer Modification**). This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ZONE*.

Zone - Portal

Select **Admin** > **System** > **Zone** and navigate to the **Portal** tab to define the portals on which a zone appears.

Description of Page

The scroll area contains the portals on which the zone appears.

To add a zone to a portal, press the + button and specify the **Portal**.

> **NOTE: Owner** indicates if this portal / zone relationship is owned by the base product or by your implementation (**Customer Modification**). This information is display-only.

> **NOTE:** You can also add a zone to a portal using *Portal - Main*. Additional configuration about how the zone appears on the portal is available only on the Portal.

Additional Zone Topics

The topics in this section provide additional information related to setting up your zones.

Zone Help Text

Most zone types support a button that allows a user to see zone-specific help text, which is defined on the zone page.

You can use HTML tags in the zone help text. The following is an example of help text that contains a variety of HTML tags:

**This zone summarizes revenue in 4 periods:
**

The above would cause the word **revenue** to be bold and blue:

- **** and **** are the HTML tags used to indicate that the surrounded text should be bold
- **** and **** are the HTML tags used to indicate that the surrounded text should be blue.

The following are other useful HTML tags:

- **
** causes a line break in a text string. If you use **

** a blank line will appear.
- **<I>** causes the surrounded text to be italicized

Please refer to an HTML reference manual or website for more examples.

You can also use "spans" to customize the look of the contents of a text string. For example, your text string could be **revenue.** This would make the word "revenue" appear as large, bold, Courier text. Please refer to a Cascading Style Sheets (CSS) reference manual or website for more examples.

The following is an example of help text using a variety of HTML tags:

This zone summarizes revenue in 4 periods:

- The 1st period is under your control. You simply select the desired Period, above (you may need to click the down arrow to expose the filter section)

- The 2nd period is the period before the 1st period

- The 3rd period is the same as the 1st period, but in the previous year

- The 4th period is the period before the 3rd period

The traffic light's color is determined as follows:

- The ratio of the 1st and 3rd period is calculated

- If this value is between 80 and 100, yellow is shown

- If this value is < 80, red is shown

- If this value is > 100, green is shown

- If the value of the 3rd period is 0, no color is shown

NOTE: It is possible to associate tool tip help with individual HTML and UI map elements. For more information, see *UI Map Help*.

Common Zone Parameters

For most zone parameters, the inline help for the parameter provides the detailed information needed for configuring the parameter values. For some parameters with very detailed descriptions, the inline help is abbreviated and more detail is provided here.

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. The parameters follow the description pattern of **Column x for SQL y**.

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**)

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.
		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.
		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 *formatting mnemonic***type=** is not applicable.
		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). 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 *formatting mnemonic***type=** is not applicable.

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.
		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).
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.	Cx	This means business object code is defined in an earlier column. For example, define **C1** if column 1 defines the business object.
		COLUMN_NAME	This means the business object was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.
		'Business Object Code'	This means the business object is defined directly. For example 'F1–BundleImport'.
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.	Cx	This means business service code is defined in an earlier column. For example, define **C1** if column 1 defines the business service.
		COLUMN_NAME	This means the business service was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.
		'Business Service Code'	>This means the business service is defined directly. For example 'F1-GetCountryStates'.
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.	Cx	This means service script code is defined in an earlier column. For example, define **C1** if column 1 defines the service script.
		COLUMN_NAME	This means the service script was retrieved by the SELECT statement. The value should match the name defined in the SELECT clause.
		'Service Script Code'	This means the service script is defined directly. For example 'F1-ReturnBtn'.
formula=	Defines the formula to use when **source=FORMULA**. Examples: • **formula=C1*.90/C2** • **formula=(C1/C2)*100**	The formula can contain numeric constants, operators and column references.	For column references, use the format Cx where x represents the column number.
			The following operators are supported: *, /, -, +, ABS, NEGATE, ROUND, FLOOR (round down), CEILING (round up), SIN, ASIN, COS, ACOS,

Mnemonic	Description	Valid Values	Comments
			TAN, ATAN, LOG, LOG10, EXP, EXP10, SQRT, **.
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 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.	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.
		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.
		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**

Formatting Mnemonics

This table describe the mnemonics that control how a column is formatted.

Mnemonic	Description	Valid Values	Comments
type=	Defines how the column's value is formatted. **NOTE: Icon and Foreign Key columns.** The **source=***source mnemonic* may be used to indicate a column should be derived from an icon reference or a foreign key (FK) reference. If you use either of these sources, the **type=** mnemonic is not relevant as either an icon or a context menu / info string will appear in the column.	**STRING**	Columns of this type capture a string. This is the default value.
		DATE	Columns of this type capture a date.
		TIME	Columns of this type capture a time (in database format) and will be displayed using the user's *display profile*.
		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.

Mnemonic	Description	Valid Values	Comments
		NUMBER	Columns of this type capture a numeric field. This type of column may also reference the **dec=** mnemonic.
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 value and omitting this mnemonic will result in a blank label.	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.
		'text'	Defines the text directly.
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'.
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 used for formatting, it does not impact the precision used for subsequent calculations. For example, if a column retrieved from the database contains 6 significant digits and **dec=0**, the column will be shown with no decimal places (truncated), however any references to the column in subsequent will use 6 decimal places. For example, if the column is referenced in a formula or set function, 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)'**.
suppress=	This is used to indicate a column should not be displayed.	**true**	

Mnemonic	Description	Valid Values	Comments
	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.	**false**	This is the default, meaning that you don't need to indicate **suppress=false** at all to indicate that the field should be shown.
suppressSearch=	This is used to indicate a column should not be displayed when the zone is invoked in search mode only.	**true**	
		false	This is the default, meaning that you don't need to indicate **suppressSearch=false** at all to indicate that the field should be shown.
suppressExport=	This is used to indicate a column should not be downloaded to Excel.	**true**	
		false	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.
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 column will be longer than the specified number of pixels. The length of the column's label (which appears in the column's heading) may also make the width wider than specified.
color=	This is used to override the column's text color.	A valid HTML "named" color	For example **color=red** or **color=yellow**.
		A valid RGB color model combination	For example **color=#FF0000** 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.
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.

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 **type=fkref** because the FK reference code defines the hyperlink's destination.	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**
		'Navigation Option Code'	This means the navigation option code is defined directly. For example **navopt='userMaint'**.

Mnemonic	Description	Valid Values	Comments
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 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 **type=fkref** because the FK reference code defines the hyperlink's destination.	Cx	Indicates that the BPA script is defined in a previous column.
		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, 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.	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.
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 Info Data Explorer - Multiple SQLs (**F1–DE**), the output may be showing a union of the results of multiple SQL statements. In this case, if some of the SQL statements configure a given column with **list=true**, but not all, only the data in the cells for the statements that configure this mnemonic are put into the work list when the user clicks the icon.
listdesc=	This is an optional mnemonic when using the **list=** mnemonic. It can	Cx	Where Cx represents the value of a previous column. For example, if

Mnemonic	Description	Valid Values	Comments
	be used to override the text that is placed in the work list zone.		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.

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.

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.
		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.
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']	
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.

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.
		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. - If no portal context value is found, the global context is checked. - If neither value is available, the field is ignored.	**G**	Indicates that the field's value is retrieved from the global context.
		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.

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=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**)

- 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.	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.
		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.	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.
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

Mnemonic	Description	Valid Values	Comments
			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.
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.	nameFromUIMap	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.
		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.	**above**	This results in a divider line placed above 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**.	**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.	FIELD_NAME	Enter the field name that exactly matches the searchField name specified in the oraSearchField html element in the UI map.
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 in FIELD_NAME if another field has a certain value. For example encrypt=[CI_PERSON,PER_ID_NBR,ID_TYPE_NBR,'SSN'].

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	
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.
		O	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.
		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

Mnemonic	Description	Valid Values	Comments
			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.
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.
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 defines how the action should be rendered.	**BUTTON**	The action is rendered as a button. This is the default.
		LINK	The action is rendered as hypertext.
		ICON	The action is rendered as a graphic icon. For this option, the icon mnemonic is required.

Mnemonic	Description	Valid Values	Comments
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 tooltip will come from the 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.
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 appropriate 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 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.
	Example of a schema:
	`<schema>`
	`  <accountInfo type="list">`
	`  <accountId/>`
	`  <name/>`
	`  <amount/>`
	`  <process/>`
		Cx	Indicates that the element should be populated with a value in the referenced column parameter.

		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.
		'constant'	Indicates that the value defined in single quotes should be passed.

Mnemonic	Description	Valid Values	Comments
	`</ accountInfo> </schema>` Example of 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.
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.

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 Dashboard when a user accesses a page for which the zone is specified as the context. For example, when viewing a business object, additional zones are visible that are specific to the business object page.

> **CAUTION:** Make sure that the zone is appropriate for the transaction on which you are specifying it. For example, if your zone requires a business object ID as one of its keys, it should not be displayed on the To Do entry transaction.

Select **Admin** > **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 dashboard for the selected navigation key. The grid contains the following fields:

- **Zone** is the name of the zone to display in the Dashboard.
- **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 Dashboard whenever a user accesses the transaction for with the zone is specified.

Defining Portals

This transaction is used to define / change portals. An implementation may define their own portals. In addition, an implementation may override some of the settings for base product provided portals.

Portal - Main

Navigate to this page using **Admin** > **System** > **Portal.**

Description of Page

Enter a meaningful and unique **Portal** code and **Description**. Please be aware that for *stand-alone portals*, the Description is the portal's title (i.e., the end-users will see this title whenever they open the portal).

> **CAUTION:** Important! When introducing a new portal, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Owner indicates if this portal is owned by the base product or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a portal. This information is display-only.

Type flag indicates whether the portal is a **Standalone Portal**, a **Tab Page Portal** or the **Dashboard**. Refer to *There Are Three Types of Portals* for more information.

The following fields are only enabled for **Standalone Portals**:

- **Navigation Option** defines the navigation option that is used to navigate to this portal from menus, scripts and your favorite links. The navigation option is automatically created when a **Standalone Portal** is added.
- You'll find an **Add To Menu** button adjacent. This field is only enabled if the navigation option is not referenced on a menu. When you click this button, a pop-up appears where you define a menu. If you subsequently press **OK**, a menu item is added to the selected menu. This menu item references the portal's navigation option. You can reposition the menu item on the menu by navigating to the *Menu page*.
  Refer to *Putting Portals on Menus* for more information.
- **Application Services** defines the service used to secure this portal. The application service is automatically created when a **Standalone Portal** is added. Please note that only users with access to this application service will be able to view this portal and its zones. Refer to *Granting Access to A Portal* for more information.
- **Show on Portal Preferences** indicates if a user is allowed to have individual control of the zones on this portal. The portal will not appear in the accordion on the user's Portal Preferences page if this value is set to No. Note that an implementation may change this value for a product delivered portal.

The grid contains a list of zones that are available in the portal. Click + to add a new zone to the portal. Click - to remove a zone from the portal. The grid displays the following fields:

- **Zone** is the name of the zone as defined on the Zone page.
- **Description** is a description of the zone as defined on the Zone page.
- **Display** controls whether or not the zone is visible in the portal. For portals that are configured to Show on Portal Preferences, users may override this value for their view of the portal.
- **Initially Collapsed** controls whether or not the zone is initially collapsed in the portal. For portals that are configured to Show on Portal Preferences, users may override this value for their view of the portal.
- **Default Sequence** is the default sequence number for the zone within the portal. It does not need to be unique within the portal. Note that a sequence of zero will appear last, not first, in the portal. For portals that are configured to Show on Portal Preferences, users may override this value for their view of the portal.

- **Override Sequence** can be used by an implementation team to override the Default Sequence value that is set in the base product.
- **Refresh Seconds** defines in seconds how often the zone is automatically refreshed. The minimum valid value is 15. The maximum valid value is 3600 (1 hour). A value of 0 indicates no automatic refresh. Implementers can change this value as needed.
- **Owner** indicates if this portal / zone relationship is owned by the base product or by your implementation (**Customer Modification**). This information is display-only.

> **NOTE: Removing zones from a 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.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_PORTAL*.

Portal - Options

Use this page to maintain a portal's options. Open this page using **Admin** > **System** > **Portal** and then navigate to the **Options** page.

Description of Page

The options grid allows you to configure the options that provide additional information related to the portal.

Select the **Option Type** dropdown to define its **Value**. **Detailed Description** may display additional information on the option type.

Set the **Sequence** to **1** unless the option can have more than one value.

Owner indicates if this is owned by the base product or by your implementation (**Customer Modification**).

> **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**.

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** > **System** > **Display Icon Reference** to maintain the population of icons available for selection.

Description of Page

Each icon requires the following information:

- **Display Icon** is a code that uniquely identifies the icon.
- **Icon Type** defines how big the icon is (in pixels). The permissible values are: **30 x 21**, **21 x 21**, and **20 x 14**. Note that only icons that are **20 x 14** can be used on base product instructions.
- **Description** contains a brief description of the icon.
- **URL** describes where the icon is located. Your icons can be located on the product's web server or on an external web server.
- To add a new icon to the product web server, place it under the **/cm/images** directory under the **DefaultWebApp**. Then, in the **URL** field, specify the relative address of the icon. For example, if the icon's file name is myIcon.gif, the **URL** would be **/cm/images/myIcon.gif**.

- If the icon resides on an external web server, the **URL** must be fully qualified (for example, **http://myWebServer/images/myIcon.gif**).
- **Owner** indicates if this icon is owned by the base product or by your implementation (**Customer Modification**). This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_DISP_ICON*.

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

There are two types of navigation keys:

- **System navigation keys** define locations where the URL is derived from other entities within the system. The items that are derived include the program location (i.e., physical location on the server), file name (i.e. program component name), and the file extension (e.g. COB). System navigation keys refer to program components, such as tab menus or tab pages.
- **External navigation keys** define locations simply as a URL. 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 online help links and URLs to external systems.

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 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 in "add mode", while the second navigates to the page in "update mode".
- Please note that a wide variety of options can be defined on a navigation option. In addition to defining if a page is opened in add or update mode, you can define which tab is opened, which fields should be passed to the page, which search program is used, etc.

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.

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 URL Location of the navigation key being overridden is **External**, specify a URL Location of **Override (External)** and define the appropriate URL Override Location.
- If the URL Location of navigation key being overridden is **System**, specify a **URL Location** 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** > **System** > **Navigation Key** to maintain navigation keys.

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. Try to use a name that is easily recognizable.

Owner indicates if this navigation key is owned by the base product or by your implementation (**Customer Modification**). This information is display-only.

For **URL Location**, you can select from the following options:

- Use **External** to create a navigation key where the location is specified in the **URL Override** field.

- Use **Override (External)** to create a navigation key that overrides another external navigation key. If you use this option, you specify the name of the navigation key you are overriding in the **Overridden Navigation Key** field.
- Use **Override (System)** to point a system navigation key to a different location. If you use this option, you specify the name of the navigation key you are overriding in the **Overridden Navigation Key** field.
- Use **System** to create a navigation key for a custom program component developed for your implementation.

FASTPATH: Refer to *Navigation Key Types* for more information about system and external navigation keys.

FASTPATH: 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 (External)** or **Override (System)** is selected for the **URL Location**). Refer to *Overriding Navigation Keys* for more information.

URL Override is the specific URL for the navigation key (external 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).

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_MD_NAV*.

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.

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

Select **Admin** > **System** > **Navigation Option** to maintain a navigation option.

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**.

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.). 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.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_NAV_OPT*.

Navigation Option - Tree

This page contains a tree that shows how a navigation option is used. Select **Admin** > **System** > **Navigation Option** and navigate to the **Tree** tab to view this page.

Description of Page

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.

Database Tools

This section describes a variety of database tools that are supplied with the your product.

Defining Table Options

The topics in this section describe the transaction that allows you to define metadata for the application's tables.

Table - Main

Navigate using **Admin** > **Database** > **Table**.

Description of Page

Table Name is the identifier of this table.

Description contains a brief description of the table.

System Table defines if the table includes rows that are owned by the base product.

Enable Referential Integrity defines if the system performs referential integrity validation when rows in this table are deleted.

Data Group ID is used for internal purposes.

Table Usage is not in use at this time.

Table Type defines if the table is an **External Table**, a **View** or a physical **Table**.

Date / Time Data Type defines if the system shows times on this table in **Local Legal Time** or in **Local Standard Time** Local Legal Time is the time as adjusted for daylight savings / summer time.

Table Classification Type specifies the category of data the table will hold. This is for information purposes only and is not used by any system processing. Valid values are **Admin System Table, Admin Non System Table, Master Table, Transaction Table**, and **Unclassified**.

Table Volume Type specifies the expected amount of data the table will hold. This is for information purposes only and is not used by any system processing. Valid values are **High Volume, Low Volume, Medium Volume,** and **Unclassified**. The volume of data in a particular table in the system may differ greatly from one implementation to another based on unique business requirements. The values populated for base product tables are set to volumes that are typical but may not be true for a given implementation. The value may be updated to reflect the situation for a given implementation.

Audit Table is the name of the table on which this table's audit logs are stored. Refer to *The Audit Trail File* for more information.

Use **Audit Program Type** to define if the audit program is written in **Java** or **Java (Converted)**, meaning it was converted into Java.

NOTE: Java (Converted) program types are not applicable to all products.

Audit Program is the name of the program that is executed to store an audit log. Refer to *Turn On Auditing For a Table* for more information.

NOTE: 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 *Java docs viewer*.

Upgrade controls what happens to the rows in this table when the system is upgraded to a new release:

- **Keep** means that the rows on this table are not touched during an upgrade
- **Merge** means that the rows on this table are merged with rows owned by the base product
- **Refresh** means that the rows on this table are deleted and refreshed with rows owned by the base product.

Data Conversion Role controls if / how the table is used by the conversion tool:

- **Convert (Retain PK)** means that the table's rows are populated from the conversion schema and the prime key in the conversion schema is used when the rows are converted. A new key is not assigned by the system.
- **Convert (New PK)** means that the table's rows are populated from the conversion schema and the prime key is reassigned by the system during conversion.
- **Not Converted** means that the table's rows are not managed by the conversion tool.
- **View of Production** means that the conversion tool uses a view of the table in production when accessing the rows in the table. This is commonly used for administrative tables.

A **Language Table** is specified when fields containing descriptions are kept in a child table. The child table keeps a separate record for each language for which a description is translated.

Enable Data Dictionary defines if the table is to be included in the *Data Dictionary* application viewer.

A **Key Table** is specified when the prime-key is assigned by the system. This table holds the identity of the prime keys allocated to both live and archived rows.

Type of Key specifies how prime key values are generated when records are added to the table:

- **Other** means a foreign-system allocates the table's prime-key.
- **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.
- **System-generated** means a program generates a random key for the record when it is added. If the record's table is the child of another table, it may inherit a portion of the random number from its parent's key.
- **User-defined** means the user specifies the key when a record is added.

Inherited Key Prefix Length defines the number of most significant digits used from a parent record's primary key value to be used as the prefix for a child record's key value. This is only specified when the Type of Key is **System-generated** and the high-order values of the table's key is inherited from the parent table.

Java Table Name. This field is used to identify the entity/Java class name of the class that represents the table in the Java code. It should contain a short "camelCased" name to be used as the name of the entity within the system. It must also be a valid Java name, and must be unique across the system. This name is used as follows:

- As the short class name on all classes in the Java hierarchy for the class: the Impl class, the Gen, and the interface.
- In HQL queries, it is used to identify the hibernate entity being selected.

Caching Regime determines if the table’s values should be cached when they are accessed by a batch process. The default value is **Not Cached**. You should select **Cached for Batch** if you know the values in the table will not change during the course of a batch job. For example, currency codes will not change during a batch process. Caching a table's values will reduce unnecessary SQL calls and improve performance.

Key Validation determines if and when keys are checked for uniqueness. The default value is **Always Check Uniqueness**. Select **Check Uniqueness Online Only** when the database constructs the keys in the table, such as in log tables. Select **Never Perform Uniqueness Checking** when you know that the database constructs the keys in the table and that users cannot add rows directly to the table, such as in log parameter tables. This will reduce unnecessary SQL calls and improve performance.

Help URL is the link to the user documentation that describes this table.

Help Text contains additional information about the table.

Extract for Translation is only visible in a development environment. It indicates whether or not the table includes strings that are eligible for product translation.

Translation Context is only visible in a development environment. It is used to provide information to a translator about the nature and purpose of rows in the table.

> **NOTE: Changes to base owned tables.** Only the following attributes of tables that are owned by the product are modifiable: Audit Table, Audit Program Type, Audit Program, Caching Regime, Key Validation and Table Volume Type.

The grid contains an entry for every field on the table. Drilling down on the field takes you to the *Table Field* tab where you may modify certain attributes. The following fields may also be modified from the grid: **Description, Override Label, Audit Delete, Audit Insert** and **Audit Update**. Refer to the Table Field tab for descriptions of these fields.

Table - Table Field

Navigate using **Admin** > **Database** > **Table** and click the **Table Field** tab.

Description of Page

Field Name is the name of the field. It is followed by its **Java Field Name**.

Field Help Text displays the help text listed for this field on the Field page, if populated.

Nullable, Required and **Validate** are for internal use.

Turn on **Audit Delete** if an audit record should be stored for this field when a row is deleted. Refer to *How To Enable Auditing* for more information.

Turn on **Audit Insert** if an audit record should be stored for this field when a row is added. Refer to *How To Enable Auditing* for more information.

Turn on **Audit Update** if an audit record should be stored for this field when it is changed. Refer to *How To Enable Auditing* for more information.

The **Allow Customization** is only applicable if the table is an Admin System Table. It indicates fields that an implementation is allowed to change 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.

Standard Time Type is only enabled if the Table indicates that the Date/Time Data Type is **Local Standard Time**. Each field that represent date/time should define if it uses **Logical Standard Time, Physical Standard Time** or uses a **Referenced Time Zone**.

Sequence is a unique sequence of this field with respect to other fields on the table.

The **Label** column is used to define a special label for this field when it relates to this table if it should be different from the field's label. Note that this only impacts the label on a fixed page user interface. Labels on portal based user interfaces do not use this information.

The **Override Label** is provided if an implementation wants to override the base-product label.

> **NOTE:** If you want the Override Label to be shown in the *data dictionary*, you must regenerate the data dictionary.

Help Text contains any additional information about the field with respect to its use on this table.

Field Usage is not used at this time.

Extract for Translation is only visible in a development environment. For tables marked to extract for translation, each translatable field on the table should indicate **Yes**.

Translation Context is only visible in a development environment. It is used to provide information to a translator about the nature and purpose of the data in this field on this table.

> **NOTE: Changes to base owned table / fields.** Only the following attributes of table / fields that are owned by the product are modifiable: Audit Delete, Audit Insert, Audit Update, Override Label.

Table - Constraints

Select **Admin** > **Database** > **Table** and navigate to the **Constraints** tab to view the constraints defined on the table.

Description of Page

The fields on this page are protected as only the product development group may change them.

This page represents a collection of constraints defined for the table. A constraint is a field (or set of fields) that represents the unique identifier of a given record stored in the table or a field (or set of fields) that represents a given record's relationship to another record in the system.

Constraint ID is a unique identifier of the constraint.

Owner indicates if this is owned by the base package or by your implementation (**Customer Modification**)

Constraint Type Flag defines how the constraint is used in the system:

- **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.

When **Enable Referential Integrity** is checked, the system validates the integrity of the constraint when a row in the table is modified.

Referring Constraint Owner indicates if this is owned by the base package or by your implementation (**Customer Modification**).

Referring Constraint ID is the **Primary Key** constraint of another table whose records are referenced by records stored in this table.

Referring Constraint Table displays the table on which the Referring Constraint ID is defined. You can use the adjacent go-to button to open the table.

Additional Conditional SQL Text is only specified when the constraint is a **Conditional Foreign Key**. The SQL represents the condition under which the foreign key represents a relationship to the referring constraint table.

> **NOTE: Additional Conditional SQL Syntax**. When specifying additional conditional SQL text, all table names are prefixed with a pound (#) sign.

The Constraint Field grid at the bottom of the page is for maintaining the field or set of fields that make up this constraint.

Field is the name of the table's field that is a component of the constraint.

Sequence The rank of the field as a component of the constraint.

The Referring Constraint Field grid at the bottom of the page displays the field or set of fields that make up the **Primary key** constraint of the referring constraint.

Field is the name of the table's field that is a component of the referring constraint.

Sequence is the rank of the field as a component of the referring constraint.

Table - Referred by Constraints

Select **Admin** > **Database** > **Table** and navigate to the **Referred By Constraints** tab to view the constraints defined on other tables that reference the **Primary Key** constraint of this table.

Description of Page

This page is used to display the collection of constraints defined on other tables that reference the table.

Referred By Constraint Id is the unique identifier of the constraint defined on another table.

Referred By Constraint Owner indicates if this constraint is owned by the base package or by your implementation (**Customer Modification**).

Prime Key Constraint Id is the **Primary Key** constraint of the current table.

Prime Key Owner indicates if this prime key is owned by the base package or by your implementation (**Customer Modification**).

Referred By Constraint Table is the table on which Referred By Constraint Idis defined.

When **Enable Referential Integrity** is checked, the system validates the integrity of the constraint when a row in the table is modified.

The grid at the bottom of the page displays the **Field** and **Sequence** for the fields that make up the constraint defined on the other table.

Defining Field Options

The topics in this section describe the transaction that can be used to view information about a field and to change the name of a field on the various pages in the system.

Field - Main

Open this page using **Admin** > **Database** > **Field**.

Description of Page

Field Name uniquely identifies this field.

> **CAUTION:** As described in *System Data Naming Convention* for most system data tables, the base product follows a specific naming convention. However, this is not true for the Field table. If you introduce new fields, you must prefix the field with **CM**. If you do not do this, there is a possibility that a future release of the application could introduce a new field with the name you allocated.

Owner indicates if this field is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a field.

Base Field indicates that the field inherits some of its definitions from another field.

Data Type indicates if the type of data the field will hold. Valid values are **Character**, **Character Large Object**, **Date**, **DateTime**, **Number**, **Time**, **Varchar2** and **XML Type**. This field is protected if the field refers to a Base Field.

Ext Data Type or 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** and **Switch**. This field is protected if the field refers to a Base Field.

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. This field is protected if the field refers to a Base Field.

Scale is only applicable for number fields. It indicates the number of decimal places supported by the field. This field is protected if the field refers to a Base Field.

Sign is only applicable for numbers. It indicates if the data may contain positive or negative numbers.

Value List is only visible for products that had at one point included COBOL. It defines the copybook that includes the list of valid values for the field.

Description contains the label of the field. This is the label of the field that appears on the various pages on which the field is displayed. Note, the field's label can be overridden for a specific table by specifying an Override Label on the *table / field* information. 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.

Java Field Name is the reference to this field used in Java code.

Override Label is used if an implementation would like to override the label that appear on user interfaces in the system.

> **CAUTION:** For fixed pages, if the field's label is overridden for a specific table, that override takes precedence. In this is the case the override on the *table / field* page should be used.

Work Field indicates that the field does not represent a database table column.

Help Text is used to provide field level embedded help to this field. If the field is displayed on a user interface that supports display of embedded help, this text may be displayed.

Use **Override Help Text** to override the existing embedded help text for this field.

Extract for Translation is only visible in a development environment. It indicates whether or not the field and its description should be included in an extract of translatable strings when doing a product translation. This flag may be set to “No” for work fields whose label is not visible to a user on any user interface.

Translation Context is only visible in a development environment. It is used to provide information to a translator about the use of the field’s label so that an appropriate translation can be provided.

Field - Tables Using Field

Select **Admin** > **Database** > **Field** and navigate to the **Tables Using Field** tab to view the tables that contain a field.

Description of Page

The grid on this page contains the **Tables** that reference the **Field**. You can use the adjacent go to button to open the *Table Maintenance* transaction.

Defining Maintenance Object Options

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.

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 *The Big Picture of Business Objects* for more information.

Maintenance Object - Main

Select **Admin** > **Database** > **Maintenance Object** to view information about a maintenance object.

Description of Page

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.

Enter a unique **Maintenance Object** name and **Description**. **Owner** indicates if this business object is owned by the base package or by your implementation (**Customer Modification**).

> **IMPORTANT:** If you introduce a new maintenance object, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Service Name is the name of the internal service associated with the maintenance object.

Click the **View XML** hyperlink to view the XML document associated with the maintenance object service in the *Service XML Viewer*.

Click the **View MO** hyperlink to view the definition of the maintenance object in the *Maintenance Object Viewer*.

The grid displays the following for each table defined under the maintenance object:

- **Table** is the name of a given table maintained as part of the maintenance object.
- **Table Role** defines the table's place in the maintenance object hierarchy. Only one **Primary** table may be specified within a maintenance object, but the maintenance object may contain many **Child** tables.
- **Parent Constraint ID** specifies the *constraint* used to link the table to its parent table within the maintenance object table hierarchy.
- **Owner** indicates if this is owned by the base package or by your implementation (**Customer Modification**).

Maintenance Object - Options

Use this page to maintain a maintenance object's options. Open this page using **Admin** > **Database** > **Maintenance Object** and then navigate to the **Options** tab.

Description of Page

The options grid allows you to configure the maintenance object to support extensible options.

Select the **Option Type** drop-down to define its **Value**. **Detailed Description** may display additional information on the option type.

Set the **Sequence** to **1** unless the option can have more than one value.

Owner indicates if this is owned by the base package or by your implementation (**Customer Modification**).

> **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**.

Maintenance Object - Algorithms

Use this page to maintain a maintenance object's algorithms. Open this page using **Admin** > **Database** > **Maintenance Object** and then navigate to the **Algorithms** tab.

Description of Page

The **Algorithms** grid contains algorithms that control important functions for instances of this maintenance object. 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.
- If the algorithm is implemented as a script, a link to the **Script** is provided. Refer to *Plug-in Scripts* for more information.
- **Owner** indicates if this is owned by the base package or by your implementation (**Customer Modification**).

The following table describes each **System Event**.

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. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.
ILM Eligibility	Optional	Algorithms of this type are used for maintenance objects that are enabled 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. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.
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

System Event	Optional / Required	Description
		applying all business object rules. This allows revision rules to take place in proper revision timings. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.

NOTE: You can inactivate algorithms on Maintenance Objects. Your implementation may want to inactivate one or more algorithms plugged into the base maintenance object. To do that, go to the options grid on Maintenance Object - Options and add a new option, setting the option type to **Inactive Algorithm** and setting the option value to the algorithm code.

Maintenance Object - Maintenance Object Tree

You can navigate to the **Maintenance Object Tree** to see an overview of the tables and table relationships associated with the maintenance objects.

Description of Page

This page is dedicated to a *tree* that shows the maintenance object's tables as well as *business objects*, if you have defined any. You can use this tree to both view high-level information about these objects and to transfer to the respective page in which an object is maintained.

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 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.

FASTPATH: 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.

FASTPATH: 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:

- 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.

Defining Lookup Options

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.

FASTPATH: Refer to *Defining Valid Values* for some background information.

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 *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.

Lookup - Main

Select **Admin** > **Database** > **Lookup** to maintain lookup values.

Description of Page

Field Name is the name of the field whose lookup values are maintained in the grid. If you need to add a new lookup field, you must first add the lookup field here, then navigate to the *Field* page to create a field with a data type of **Character** and an extended data type of **Flag**.

Owner indicates if this lookup field is owned by the base package or by your implementation (**Customer Modification**). This information is display-only.

Custom switch is used to indicate whether you are allowed to add valid values for a lookup field whose owner is not **Customer Modification**.

- If this switch is turned on, you may add new values to the grid for system owned lookup fields.
- If this switch is turned off, you may not add, remove or change any of the values for system owned lookup fields, with the exception of the override description.

This field is always protected for system owned lookup fields because you may not change a field from customizable to non-customizable (or vice versa).

Java Field Name indicates the name of the field as it is referenced in Java code.

The grid contains the lookup values for a specific field. The following fields are visible:

Field Value is the unique identifier of the lookup value. If you add a new value, it must begin with an **X** or **Y** (in order to allow future upgrades to differentiate between your implementation-specific values and base-package values).

Description is the name of the lookup value that appears on the various transactions in the system

Java Value Name indicates the unique identifier of the lookup value as it is referenced in Java code.

Status indicates if the value is **Active** or **Inactive**. The system does not allow **Inactive** values to be used (the reason we allow **Inactive** values is to support historical data that references a value that is no longer valid).

Detailed Description is the detailed description for a lookup value, which is provided in certain cases.

Override Description is provided if your implementation wishes to override the description of the value provided by the product.

> **NOTE:** If you wish the override descriptions of your lookup values to appear in the application viewer, you must *regenerate* the data dictionary application viewer background process.

Owner indicates if this lookup value is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add lookup values to a field. This information is display-only.

Defining Extendable Lookups

Extendable lookups are a way of defining valid values that are more sophisticated than simple lookups.

> **FASTPATH:** 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's 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** > **Database** > **Extendable Lookup.**

You are brought to the **Extendable Lookup Query** where you need to search for the extendable lookup object (i.e., its business object).

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.

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 will be known when the attribute is needed (in which case a CLOB mapping is appropriate) or if the functionality expects to determine the extendable lookup 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.
  - 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.

The Big Picture Of Audit Trails

The topics in this section describe auditing, enabling auditing for fields, and auditing queries that you can use to view audit records.

Captured Information

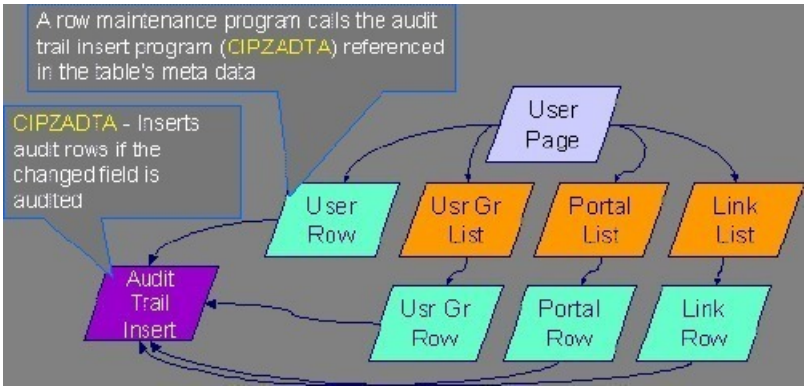
When auditing is enabled for a field, the following information is recorded when the field is changed, added and/or deleted (depending on the actions that you are auditing for that field):

- User ID
- 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 (**CIPZADTA** is supplied with the base package). If any of the changed fields are marked for audit, **CIPZADTA** inserts audit rows into the audit table (**CI_AUDIT** is the audit table supplied with the base package).



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 **CIPZADTA** and *CI_AUDIT* 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 audit insert program (**CIPZADTA**) 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 CIPZADTA 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.).
- The name of the new table must be referenced on the various tables whose changes should be logged in the new table.

NOTE: Interesting fact. 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 **CIPZADTA**) 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

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 Maintenance* page, try using the *Data Dictionary*. If you still cannot find the name of the table, please contact customer support.

To enable auditing for a table:

- Navigate to the *Table maintenance* page 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** (**CIPZADTA** is the default audit program supplied with the base package).

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 - Table Field maintenance* page 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: **Note.** You can also turn on the audit switches using the Field grid at the bottom of the *Table maintenance page*.

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

This transaction is used to view changes made by a user that are stored on a given *Audit Trail File*.

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** > **Audit Query** > **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.

CAUTION: The system only audits changes that you've told it to audit. Refer to *The Big Picture Of Audit Trails* for more information.

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 Maintenance* page, try using the *Data Dictionary*. If you still cannot find the name of the table, please contact customer support.

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** > **Audit Query** > **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**.
- **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

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

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.
- 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.

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

All 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:

Complete this configuration task...	for...
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
Create a physical business object	All objects to be included in the bundle
Create a bundling add business object	Objects with recursive foreign key references
Add the Current Bundle zone	All objects, if you want the Current Bundle zone to appear on the maintenance object's dashboard. This is not required by the bundling process.
Create a custom Entity Search zone and add it to the Bundle Export portal	All objects, if you want them to be searchable 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.

To make maintenance objects eligible for bundling:

1. Select **Admin** > **Maintenance Object** > **Search** and search for the maintenance object.
2. On the Options tab, add a new option with the type **Eligible For Bundling**.
3. Set the value to "Y" and click **Save**.

Adding a Foreign Key Reference

Each maintenance object in a bundle must have a foreign key reference. Bundling zones use the foreign key reference to display the standard information string for the maintenance object.

To add a foreign key reference to the maintenance object:

1. Select **Admin** > **FK Reference** > **Add** and set up a foreign key reference for the primary table of the maintenance object.
2. Select **Admin** > **Maintenance Object** > **Search** and search for the maintenance object.

3. On the **Option** tab, add a new option with the type **Foreign Key Reference**. The value is the name of the foreign key reference you just created.

Creating a Physical Business Object

Each maintenance object in a bundle must have 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. The bundling process uses this schema to generate the XML for the import bundle.

To create a physical business object for the maintenance object:

1. Select **Admin** > **System** > **Business Object** > **Add** and specify the maintenance object.
2. Click **Generate** in the **BO Schema** dashboard zone to generate a schema that looks like the physical structure of the maintenance object.
3. Save the physical business object.
4. Select **Admin** > **Maintenance Object** > **Search** 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.

Creating a Bundling Add Business Object

If the objects to be bundled have recursive foreign key references, you must create a bundling add business object to avoid problems with referential integrity.

To create a bundling add business object:

1. Select **Admin** > **System** > **Business Object** > **Add** and specify the maintenance object.
2. Click **Generate** in the **BO Schema** dashboard zone to generate a schema that looks like the physical structure of the maintenance object.
3. Remove all elements that are not essential. Typically, only a code and description are required.
4. Save the physical business object.
5. Select **Admin** > **Maintenance Object** > **Search** 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.

Adding the Current Bundle Zone

If you want the Current Bundle zone to appear on the maintenance object's dashboard, you must add the Current Bundle zone as a context-sensitive zone for the maintenance object.

To add the Current Bundle zone to the maintenance object:

1. Select **Admin** > **System** > **Context Sensitive Zone** and search for the navigation key for the maintenance 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, 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.

To make the maintenance object searchable:

1. Create an entity-specific query zone to search for the maintenance object:
   a) Select **Admin** > **System** > **Zone** > **Search** and search for one of the base query zones, such as the Algorithm Search zone, F1-BNALGS.
   b) Click the **Duplicate** button in the page actions toolbar.
   c) Enter a name for the new zone.
   d) Click **Save**.
   e) Locate the **User Filter** parameter in the parameter list. Add SQL to search for the maintenance object(s) you want to appear in the zone.
   f) Save the query zone.
2. 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 go to step 3
   a) Select **Admin** > **System** > **Zone** > **Search** and search for the F1-BNDLENTQ Entity Search zone.
   b) Duplicate this zone (as described above).
   c) Remove any references to base query zones.
3. Add the new entity-specific query zone to the customized entity search zone:
   a) Locate the customized entity search zone for your Bundle Export portal. This is the zone created in Step 2.
   b) Locate the Query Zone parameter in the parameter list. Add the name of the query zone you created in Step 1.
   c) Save the entity search zone.
4. Add the customized entity search zone to the Bundle Export portal:

   This step needs to be done only once.
   a) Select **Admin** > **System** > **Portal** > **Search** and search for the Bundle Export portal, F1BNDLEM.
   b) In the zone list, add the entity search zone you created in Step 2. (Add the new zone after the base entity search zone).
   c) Save the portal.

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

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** > **System** > **Bundle Export** > **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 dashboard 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.

   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** > **System** > **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** > **System** > **Bundle Import** > **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.

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

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.

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

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 Dashboard portal.
   a) Select **Admin** > **System** > **Portal**.
   b) Search for the portal CI_DASHBOARD.
   c) In the zone list for the **Dashboard** 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) Select **Admin** > **System** > **Maintenance Object** 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.

   A physical business object is one that has a schema with elements for all of the fields for the tables in the maintenance object. Follow these steps to create a physical business object:
   a) Select **Admin** > **System** > **Business Object** > **Add** and specify the maintenance object.
   b) Use the **BO Schema** dashboard zone to generate a schema that looks like the physical structure of the maintenance object.
   c) Save the physical business object.
   d) Select **Admin** > **Database** > **Maintenance Object** > **Search** and search for the maintenance object for which you want to enable revision control.
   e) On the **Options** tab of the maintenance object add a new option with the type **Physical Business Object**. The value is the name of the physical business object that you just created.
2. Add a foreign key reference to the maintenance object.

The revision control zones will display the standard information string for the object based on the foreign key reference. Follow these steps to create a foreign key reference:

a) Select **Admin** > **Database** > **FK Reference** > **Add** and set up a foreign key reference for the primary table of the maintenance object.

b) Select **Admin** > **Database** > **Maintenance Object** > **Search** and search for the maintenance object.

c) On the **Options** tab of the maintenance object, add a new option with the type **Foreign Key Reference**. The value is the name of the foreign key reference that you just created.

3. Add the **Revision Control** zone to the maintenance object.

   a) Select **Admin** > **System** > **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) Select **Admin** > **Database** > **Maintenance Object** 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 dashboard 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 Control Search** 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.
- Delete an object.

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 Search* for more information about Check In, Force Check In, and Check Out one or more records simultaneously.

Checking Out an Object

You must check out a revision controlled object in order to change it.

An object must have revision control turned on before you can check it out.

NOTE: When you first create or update an object 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.

1. Go to the object that you want to work on.
2. Select **Check Out** in the **Revision Control** dashboard zone.

Checking In an Object

You must check in a revision controlled object in order to create a new version of it. Checking in an object also allows others to check it out.

1. Select a link in the **Checked Out** dashboard zone to go to the object that you want to check in.
2. Select **Check In** in the **Revision Control** dashboard zone.
3. Provide details about the version:
   - In the **External References** field state the bug number, enhancement number, or a reason for the revision.
   - In the **Detailed Description** field provide additional details regarding the revision.
   - In the **Keep Checked Out** box specify if you want to keep the object checked out. If you keep the object checked out then your revision is a new version that you can restore later.
   - In the **Add To Bundle** box specify if the object belongs to a bundle.
4. Select **OK** to check in the object.

Reverting Changes

Reverting changes will undo any changes you made since you checked out an object.

To revert changes:

1. Go to the object that you want to revert.
2. Select **Revert** in the **Revision Control** dashboard zone.
3. In the confirmation dialog box select **OK** to confirm the action or **Cancel** to return to the object page.

Once reverted, the object can be checked out by another user.

Forcing a Check In or Restore

You can force a check in if an object is checked out by another user and that person is not available to check it in.

You must have proper access rights to force a check in or restore.

To force a check in or restore:

1. Go to the object that is checked out by another user.
2. Select **Force Check In** or **Force Restore** in the Revision Control zone.

The **Force Check In** option is the same as a regular check in. The **Force Restore** option checks in the object and restores it to the previously checked in version.

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.

To delete a revision controlled object:

1. Go to the object that you want to delete.
2. Select **Delete** in the **Revision Control** zone.

3. Provide details regarding the deletion.
4. Select **OK** to delete the object.

The system creates a revision record before the object is deleted so that the deleted object can be restored.

Restoring an Object

You can restore an older version of either a current object or a deleted object.

An object must be checked in before an older version can be restored.

To restore an object:

1. Go to the **Revision History** portal for the object.

   If the object was deleted you must search for it by going to **Admin** > **Revision Control**.
2. Select the desired entity by clicking the hyperlink in the **Details** column.
3. Locate the row in the version history that has the version that you want to restore and click **Restore**.
4. In the confirmation dialog box select **OK** to confirm the action or **Cancel** to return to the object page.

Working with the Revision Control Portal

The **Revision Control** portal lists information about each version of a revision controlled object.

You can navigate to the **Revision Control** portal from either a link in the **Revision Control** dashboard zone or by going to **Revision Control** portal through **Admin**.

If you want to find the Revision History entry for an earlier version or deleted object, you must search for the object using the **Revision Control Search** portal. Once you select the desired entry, you can restore a previous version of the object clicking **Restore** in the row for the version that you want to restore. You can also see the details of each version by clicking the broadcast icon for that version.

See *Working with Revision Control Zones* for more information about tasks that can be performed through Revision Control.

Revision Control Search

The **Revision Control Search** portal allows users to search for entities that have a revision history. The **Search By** dropdown provides additional functionality so that users can search for revisions that are associated to theirs or other's user ID. Users can also **Check In**, **Force Check In**, or **Check Out** one or more entities through this portal.

Zone Options

- **Revision History Search** *(default)* allows the user to query for revised entities based on a combination of criteria.
  - In the **User ID** field, enter the user ID that is associated with a revision.
  - In the **External Reference** field, enter an ID from an external system and is associated with a revision.
  - In the **Maintenance Object** dropdown menu, select the Maintenance Object that is associated with a revision. The options in this list are populated by the Maintenance Objects that are active to track revision.
  - In the **Key 1**, **Key 2**, **Key 3**, **Key 4**, **Key 5** fields, enter the primary identifier(s) for the revised entity. Typically, the entity only requires a single key, but some entities require more than one (for example, Oracle Utilities Customer Care and Billing SA Type require CIS Division and SA Type).
  - In the **Status** dropdown menu, select the entity status for your search.

- **Check In** allows the user to search for entities currently checked out to the logged in user ID and a combination of criteria. Once the search results are returned, the user has the option to select one or more entities and check them in.
  - In the **Maintenance Object** dropdown menu, select the Maintenance Object that is associated with a revision. The options in this list are populated by the Maintenance Objects that are active to track revision.
  - In the **Key** field, enter the primary identifier(s) for the revised entity.
- **Force Check In** allows the user to search for entities that are currently checked out by other user IDs (excluding the logged in user ID) based on a combination of criteria. Once the search results are returned, the user has the option to select one or more entities and check them in.
  - In the **Checked Out By User** field, enter the user ID that has the entity in a Checked Out status.
  - In the **Maintenance Object** dropdown menu, select the Maintenance Object that is associated with a revision. The options in this list are populated by the Maintenance Objects that are active to track revision.
  - In the **Key** field, enter the primary identifier(s) for the revised entity.
- **Check Out** allows the user to search for entities currently checked in user ID and a combination of criteria. Once the search results are returned, the user has the option to select one or more entities and check them out.
  - In the **Maintenance Object** dropdown menu, select the Maintenance Object that is associated with a revision. The options in this list are populated by the Maintenance Objects that are active to track revision.
  - In the **Key** field, enter the primary identifier(s) for the revised entity.

  Please see *Working with Revision Control Zones* for more information about working with individual entities.

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

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 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.

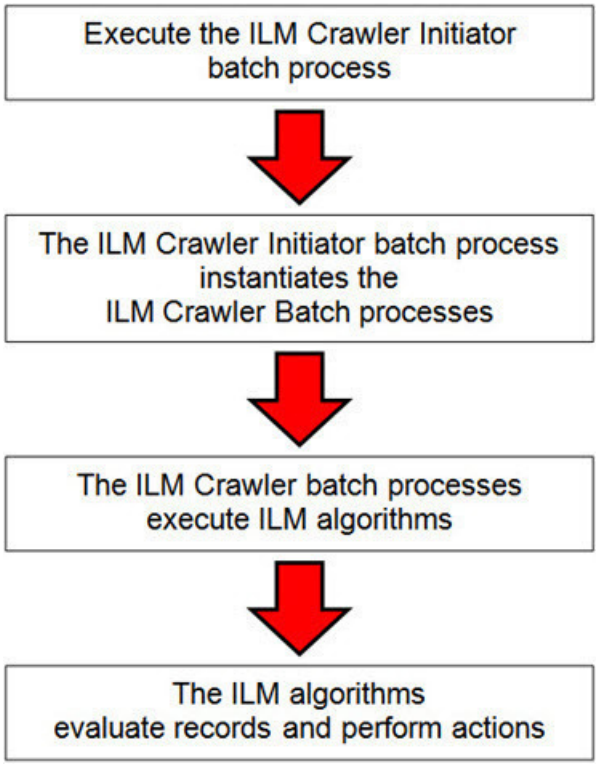
For each MO enabled for ILM, the product provides a batch process to review “old” records and an ILM eligibility algorithm that contains business logic to evaluate the record and mark it eligible for archiving or not. The following sections provide more information about the batch process and algorithm functionality.

Batch Processes

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.

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 default and some steps that must be taken in order to fully implement ILM.

There is some configuration enabled by default, but it won't be used unless ILM is fully configured. Each maintenance object that the product has configured for ILM 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. Navigate using **Admin Menu** > **Master Configuration.**

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 inline 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.

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 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.
- 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 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 take note of the **ILM Eligibility** algorithm code.
- Go to the *Maintenance Object — Option* tab for the same maintenance object and add an option with an option type of **Inactivate Algorithm** and the value set to the ILM eligibility algorithm noted in the previous step.

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 DBA 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.

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 choose 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

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.

The Big Picture of Business Objects

The topics in this section describe background topics relevant 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 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.

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"/>
  …
```

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"/>
            <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"/>
```

Elements mapped to an MO XML structure field are typically ones that do not have to be exposed for SQL indexing or joining.

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.
- 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: Schema Definition Tips. A context sensitive "Schema Tips" zone appears when you open the *Business Object* page to assist you with the schema definition syntax. The zone provides a 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.

- 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.
- A **Pre-Processing** 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.
- A **Post-Processing** algorithm may be used to perform additional steps such as creating 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.
- An **Audit** algorithm may be used to audit changes made to entities of this type.
  Any time a business entity is added, changed or deleted, the system detects and summarizes the list of changes that took place in that transaction and hands it over to **Audit** plug-ins associated with the business object. These plug-ins are executed after all the post-processing rules are executed. It is the responsibility of such algorithms to log the changes if and where appropriate, for example as a log entry or an entry in an audit trail table or an entry in the *business event log*

  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 the "Schema Tips" context sensitive zone associated with the Business Object maintenance page for more information on this attribute.

Refer to *Business Object - Algorithms* for more information on the various types of algorithms.

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.

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.

FASTPATH: 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. The BO may 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”).

The standard going forward is to use schema definition and UI Hints to define user interface behavior so that a full UI map is not needed but rather the HTML is derived. 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.

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: Schema Definition Tips.** The context sensitive "Schema Tips" zone appears when you open the *Business Object* page. This includes detailed information about supported UI hint definition 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.

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.

  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 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 or the form rule in Oracle Public Sector Revenue 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 or Tax Role.
- 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 or the Appeal object in Oracle Public Sector Revenue Management.
- 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*. Some examples of the are Tax Form in Oracle Public Sector Revenue Management or 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 Configuration 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.

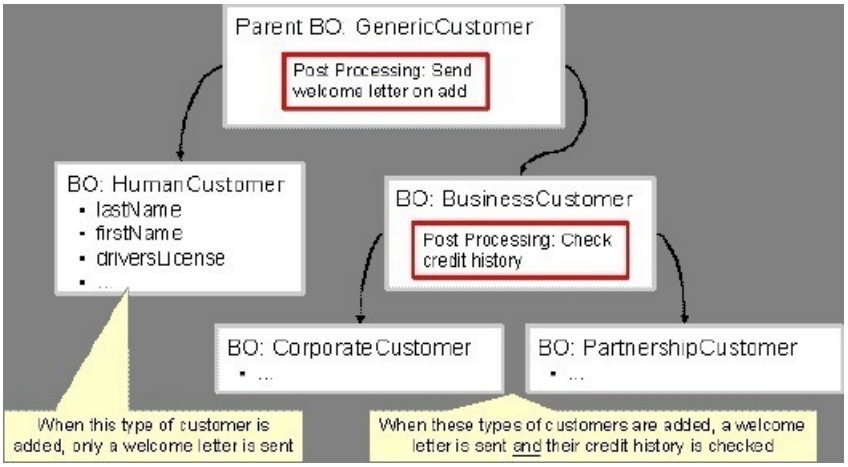
For all maintenance objects, the base product may provide additional BOs that are not meant to be “identifying” BOs, but instead are provided to support functionality to interact with the MO using the BO as a tool as described in Invoking a BO.

- 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* and *revision control*.

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.

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.

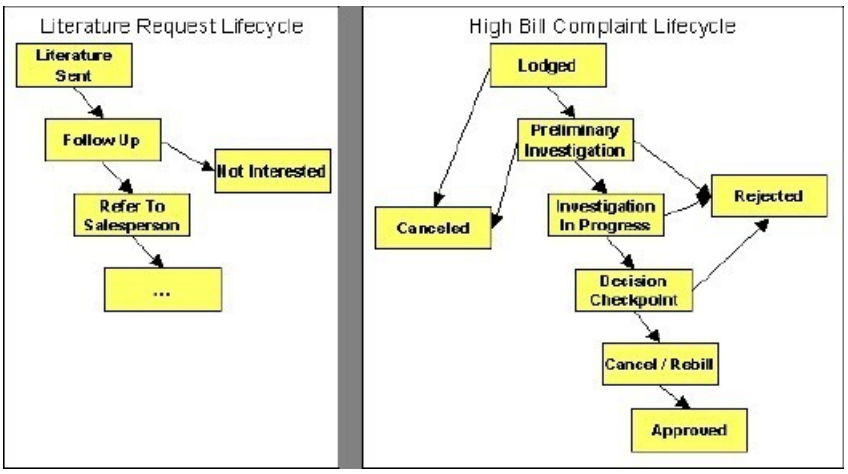
NOTE: User interface maps are inherited. When determining if the business object has a UI map to use for UI rendering, the system looks for display and maintenance maps linked to the BO as options. If the identifying BO does not have maps defined, the system follows “up the chain” of inheritance until 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 (e.g., what is its initial state, when can it transition to another state, etc.) 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 that belong to the same maintenance object.



NOTE: A Maintenance Object supports soft lifecycle rules if it is defined with a **Status Field** *Maintenance Object option*.

The topics that follow describe important lifecycle oriented concepts.

Valid States versus State Transition Rules

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.

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.

FASTPATH: Refer to *BO Algorithm Execution Order* for a summary of when these lifecycle algorithms are executed with respect to BO level algorithms.

Logic To Take Place When 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.

Logic To Take Place When 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.

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.

FASTPATH: 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.

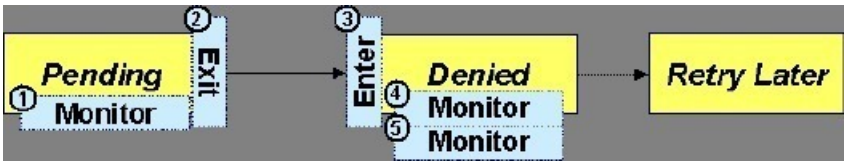
The system executes all state-specific algorithms at all levels in the inheritance chain starting from the highest-level parent business object moving on to lower levels.

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.

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

The base package provides a periodic monitoring batch process for each maintenance object that supports soft state transition. The process periodically executes the monitoring algorithms associated with the current state of an entity, excluding states explicitly referencing a deferred monitoring batch process.

A deferred monitoring process works in the same way but only considers entities whose current state references this particular batch control as their monitor process. Deferred monitoring is only needed for certain states based on business requirements.

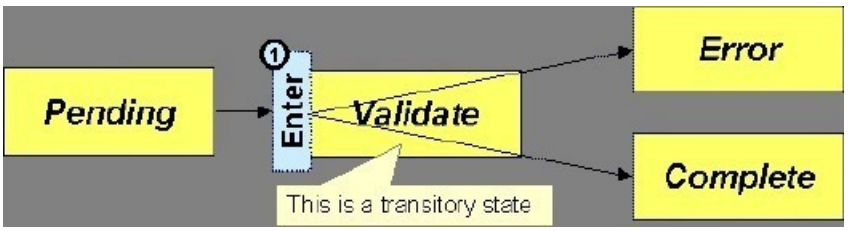
Your business rules will dictate the execution frequency of each monitoring process and the order in which they should be scheduled.

> **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 the *business rules* plugged in to the business object are not executed.

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 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.

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.

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.

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.

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 — MO Transition algorithms are executed. **FASTPATH:** Refer to *State Transitions are Audited* for more information.
	If error and there are “save points” the MO Transition Error algorithms are executed. **FASTPATH:** 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. Records processed by the *Monitor Batch Process* does not invoke the maintenance service. 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).

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).

FASTPATH: 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

The topics in this section describe how to maintain business objects.

Note that several context sensitive dashboard zones appear on this page and are visible on all tabs.

- **Schema Tips**. This zone provides several links to view details related to the valid schema syntax and UI Hint syntax.
- **View UI Rendering**. This zone provides buttons to view the automatic rendering of the Display map or Input map based on the attributes defined in the schema, including UI hints.
- **Generate Schema**. This zone includes a button that can be used to generate a “physical” schema based on the maintenance object definition. The element names are taken from the Java field name for each column. Once generated, adjust the schema as desired.
- **Create a BO Algorithm**. This zone includes a button to create a script based algorithm related to this business object. You are then 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, algorithm, links the algorithm to the business object, creates the script and brings you to the script step to start defining the logic for the plug-in script.

- **BOs Linked to the MO**. This zone displays other business objects for the same maintenance object as the BO currently displayed. You may drill into any of the other BOs by clicking its description.

Business Object - Main

Use this page to define basic information about a business object. Open this page using **Admin** > **System** > **Business Object**

Description of Page

Enter a unique **Business Object** name and **Description**. Use the **Detailed Description** to describe the purpose of this business object in detail. **Owner** indicates if this business object is owned by the base package or by your implementation (**Customer Modification**).

> **CAUTION:** Important! If you introduce a new business object, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Enter the **Maintenance Object** that is used to maintain objects of this type.

Enter a **Parent Business Object** from which to *inherit* business rules.

Lifecycle Business Object is only displayed for child business objects, i.e. those that reference a parent business object. It displays the highest-level business object in the inheritance hierarchy. Refer to *Inheriting Lifecycle* for more information.

Application Service is the application service that is used to provide security for the business object. Refer to *Granting Access To Business Objects* for more information. The application service on the child business object must have the same valid actions as the application service on the parent business object.

Use **Instance Control** to allow or prevent new entities from referencing the business object. Typically only the *identifying BOs* are marked to allow new instances.

Click the **View Schema** hyperlink to view the business object's expanded schema definition. Doing this opens the *schema viewer* window.

Click the **View XSD** hyperlink to view the business object's expanded schema definition in XSD format.

Click the **View MO** hyperlink to view the maintenance object in the *Maintenance Object Viewer*. You may find it useful to leave the application viewer window open while defining your business object schema.

The options grid allows you to configure the business object to support extensible options. Select the **Option Type** drop-down to define its **Value**. **Detailed Description** may display additional information on the option type. Set the **Sequence** to **1** unless the option can have more than one value. **Owner** indicates if this option is owned by the base package or by your implementation (**Customer Modification**).

> **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*.

Where Used

Follow this link to open the data dictionary to view the tables that reference *F1_BUS_OBJ*.

Business Object - Schema

Use this page to maintain a business object's schema. Open this page using **Admin** > **System** > **Business Object** and then navigate to the **Schema** tab.

Description of Page

The contents of this section describe the zones that are available on this portal.

The **General Information** zone displays main attributes of the business object.

Click the **View Schema** hyperlink to view the business object's expanded schema definition. Doing this opens the *schema viewer* window.

Click the **View XSD** hyperlink to view the business object's expanded schema definition in XSD format.

The *Schema Designer* zone allows you to edit the business object's schema. The purpose of the schema is to describe the business object's properties and map them to corresponding maintenance object fields.

NOTE: Generating a Schema A context sensitive "Generate Schema" zone is associated with this page. The zone provides a button that allows the user to generate a basic schema that includes all the fields for all the tables for the BO's maintenance object.

NOTE: Schema Definition Tips. A context sensitive "Schema Tips" zone is associated with this page. The zone provides a complete list of the XML nodes and attributes available to you when you construct a schema.

NOTE: View UI Rendering. A context sensitive "View UI Rendering" zone is associated with this page. The zone is useful for *business objects that define the user interface detail* using schema attributes and UI Hints. The buttons allow you to view the automatically rendered display and input maps.

The **Schema Usage Tree** zone summarizes all cross-references to this schema. These may be other schemas, scripts, and web services. For each type of referencing entity, the *tree* displays a summary node showing a total count of referencing items. The summary node appears if at least one referencing item exists. Expand the node to list the referencing items and use their description to navigate to their corresponding pages.

Business Object - Algorithms

Use this page to maintain a business object's algorithms. Open this page using **Admin** > **System** > **Business Object** and then navigate to the **Algorithms** tab.

Description of Page

The **Algorithms** grid contains algorithms that control important functions for entities defined by this business object. 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.
- If the algorithm is implemented as a script, a link to the **Script** is provided. Refer to *Plug-In Scripts* for more information.
- **Owner** indicates if this is owned by the base package or by your implementation (**Customer Modification**).

The following table describes each **System Event**. Refer to *A Business Object May Define Business Rules* for more information about these system events.

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

System Event	Optional / Required	Description
		an object. Excluded from this processing are elements explicitly marked on the schema as requiring no audit. For each element its original value before the change as well as its new value are provided. It is the responsibility of the algorithms to record corresponding audit information. The system invokes all algorithms of this type defined on the business object's inheritance hierarchy. Refer to *Business Object inheritance* for more information. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.
Post-Processing	Optional	Algorithms of this type may be used to perform additional business logic after a business object instance has been processed. The system invokes all algorithms of this type defined on the business object's inheritance hierarchy. Refer to *Business Object inheritance* for more information. Click *here* to see the algorithm types available for this system event.
Pre-Processing	Optional	Algorithms of this type further populates a request to maintain a business object instance right before it is processed. The system invokes all algorithms of this type defined on the business object's inheritance hierarchy. Refer to *Business Object inheritance* for more information. Click *here* to see the algorithm types available for this system event.
Validation	Optional	Algorithms of this type may be used to validate a business object instance when added, updated or deleted. The system invokes all algorithms of this type defined on the business object's inheritance hierarchy. Refer to *Business Object inheritance* for more information. Click *here* to see the algorithm types available for this system event.

NOTE: Generate Algorithm. A context sensitive "Generate a BO Algorithm" zone is associated with this page. Refer to *Defining Business Objects* for more information about this zone.

NOTE: You can add new system events. Your implementation may want to add additional business object oriented system events. For example, your implementation may have plug-in driven logic that would benefit from a new system

event. To do that, add your new values to the customizable lookup field **BO_SEVT_FLG**. If you add a new business object system event, you must update the maintenance object to declare this new system event. Otherwise, it won't appear on the system event dropdown. You do that by referencing the new system event as a **Valid BO System Event** *maintenance object option*.

NOTE: 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, on the business object where this algorithm is referenced, go to the options grid on Business Object - Main and add a new option, setting the option type to **Inactive Algorithm** and setting the option value to the algorithm code.

Business Object - Lifecycle

Use this page to maintain a business object's lifecycle oriented business rules and options. Open this page using **Admin** > **System** > **Business Object** and then navigate to the **Lifecycle** tab.

Description of Page

The **Status** accordion contains an entry for every status in the object's *lifecycle*. The entry appears differently for a child business object as it can only extend its inherited lifecycle by introducing algorithms and options of its own.

Use **Status** to define the unique identifier of the status. This is NOT the status's description, it is simply the unique identifier used by the system. Only the highest-level business object can define lifecycle statuses. For a child business object the inherited status description is displayed allowing navigation to the corresponding entry on the business object defining the lifecycle.

Use **Description** to define the label of the status. This field is hidden for a child business object.

Use **Access Mode** to define the action associated with this status. Refer to *Access Rights* for the details of how to use this field to restrict which users can transition a business entity into this state. This field is hidden for a child business object.

Enter a **Monitor Process** to defer the monitoring of entities in this state until the specific batch process runs. Refer to *Monitor Rules* for more information. This field is hidden for a child business object.

The **Status Reason** dropdown indicates if users should be prompted to provide a specific reason when the business object enters this state. This field appears only if the Status Reason Field is configured as an option on the business object's maintenance object. Valid values are blank, **Optional**, and **Required**. The default value is blank (users are not prompted to provide a status reason). See *Configuring Status Reasons* for more information about status reasons.

Use **Status Condition** to define if this status is an **Initial**, **Interim** or **Final** state. Refer to *One Initial State and Multiple Final States* for more information about how this field is used. This field is hidden for a child business object.

Use **Transitory State** to indicate whether a business entity should ever exist in this state. Only **Initial** or **Interim** states can have a transitory state value of **No**. Refer to *transitory states* for more information. This field is hidden for a child business object.

Use **Alert Flag** to indicate that being in this state warrants an application alert. This may be used by custom logic to provide an alert to a user that entities exist in this state. This field is hidden for a child business object.

Use **Display Sequence** to define the relative order of this status for display purposes. For example when displayed on the status accordion and on the summary tab page. This field is hidden for a child business object.

Algorithms

The **Algorithms** grid contains algorithms that control important functions for a given status. 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.
- If the algorithm is implemented as a script, a link to the **Script** is provided. Refer to *Plug-In Scripts* for more information.
- **Owner** indicates if this is owned by the base package or by your implementation (**Customer Modification**).

The following table describes each **System Event**.

System Event	Optional / Required	Description
Enter	Optional	Algorithms of this type apply business rules when a business object instance enters a given 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. Click *here* to see the algorithm types available for this system event.
Exit	Optional	Algorithms of this type apply business rules when a business object instance exits a given 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. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.

NOTE: Generate Algorithm. A context sensitive "Generate a BO Algorithm" zone is associated with this page. Refer to *Defining Business Objects* for more information about this zone.

NOTE: You can inactivate status level 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 of the status oriented algorithms provided by the base business object. To do that, on the business object and status where this algorithm is referenced, go to the options grid and add a new option, setting the option type to **Inactive Algorithm** and setting the option value to the algorithm code.

Next Statuses

Use the **Next Statuses** grid to define the valid statuses a business entity can transition into while it's in this state. This section is hidden for a child business object. Refer to *Valid States versus State Transition Rules* for more information. Please note the following about this grid:

- **Status** shows the statuses for the top-level business object, the **Status Code**, the **Lifecycle BO description**, and the **Status description** for each status.
- Use **Action Label** to indicate the verbiage to display on the button used to transition to this status.

- **Sequence** controls the relative order of one status compared to others for display purposes. This information may be used to control the order in which buttons are presented on a user interface.
- **Default** controls which next state (if any) is the default one. This information may be used by an **Enter** or **Monitor** algorithm to determine an auto-transition to the default state. It may also be used to also mark the associated button as the default one on a user interface.
- **Transition Condition** may be configured to identify a common transition path from the current state. By associating a given "next status" with a transition condition value, you can design your auto-transition rules to utilize those flag values without specifying a status particular to a given business object. Thus, similar logic may be used across a range of business objects to transition a business entity into, for example, the next **Ok** state for its current state. You'll need to add your values to the customizable lookup field **BO_TR_COND_FLG**.
- **Transition Role** controls whether only the **System** or both **System and User** have the ability to transition a business entity into a given "next status".
- When you initially set up a business object lifecycle, none of the statuses will reside on the database and therefore you can't use the search to define a "next status". We recommend working as follows to facilitate the definition of this information:
  - Leave the Next Statuses grid blank when you initially define a business object's statuses
  - After all statuses have been saved on the database, update each status to define its Next Statuses (this way, you can use the search to select the status).

Options

The options grid allows you to configure the business object status to support extensible options. Select the **Option Type** drop-down to define its **Value**. **Detailed Description** may display additional information on the option type. Set the **Sequence** to **1** unless the option can have more than one value. **Owner** indicates if this option is owned by the base package or by your implementation (**Customer Modification**).

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*.

Business Object - Summary

This page summarizes business object information in a high level. Open this page using **Admin** > **System** > **Business Object** > **Search** and then navigate to the **Summary** tab.

Description of Page

The contents of this section describe the zones that are available on this portal.

The **General Information** zone displays main attributes of the business object.

Click the **View Schema** hyperlink to view the business object's expanded schema definition. Doing this opens the *schema viewer* window.

Click the **View XSD** hyperlink to view the business object's expanded schema definition in XSD format.

The **Business Object Hierarchy** zone displays in a tree view format the *hierarchy* of child business object associated with the current business object. It also shows the current business object's immediate parent business object.

For business objects with a lifecycle, the **Lifecycle Display** zone shows a graphical depiction of the lifecycle. Refer to the inline help of that zone for more information.

The **Options** zone summarizes business object and state specific options throughout the *inheritance* chain.

The **Rules** zone summarizes business object and state specific rules throughout the *inheritance* chain.

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.

> **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** > **System** > **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.

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.

> **NOTE:** **Schema Definition Tips.** A context sensitive "Schema Tips" zone appears when you open the *Business Service* page to assist you with the schema definition syntax. The zone provides 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.

Service Program

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.

Select **Admin** > **System** > **Service Program** to maintain service programs.

Description of Page

Service Name is the unique identifier of the service.

CAUTION: Important! When adding new service programs, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Owner indicates if this service is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a service. This information is display-only.

Description describes the service.

Service Type indicates whether the service is a **Java Based Service** or a **Java (Converted) Service**.

This **Program Component** grid shows the list of program user interface components associated with the service. For a stand-alone service, this list is typically not applicable.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_MD_SVC*.

Defining Business Services

The topics in this section describe how to maintain business services.

Note that several context sensitive dashboard zones appear on this page and are visible on all tabs.

- **Schema Tips**. This zone provides several links to view details related to the valid schema syntax.
- **Generate Schema**. This zone includes a button that can be used to generate the schema based on the XML of its related Service. Once generated, adjust the schema as desired.

Business Service - Main

Use this page to define basic information about a Business Service. Open this page using **Admin** > **System** > **Business Service**

Description of Page

Enter a unique **Business Service** name and **Description**. Use the **Detailed Description** to describe the purpose of this business service in detail. **Owner** indicates if the business service is owned by the base package or by your implementation (**Customer Modification**).

CAUTION: Important! If you introduce a new business service, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Enter the internal **Service Name** being called when this business service is invoked.

Enter the **Application Service** that is used to provide security for the business service. The application service must have an Access Mode of Execute.

Click the **View Schema** to view the business service's expanded schema definition. Doing this opens the *schema viewer* window.

Click the **View XSD** hyperlink to view the business object's expanded schema definition in XSD format.

Click the **View XML** hyperlink to view the XML document used to pass data to and from the service in the *Service XML Viewer*. You may find it useful to leave the application viewer window open while defining your business service schema.

NOTE: XML document may not be viewable. If you create a new service program and do not regenerate the application viewer, you will not be able to view its XML document.

Where Used

Follow this link to open the data dictionary to view the tables that reference *F1_BUS_SVC*.

Business Service - Schema

Use this page to maintain a Business Service's schema and to see where the Business Service is used in the system. Open this page using **Admin** > **System** > **Business Service** and then navigate to the **Schema** tab.

Description of Page

The contents of this section describe the zones that are available on this portal.

The **General Information** zone displays main attributes of the business service.

The *Schema Designer* zone allows you to edit the business service's schema. The purpose of the schema is to map the business service's elements to the corresponding fields of the back-end service program it rides on.

> **NOTE: Generating a Schema** A context sensitive "Generate Schema" zone is associated with this page. The zone provides a button that allows the user to generate a basic schema that includes all the elements that are found in the XML of the BS's service.

> **NOTE: Schema Definition Tips.** A context sensitive "Schema Tips" zone is associated with this page. The zone provides a complete list of the XML nodes and attributes available to you when you construct a schema.

The **Schema Usage Tree** zone summarizes all cross-references to this schema. These may be other schemas, scripts, and web services. For each type of referencing entity, the *tree* displays a summary node showing a total count of referencing items. The summary node appears if at least one referencing item exists. Expand the node to list the referencing items and use their description to navigate to their corresponding pages.

User Interface (UI) Maps

The User Interface (UI) map holds HTML to be rendered within *portal zones* and *Business Process Assistant (BPA) scripts*. UI maps allow your implementation to create input forms and output maps that closely match your customer's business practices. In other words, the UI Map is designed to facilitate the capture and display of your *business objects* and *business services*.

The 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.

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 - please refer to the HTML tips document (more on this below).

```
<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>
```

Figure 1: HTML to Display Customer Business Object

Name:	**Greer,Johan**
Home Phone:	**(838) 030-0303**
Business Phone:	**(737) 393-3838**
Cell Phone:	**(444) 444-4040**
FAX:	**(373) 939-3939**
Social Security:	**939-30-3939**
Drivers License:	**C8392020**
Email:	**jurgen.greer@media.com** edit

Figure 2: Customer HTML Rendered (Output Data for Zone)

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*, UI maps are typically crafted as forms for the capture and update of data.

Figure 3: HTML Input Form Rendered (for BPA Script)

Portal zones can reference a UI map for the zone header. They may also utilize a UI map to define their filter area. This type of UI map is not a complete HTML document, but is instead configured as a UI Map "fragment".

NOTE: UI Map Tips. A context sensitive "UI Map Tips" zone appears when you open the *UI Map* page to assist you with the HTML document and schema definition syntax. The "tips" describe methods to take advantage of the configuration tools, however, they are not an HTML reference.

NOTE: Editing HTML. You can use a variety of HTML editors to compose your HTML, which you can then cut, and paste into your UI map. In addition, the zone provides a complete list of the XML schema nodes and attributes available to you when you construct the map's data schema.

Defining UI Maps

The topics in this section describe how to maintain UI Maps.

UI Map - Main

Use this page to define basic information about a user interface (UI) Map. Open this page using **Admin** > **System** > **UI Map**

Description of Page

Enter a unique **Map** name. **Owner** indicates if the UI map is owned by the base package or by your implementation (**Customer Modification**).

CAUTION: Important! If you introduce a new UI map, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Use **UI Map Type** to indicate whether the map is a **Complete HTML Document** or an **HTML Fragment**. Portal zones can reference a UI map to describe a fragment of their HTML, for example the zone header or filter area. In this case the UI map is not a complete HTML document, but is instead configured as a UI Map "fragment".

NOTE: A context sensitive "UI Map Tips" zone is associated with this page to assist you with the HTML document definition syntax. Refer to the tips zone for more information on how to use fragment UI maps to construct portal zone HTML components.

Enter a **Description**. Use the **Detailed Description** to describe how this map is used in detail.

Click on the **View Schema** to view the UI map's expanded schema definition. Doing this opens the *schema viewer* window.

Use the **Test UI Map** hyperlink to render your html in a test window.

NOTE: The **Test UI Map** hyperlink also exercises the proprietary functionality that binds an xml element with an html element so you can get immediate feedback on your html syntax.

Where Used

Follow this link to open the data dictionary to view the tables that reference *F1_MAP*.

UI Map - Schema

Use this page to maintain a UI Map's HTML and schema and to see where the UI Map is used in the system. Open this page using **Admin** > **System** > **UI Map** and then navigate to the **Schema** tab.

Description of Page

The contents of this section describe the zones that are available on this portal.

The **General Information** zone displays main attributes of the UI Map.

The **HTML Editor** zone allows you to edit the HTML document of the map.

NOTE: HTML Definition Tips. A context sensitive "UI Map Tips" zone is associated with this page to assist you with the HTML document definition syntax. The "tips" 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 the tips context sensitive zone for more information on how to enable and provide UI map help.

The ***Schema Designer*** zone allows you to edit the data schema part of the map. The purpose of the schema is to describe the data elements being displayed by the map.

NOTE: Schema Definition Tips. The same "UI Map Tips" zone above also provides a complete list of the XML nodes and attributes available to you when you construct the map's data schema.

The **Schema Usage Tree** zone summarizes all cross-references to this schema. These may be other schemas, scripts, and web services. For each type of referencing entity, the *tree* displays a summary node showing a total count of referencing items. The summary node appears if at least one referencing item exists. Expand the node to list the referencing items and use their description to navigate to their corresponding pages.

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]);
        }
    }
...
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 t
compliant.
```

Maintaining Managed Content

The Managed Content maintenance object is used to store content such as XSL files used to create vector charts, JavaScript include files, and CSS files. These files may then be maintained in the same manner as the HTML in UI Maps.

The topics in this section describe the Managed Content portal.

Managed Content - Main

This page is used to define basic information about the content. Open this page using **Admin** > **System** > **Managed Content**.

Description of Page

Enter a unique name for the content in the **Managed Content** field.

Owner indicates if the content is owned by the base package or by your implementation.

Use **Managed Content Type** to indicate the type of content, for example, XSLT or JavaScript.

Enter a **Description.**

Use the **Detailed Description** to describe in detail how this map is used.

Managed Content - Schema

This page is used to create and maintain the managed content. Open this page using **Admin** > **System** > **Managed Content** and then navigate to the **Schema** tab.

Description of Page

The General Information zone displays the main attributes of the content. The Editor zone allows you to edit the content.

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.

> **NOTE: Schema Definition Tips.** A context sensitive "Schema Tips" zone appears when you open the *Data Area* page to assist you with the schema definition syntax. The zone provides a complete list of the XML nodes and attributes available to you when you construct a schema.

Data areas may be included in a business object that does not define a full UI map for display or input. Rather, it is using auto-rendering by defining UI attributes in its schema and via UI hints.

> **NOTE: View UI Rendering.** A context sensitive "View UI Rendering" zone appears on this page. It may be used for a data area that is part of a business object that is using auto-rendering for the display and input maps. The buttons allow you to view the rendered UI for the segment of the schema that is defined by the data area.

Defining Data Areas

The topics in this section describe how to maintain Data Areas.

Data Area - Main

Use this page to define basic information about a data area. Open this page using **Admin** > **System** > **Data Area**.

Description of Page

Enter a unique **Data Area** name and **Description**. Use the **Detailed Description** to describe what this data area defines in detail. **Owner** indicates if the data area is owned by the base package or by your implementation (**Customer Modification**).

CAUTION: Important! If you introduce a new data area, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Click the **View Schema** to view the data area's expanded schema definition. Doing this opens the *schema viewer* window.

Click the **View XSD** hyperlink to view the business object's expanded schema definition in XSD format.

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.

Where Used

Follow this link to open the data dictionary to view the tables that reference *F1_DATA_AREA*.

Data Area - Schema

Use this page to maintain a Data Area's schema and to see where the data area is used in the system. Open this page using **Admin** > **System** > **Data Area** and then navigate to the **Schema** tab.

Description of Page

The contents of this section describe the zones that are available on this portal.

The **General Information** zone displays the main attributes of the data area.

The *Schema Designer* zone allows you to edit the data area's schema. The purpose of the schema is to describe the structure and elements of the data area.

NOTE: Schema Definition Tips. A context sensitive "Schema Tips" zone is associated with this page. The zone provides a complete list of the XML nodes and attributes available to you when you construct a schema.

NOTE: View UI Rendering. A context sensitive "View UI Rendering" zone is associated with this page. The zone is useful for data areas that are to be included in *business objects that define the user interface detail* using schema attributes and UI Hints. The buttons allow you to view the automatically rendered display and input maps.

The **Schema Usage Tree** zone summarizes all cross-references to this schema. These may be other schemas, scripts, and web services. For each type of referencing entity, the *tree* displays a summary node showing a total count of referencing items. The summary node appears if at least one referencing item exists. Expand the node to list the referencing items and use their description to navigate to their corresponding pages.

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 the ability to toggle between **Design View** and **Source View** views by clicking the icons on the **Schema Designer** title bar:

The **Source View** shows the schema elements and their attributes written in the proper syntax.

In the graphical **Design View** mode, the zone is split into two areas. The left pane displays the elements of the schema in a tree-like presentation, while the right pane displays all valid attributes and values for selected schema elements.

The following points highlight some functionality available in the design view.

- If the schema definition refers to another schema using an “include” statement, one can expand that schema in the left panel to view the elements within that schema. Clicking an element in that expanded view shows information about the element’s definition in the right panel. Changes cannot be made to elements in this view.
- To move an existing element within the schema in the left panel, simply drag and drop.
- Right clicking an element in the left panel causes a pop-up to display which offers options based on the position of the element clicked on and based on the type of element.
  - **Add element above | below**
  - **Delete this element**
  - **Move this element up | down**
  - **Add child element**

When adding a new element, you are prompted for the element type. The following lists the possible element types. Most are self explanatory and represent standard schema options.

- 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
- 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 an XML column.

Context-sensitive embedded help is provided for fields and controls in the right pane by clicking the Help icon

You can also use links in the **Schema Tips** zone in the dashboard area to open a navigable Help window containing schema-related topics and tips. To search topic content, press `Ctrl+F` when the Schema Tips Help window has focus.

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.

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.
- 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.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *F1_BUS_EVT_LOG*.

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.

FASTPATH: 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

The topics below provide more information about To Do configuration.

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 To Do list on which the entry appears.
- The page into which a user is taken when they drill down on an entry.
- The message that appears in the user's To Do list. 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 list's sort options. Sort options may be used on the To Do list page to sort the entries in a different order. For example, when a user looks at the bill segment error To Do list, they have the option of sorting it in error number order, account name order, or in customer class order. Note the default sort order is also defined on To Do type.
- 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 list in respect of other To Do lists.
- The To Do list's usage, which indicates whether a To Do of that type may be created manually by a user.
- The algorithms used to perform To Do list specific business rules.
- The characteristics applicable to the To Do list.

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.

An entry's initial role is assigned by the background process or algorithm that creates the entry. Because you can create your own processes and algorithms, there are an infinite number of ways to default an entry's role. However, the base package processes and algorithms use the following mechanisms to default an entry's role:

- The system checks if an entry's message category / number is suppressed (i.e., not created). If so, the entry is not created. Refer to *To Do Entries Can Be Rerouted Or Suppressed Based On Message Number* for more information.
- The system checks if an entry's message category / number is rerouted to a specific role. If so, it defaults this role. Refer to *To Do Entries Can Be Rerouted Or Suppressed Based On Message Number* for more information.
- Your specific product may introduce additional criteria for assigning a role, for example perhaps important accounts are assigned to a kind of account management group and the account management group includes configuration for special role for certain To Do types. Refer to *Set Additional Information Before a To Do is Created* for more information.
- If a Role wasn't determined in one of the previous steps and a Role is provided by the initiating 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.

CAUTION: Important! Most organizations have the notion of a supervisor who is responsible for all entries assigned to a given role. It's important for this user (or users) to be part of all such roles. Refer to *To Do Supervisor Functions* for information about transactions that can be used by supervisors to review and assign work to users.

To Do Entries Can Be Rerouted (Or Suppressed) Based On Message Number

Consider the To Do type used to highlight bill segments that are in error. To Do entries of this type reference the specific bill segment error number so that the error message can be shown when the Bill Segments in Error To Do list is displayed.

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.

If you want specific types of errors to be routed to specific users, you can indicate such on the To Do type. For example, if certain bill segment errors are always resolved by a given rate specialist, you can indicate such on the To Do type. You do this by updating the *To Do type's message overrides*. On this page you specify the message category / number of the error and indicate the To Do role of the user(s) who should work on such errors. Once the To Do type is updated, all new To Do entries of this type that reference the message number are routed to the desired role.

NOTE: Reroute versus suppression. Rather than reroute an entry to a specific role, you can indicate that an entry with a given message number should be suppressed (i.e., not created). You might want to do this if you have a large volume of certain types of errors and you don't want these to clutter your users' To Do lists.

Obviously, you would only reroute those To Do types that handle many different types of messages. In other words, if the To Do type already references a specific message category / number rerouting is not applicable.

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 you're testing the system. During this period, compile a list of the messages that should be routed to specific roles and add them to the To Do type.

Keep in mind that if a message number / category is not referenced on a To Do type's reroute information, the entry is routed as described under *To Do Entries Reference A Role*.

> **NOTE: Manually created To Do entries cannot be rerouted or suppressed.** The rerouting occurs as part of the batch process or algorithm processing when the To Do is created. The role or user to whom a manual To Do should be assigned is specified when the To Do is created online. A manually created To Do may also be forwarded to another user or role.

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 initially assigned as follows:

- If a **Calculate Priority** plug-in is defined on the To Do entry's type, the system calls it to determine the entry's priority. 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. When applicable, you may design a process that triggers priority recalculation of To Do entries "at will". For example, when priority is reassessed periodically based on factors external to the To Do entry's information. Refer to *To Do Type* for more information on priority calculation algorithms.
- 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. 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.

Working On A To Do Entry

A user can drill down on a To Do entry. When a user drills down on an entry, the user is transferred to the transaction associated with the entry. For example, if a user drills down on a bill segment error entry, the user is taken to the Bill Segment - Main page. Obviously, the page to which the user is taken differs depending on the type of entry.

It is also possible to configure the To Do type to launch a *script* when a user drills down on an entry rather than taking the user to a transaction. The script would walk the user through the steps required to resolve the To Do entry. Refer to *Launching Scripts When A To Do Is Selected* for more information.

After finishing work on an entry, the user can mark it as **Complete**. Completed entries do not appear on the To Do list queries (but they are retained on the database for audit purposes). If the user cannot resolve the problem, the user can forward the To Do to another user.

Launching Scripts When A To Do Is Selected

Users can complete many To Do entries without assistance. However, you can set up the system to 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.

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.

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. 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
- 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

FASTPATH: For information about the contents of log entries for each of the events, refer to *Log Entry Events*.

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 - Main* 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 *To Do Entries Can Be Rerouted (Or Suppressed)* and *Launching Scripts When a To Do Is Selected* for more information.

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

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: 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 and it is not possible to create an exception record. (I.e., either no exception record exists for the process or the error is not related to the entity reported in the 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. To this by indicating the message category and message number you want to suppress. Any error that is suppressed is written to the *batch run tree*.

If you do not populate the creation background process, the errors are written to the *batch run tree*.

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 tree 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 tree*. 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 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:

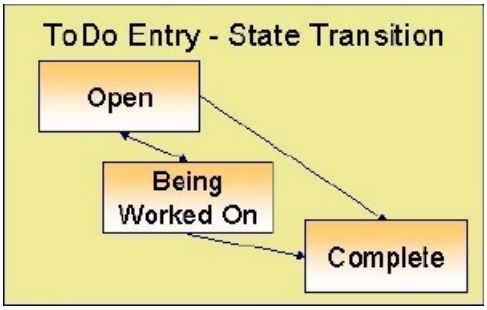
When a user adds a manual To Do entry, it is created with a drill key value equal to the To Do entry's ID. When the user clicks the Go To button next to the message in the To Do list, the system uses the drill down application service (defined on the main tab) and the drill key to display the associated 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
1	CI_TD_ENTRY	TD_ENTRY_ID

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 **Being Worked On** when it is assigned to a specific user or when a user proactively assumes responsibility for the entry. While an entry is **Being Worked On**, it is visible on the To Do Summary page only by the user who is assigned to it.

> **NOTE: To Do entries may be created in theBeing Worked Onstate.** Some To Do background processes may create To Do entries in the **Being Worked On** 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 **Being Worked On** state.

A **Being Worked On** entry may be forwarded to a different user or role. If the entry is forwarded to a role, it becomes **Open** again.

When an entry becomes **Complete**, it is no longer visible in the To Do list queries (but it remains on the database for audit purposes). There are two ways an entry can become **Complete**:

- A user can manually indicate it is **Complete** (there are several ways to do this).
- For To Do entries that are logically associated with the state of some object, the system automatically marks the entry **Complete** when the object is no longer in the respective state. 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.

> **CAUTION:** Important! The automatic completion of To Do entries occurs when the background process responsible for creating entries of a given type is executed. Therefore, if you only run these processes once per day, these entries remain **Being Worked On** even if the object is no longer in the respective state.

Linking Additional Information To A To Do Entry

Additional information may be linked to a To Do entry using characteristics. For example, when creating a manual To Do entry, a user may define the account related to the To Do.

When creating an automatic To Do entry, the program that generates the To Do may link related data to the To Do using characteristics. Use system *algorithm* to link related entities. For manually created To Dos, 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.

If your To Do entries reference characteristics that are related to your global context data, you may want to configure an *Alerts* to display an alert if a related entry is **Open** or **Being Worked On**.

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.

Click *here* to see the algorithm types available for this system event.

Periodically Purging To Do Entries

Completed To Do entries should be periodically purged from the system by executing the *F1–TDPG* background process. 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.

We want to stress that there is no system constraint as to the number of **Completed** To Do entries that may exist. You can retain these entries for as long as you desire. However, you will eventually end up with a very large number of **Completed** entries and these entries will cause the various To Do background processes to degrade over time. Therefore, you should periodically purge **Completed** To Do entries as they exist only to satisfy auditing and reporting needs.

> **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

The following section describes configuration setup on the installation options.

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*.

Set Additional Information Before A To Do Is Created

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. Algorithms of this type are used for two common purposes:

- Linking context specific data to the To Do entry using characteristics. For example, Oracle Utilities Customer Care and Billing provides an algorithm that attempts to link a related person, account, premise, service agreement or service point to a To Do entry based on its drill key value. Note, before you can set up this algorithm, 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.
- Overriding the Role of a To Do entry based on specific configuration related to the To Do's context data. For example, Oracle Utilities Customer Care and Billing provides an algorithm to determine a To Do role based on overrides related to the account's account management group or division.

Alerts

If your To Do entries reference characteristics related to your global context data and your product supports dashboard alerts generated by algorithms, you may want configure an algorithm to display an alert if the entry is **Open** or **Being Worked On** for the data currently in context.

Refer to your product's documentation to determine if these types of alerts are supported.

Next Assignment Algorithm

If your organization opts to use the next assignment feature supported by the Current To Do dashboard zone, you need to plug-in a **Next To Do Assignment** algorithm into the *installation options* to determine the next To Do entry the user should work on. Make sure you provide users with security access rights to the zone's next assignment action.

FASTPATH: Refer to the *Current To Do* zone for more information.

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.

Feature Configuration

The base package is provided with a generic **Activity Queue Management** *Feature Configuration* type. You may want to set up a feature configuration of this type to define any To Do management related options supporting business rules specific to your organization.

For example, the base package provides the following plug-ins to demonstrate a business practice where To Do entries are only assigned to users with the proper skill levels to work on them.

- 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.
- The base **Next To Do Assignment** installation options algorithm *F1-NEXT-ASSG* only assigns To Do entries to users that have the proper skills to work on them. This plug-in is only applicable if your organization practices *work distribution* "on demand."

You must set up such an **Activity Queue Management** feature configuration if you want to use any of the above base package plug-ins.

The following points describe the various **Option Types** provided with the base package:

- **Skill.** This option provides a reference to a skill category. For example, if you were using characteristics to represent skill categories then you should reference each characteristic type using this option.
- **Override Skill.** This option provides an override skill information reference for a specific message. For example, if you were using a To Do Type characteristic to specify an override skill category and level for a specific message category / number then you would reference this characteristic type using this option.

NOTE: Skill Setup. Refer to the description of the above base package algorithms for further details on how to setup skill level information.

NOTE: More Options. Your implementation may define additional options types. You do this by add new lookup values to the lookup field **F1QM_OPT_TYP_FLG**.

NOTE: Only one. The system expects only one **Activity Queue Management** feature configuration to be defined.

Defining To Do Roles

This section describes the control table used to maintain To Do roles.

To Do Role - Main

The **Main** page is used to define basic information about a To Do role.

To maintain this information, select **Admin** > **General** > **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.

Where Used

Follow this link to view the tables that reference *CI_ROLE* in the data dictionary schema viewer.

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** > **To Do Role** > **Search** 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.

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

This section describes the control table used to maintain To Do types.

To Do Type - Main

The **Main** page is used to define basic information about a To Do type.

> **FASTPATH:** Refer to *The Big Picture Of To Do Lists* for more information about To Do types and To Do lists in general.

To maintain this information, select **Admin** > **General** > **To Do Type**.

> **CAUTION:** Important! If you introduce a To Do type, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Description of Page

Enter a unique **To Do Type** and **Description** for the To Do type.

Owner indicates if this entry is owned by the base package or by your implementation (**Customer Modification**).

Use the **Detailed Description** to provide further details related to the To Do Type.

Enter the default **Priority** of To Do entries of this type in respect of other To Do types. Refer to *The Priority Of A To Do Entry* for more information.

For **To Do Type Usage**, select **Automatic** if To Dos of this type are created by the system (i.e., a background process or algorithm). Select **Manual** if a user can create a To Do of this type online.

Define the **Navigation Option** for the page into which the user is transferred when drilling down on a To Do entry of this type.

Use **Creation Process** to define the background process, if any, that is used to manage (i.e., create and perhaps complete) entries of this type. A **Creation Process** need only be specified for those To Do types whose entries are created by a background process. Refer to *To Do Entries Created By Background Processes* for more information.

Use **Routing Process** to define the background process that is used to download entries of a given type to an external system, if any. A **Routing Process** need only be specified for those To Do types whose entries are routed to an external system (e.g., an Email system or an auto-dialer). Refer to *To Do Entries May Be Routed Out Of The System* for more information.

Use **Message Category** and **Message Number** to define the message associated with this To Do type's entries. Note: this message will only be used if the process that creates the To Do entry does not supply a specific message number. For example, the process that creates To Do entries that highlight bill segments that are in error would not use this message; rather, the entries are marked with the message associated with the bill segment's error.

Use the characteristics collection to define a **Characteristic Type** and **Characteristic Value** common to all To Do entries of this 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.

Where Used

Follow this link to view the tables that reference *CI_TD_TYPE* in the data dictionary schema viewer.

To Do Type - Roles

The **Roles** page defines the roles who may view and work on entries of a given To Do type.

To maintain this information, select **Admin** > **To Do Type** > **Search** and navigate to the **Roles** page.

Description of Page

Enter each **To Do Role** that may view and work on entries of a given type. Turn on **Use as Default** if the role should be assigned to newly created entries of this type. Only one role may be defined as the default per To Do type.

FASTPATH: Refer to *To Do Entries Reference A Role* for more information about roles and To Do entries.

To Do Type - Sort Keys

The **Sort Keys** page defines 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.

To maintain this information, select **Admin** > **To Do Type** > **Search** and navigate to the **Sort Keys** page.

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.

Description of Page

The following fields display for each sort key.

Sequence is the unique ID of the sort key.

Description is the description of the sort key that appears on the To Do list.

Use as Default indicates the default sort key (the one that is initially used when a user opens a To Do list). Only one sort key may be defined as the default per To Do type.

Sort Order indicates whether the To Do entries should be sorted in **Ascending** or **Descending** order when this sort key is used.

Owner indicates if this entry is owned by the base package or by your implementation (**Customer Modification**).

To Do Type - Drill Keys

The **Drill Keys** page defines the keys passed to the application service (defined on the Main page) when you drill down on an entry of a given type.

To maintain this information, select **Admin** > **To Do Type** > **Search** and navigate to the **Drill Keys** page.

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.

Description of Page

Navigation Option shows the page into which the user is transferred when drilling down on a To Do entry of this type.

The following fields display for each drill key.

Sequence is the unique ID of the drill key.

Table and **Field** are passed to the application service when you drill down on an entry of a given type.

Owner indicates if this entry is owned by the base package or by your implementation (**Customer Modification**).

To Do Type - Message Overrides

The **Message Overrides** page is used 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.

FASTPATH: Refer to *To Do Entries Reference A Role* and *To Do Entries Can Be Rerouted Or Suppressed* for more information.

To maintain this information, select **Admin** > **To Do Type** > **Search** and navigate to the **Message Overrides** page.

Description of Page

The following fields display for each override.

Message Category and **Number** allow the message to be overridden.

Exclude To Do Entry indicates if a To Do entry of this type that references the adjacent **Message Category** and **Number** should NOT be created.

Override Role indicates the to do role to which a To Do entry of this type that references the adjacent **Message Category** and **Number** should be addressed. This field is protected if **Exclude To Do Entry** is on.

Script indicates the script that should execute when a user drills down on a To Do entry of this type that references the adjacent **Message Category** and **Number**. This field is protected if **Exclude To Do Entry** is on. Refer to *Working On A To Do Entry* for more information.

To Do Type - To Do Characteristics

The **To Do Characteristics** page defines 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.

To maintain this information, select **Admin** > **To Do Type** > **Search** and navigate to the **To Do Characteristics** page.

Turn on the **Required** switch if the **Characteristic Type** must be defined on To Do entries of this type.

Enter a **Characteristic Value** to use as the default for a given **Characteristic Type** when the **Default** switch is turned on. Use **Sequence** to control the order in which characteristics are defaulted.

To Do Type - Algorithms

The **To Do Algorithms** page defines the algorithms that should be executed for a given To Do type.

To maintain this information, select **Admin** > **To Do Type** > **Search** and navigate to the **Algorithms** page.

Description of Page

The grid contains **Algorithms** that control important To Do functions. If you haven't already done so, you must *set up the appropriate algorithms* in your 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.

The following table describes each **System Event**.

System Event	Optional / Required	Description
Calculate Priority	Optional	Algorithms of this type may be used to calculate a To Do entry's priority. They are called initially when a To Do entry is created and each time it gets updated so long as the To Do entry's priority has not been manually overridden. Once overridden, these algorithms are not called anymore. 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. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.
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. Click *here* to see the algorithm types available for this system event.

List of System To Do Types

The To Do types available to use with the product are found in the To Do Type page. In addition, they may be viewed in the *application viewer*'s *To Do type* viewer. If your implementation adds To Do types, you may *regenerate* the application viewer to see your additions reflected there.

Implementing The To Do Entries

To enable the To Do entries visible in the To Do Type page and application viewer, 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.

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.

The Big Picture of Background Processes

This section describes various topics related to the background processes that perform many important functions throughout your product such as:

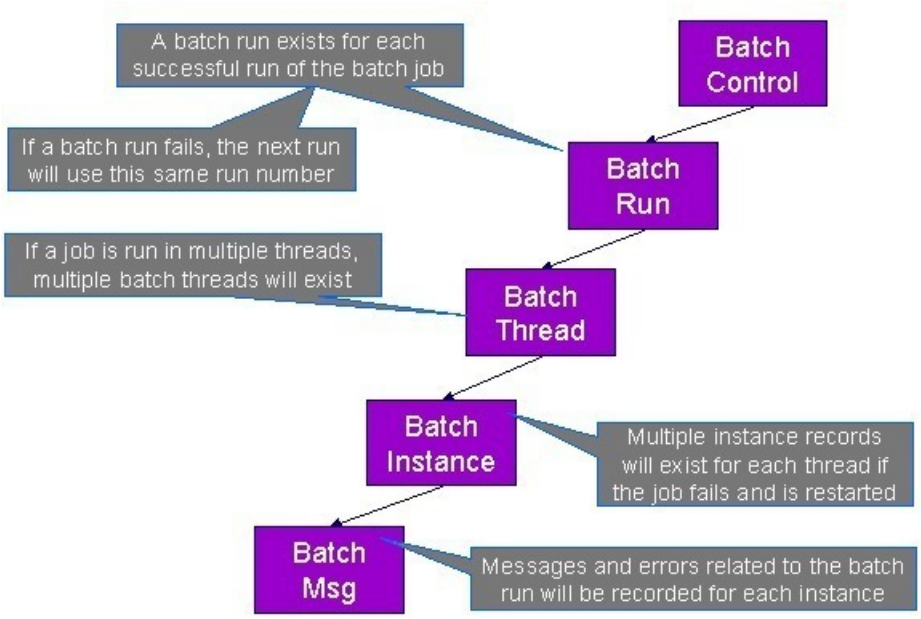
- Processing To Do Entries
- Monitor processes that select records in a given state to progress them to their next state in their lifecycle
- Processes that purge data
- Processes that extract data
- And many more...

Background Processing Concepts

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.



Results of each batch run can be viewed using the *Batch Run Tree* page.

Parameters Supplied To Background Processes

All background processes receive the following parameters.

- **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, billing using 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.
- **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.

  NOTE: The maximum minutes between cursor re-initiation is relevant for Oracle implementations only. Most of the system background processes contain an outermost loop / cursor. The cursor is opened at the beginning of the process and closed at the end. If Oracle feels that the cursor is open for too long, it may incorrectly interpret this as a problem and my issue an error that the snapshot is too old. The commit processing for the background processes is designed to refresh the cursor based on the minutes between cursor re-initiation in order to prevent this error.

- **User ID.** Please be aware of the following in respect of user ID:
  - The user ID is a user who should have access to all application services in the system. This is because some batch processes update records via services that may be check security.
  - Any batch process that stamps a user ID on a record it creates or updates uses this user ID.
  - This user ID's *display profile* controls how dates and currency values are formatted in messages.
- **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 at start** (Y/N), **trace program exit** (Y/N), **trace SQL** (Y/N) and **output trace** (Y/N). These switches are only used during QA and benchmarking. If trace program start is set to Y, a message is displayed whenever a program is started. If trace program at exist is set to Y, a message is displayed whenever a program is exited. If trace SQL is set to Y, a message is displayed whenever an SQL statement is executed. If output trace is set to Y, special messages formatted by the background process are written.

  NOTE: The information displayed when the output trace switch is turned on depends on each background process. It is possible that a background process displays no special information for this switch.

Override Maximum Errors in Batch Process Parameter

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 this constant with an optional additional parameter (defined as either **MAX-ERRORS** or **maxErrors**). If a user chooses not to enter a value for the parameter, the process uses its own preset constant.

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.

The syntax for entering this additional parameter when submitting the batch process is "MAX-ERRORS|maxErrors=PARM VALUE", where the PARM VALUE is the desired value (e.g., **MAX-ERRORS=50** or **maxErrors=50**).

Extra Parameters

Some background processes receive 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. They are also visible in the *batch control* viewer (part of the *application viewer*).

The syntax for entering these parameters when submitting the batch process is "PARM-NAME=PARM VALUE", where PARM-NAME is the name of the parameter as indicated in the batch control record. For example, if the batch control includes the **ADD-WORK-DAYS**, with possible values of **Y** and **N**, and you want to pass a value of **N**, enter the following when prompted: **ADD-WORK-DAYS=N**.

Indicating a File Path

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.

When supplying a FILE-PATH variable, the directory specified in the FILE-PATH must already exist and must grant write access to the administrator account for the product. You may need to verify a proper location with your systems administrator.

The syntax of the FILE-PATH depends on the platform used for the product application server. Contact your system administrator for verification. For example, if the platform is UNIX, use forward slashes and be sure to put a trailing slash, for example **/spltemp/filepath/**.

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 Tree*.
- 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 tree. 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 tree. 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 tree*.

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.

Parallel Background Processes

Many processes have been designed to run in parallel in order to speed execution. For example, the billing process in Oracle Utilities Customer Care and Billing can be executed so that bills are produced in multiple "threads" (and multiple threads can execute at the same time).

NOTE: The detailed description in the metadata for each batch control provided with the system should indicate if it may be run in parallel.

By default the system distributes the data for the multiple threads using the primary key of the main table of the process. For example, if you are running BILLING in Oracle Utilities Customer Care and Billing with multiple threads, the batch process distributes the accounts across the multiple threads. The Account ID is 10 digits long so if you run it with 4 threads, the records are processed as follows:

- Thread 1: Account IDs 0000000001 - 2500000000
- Thread 2: Account IDs 2500000001 - 5000000000
- Thread 3: Account IDs 5000000001 - 7500000000
- Thread 4: Account Ids 7500000001 - 9999999999

Note that the multi-threading logic relies on the fact that primary keys for master and transaction data are typically system generated random keys.

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

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.

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 tree. 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.

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.

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.

In addition, you can manually submit your adhoc background processes or submit a special run for one of your scheduled background processes using the online *batch job submission* page.

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 tree shows each thread, the run-instances of each thread, and any messages (informational, warnings, and errors) that might have occurred during the run.

FASTPATH: For more information, refer to *Tracking Batch Processes*.

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 an algorithm that checks some conditions to assess whether or not the process is performing as expected. This algorithm could be simply verifying that the batch process is running as frequently as expected. Or it 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 algorithm for a given background process, if desired. The 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 viewing a *batch control* record, if there is a level of service algorithm configured, its logic is executed and the results are displayed. The level of service is also part of the *Health Check* service.

System Background Processes

NOTE: List of system background processes. The list of background processes provided in the base product may be viewed in the *application viewer*'s *batch control* viewer. In addition if your implementation adds batch control records, you may *regenerate* the application viewer to see your additions reflected there.

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** > **System** > **Batch Control.** Refer to *Background Processing Concepts* for more information.

CAUTION: Important! If you introduce a new batch process, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Description of Page

Enter an easily recognizable **Batch Process** and **Description** for each batch process.

Owner indicates if this batch control is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add a batch control. This information is display-only.

Use the **Detailed Description** to describe the functionality of the batch process in detail.

Use **Batch Control Type** to define the batch process as either **Timed** or **Not Timed**. A *Timed batch process* will be automatically initialized on a regular basis. A Not Timed process needs to be run manually or through a scheduler.

Use **Batch Control Category** to categorize the process 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.
- **To Do Entry**. Processes of this type are used to detect a given situation and create a To Do Entry. Refer to *To Do Entries Created by Background Processes* for more information.
- The following categories are related to the data conversion / migration processes, which are not applicable to all products:
  - **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.

If the batch process is Timed, then the following fields are available:

- **Timer Interval** is the number of seconds between batch process submissions. The system will start the next run this many seconds from the start time of the previous run.
- **User ID** is the ID under which the batch process will run.
- **Email Address** is the Email address to be used for notification if the batch process fails.
- **Timer Active** allows you to temporarily switch off the timer while retaining the other settings for the timed job.
- **Batch Language** is the language associated with the batch process.

Use **Program Type** to define if the batch process program is written in **Java** or **Java (Converted)**, meaning that the program has been converted into Java.

NOTE: **Java (Converted)** program types are not applicable to all products.

Use **Program Name** to define the Java class / program associated with your batch process:

NOTE: **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 *Java docs viewer*.

Level of Service shows the output of the *level of service* algorithm for the batch control. It shows the level of service lookup value along with a message indicating the reason for the output value. Note that if no level of service algorithm is found, then the value **Disabled** is shown with a message indicating that no algorithm is provided for this batch control.

The **Last Update Timestamp, Last Update Instance** and **Next Batch Nbr** are used for audit purposes.

Turn on **Accumulate All Instances** to control how this batch control is displayed in the *Batch Run Tree*. If checked, the run statistics (i.e., "Records Processed" and "Records in Error") for a thread are to be accumulated from all the instances of the thread. This would include the original thread instance, as well as any restarted instances. If this is not turned on, only the ending (last) thread instance's statistics are used as the thread's statistics. This may be preferred for certain types of batch processes where the accumulation would create inaccurate thread statistics, such as those that process flat files and, therefore, always start at the beginning, even in the case of a restart.

The following fields are default values that are used when a batch job is submitted for the batch control:

- Use **Thread Count** to control whether a background process is run single threaded or in multiple parallel threads. This value defines the total number of threads that have been scheduled.
- Select **Trace Program Start** if you want a message to be written whenever a program is started.
- Select **Trace SQL** if you want a message to be written whenever an SQL statement is executed.
- Use **Override Nbr Records to Commit** to define the default number of records to commit. This is used as the default value for timed jobs as well as online submission of jobs that are not timed.
- Select **Trace Program Exit** if you want a message to be written whenever a program is exited.
- Select **Trace Output** if you want a message to be displayed for special information logged by the background process.

For more information about these fields, see *Batch Job Submission - Main*

The parameter collection is used to define additional parameters required for a particular background process. The following fields should be defined for each parameter:

Sequence. Defines the relative position of the parameter.

Parameter Name. The name of the parameter as defined by the background process program.

Description. A description of the parameter.

Detailed Description. A more detailed description of the parameter.

Required. Indicates whether or not this is a required parameter.

Parameter Value. The default value, if applicable. Note that an implementation may define a default value for base provided batch controls.

Security. Indicates whether the system should **Encrypt** the parameter value or not. A value of **Encrypt** means that the parameter value is stored in the database and written to the log files using encryption. In addition, the parameter is written to the log files with asterisks. The setting applies to values entered here as well as in the online *Batch Submission*. If there is no need to secure the parameter value, use the default setting of **None**.

Owner Indicates if this batch process is owned by the base package or by your implementation (Customer Modification). The system sets the owner to **Customer Modification** when you add a batch process. This information is display-only.

Batch Control - Algorithms

Use this page to maintain a batch control's algorithms. Open this page using **Admin** > **System** > **Batch Control** and then navigate to the **Algorithms** tab.

Description of Page

The **Algorithms** grid contains algorithms that control important functions for instances of this batch control. 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.

The following table describes the **System Events**.

System Event	Optional / Required	Description
Level of Service	Optional	Algorithms of this type are called to determine the Level of Service provided by a batch control. Refer to *Assessing Level of Service* for more information. Click *here* to see the algorithm types available for this system event.

On-Line Batch Submission

The on-line *batch submission* page 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 page 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

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 Tree* page 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 Tree* page 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.

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.

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.

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 or run a single thread of a multi-threaded process. The fields Thread Count and Thread Number on the *batch submission* page 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**.
- To run a single thread in a multi-threaded process, indicate the number of threads in Thread Count and indicate the Thread Number you would like to run.
- To run a process as a single thread, enter Thread Count = **1** and Thread Number = **1**. 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**.

Batch Jobs May End in Error

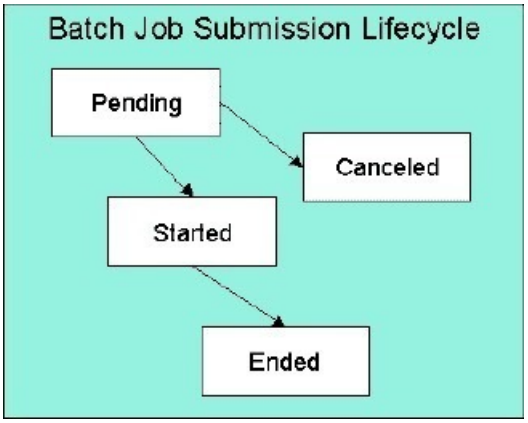
It is possible for your background process to end with an error. When this occurs, your batch job submission record will still be marked as **Ended**. You will need to navigate to the *Batch Run Tree* page to determine the status of the batch run.

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.



Pending — Records are created in **Pending** status. Records in this state are put in a queue to be submitted.

Canceled— Users may cancel a pending record to prevent the batch job from being submitted.

Started— Once a pending record has been submitted for processing, its status will be changed to **Started**. Records in this status may not be canceled.

Ended— When the batch job has finished processing, its status will be changed to **Ended**. Note that records in **Ended** status may have ended in error. Refer to *Batch Jobs May End in Error* for more information.

Batch Job Submission - Main

This page allows you to submit a batch job on-line. Navigate to this page using **Menu** > **Batch** > **Batch Job Submission**.

Description of Page

The **Batch Job ID** is a system generated random number that identifies a particular submission.

To submit a batch job, choose the **Batch Code** for the process you wish to submit.

> **NOTE: List of system background processes.** The list of background processes provided in the base product may be viewed in the *application viewer*'s *batch control* viewer.

The following parameters are provided with each background process:

Thread Number is used to control whether a background processes is run single threaded or in multiple parallel threads. It contains the relative thread number of the process. For example, if the 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 *Running Multi-threaded Processes* for more information about populating this field.

NOTE: Not all processes may be run multi-threaded. Refer to the description of a batch control to find out if it runs multi-threaded.

Thread Count is used to control whether a background processes is run single threaded or in multiple parallel threads. It contains the total number of threads that have been scheduled. For example, if the process has been set up to run in 20 parallel threads, each of the 20 instances receives a thread count of 20. Refer to *Running Multi-threaded Processes* for more information about populating this field.

Batch 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 is only used for background processes that use a date in their processing. In Oracle Utilities Customer Care and Billing, for example, a billing process can use the business date to determine which bill cycles should be downloaded. If this parameter is left blank, the system date is used at the time the background process is executed.

NOTE: Saving a record on this page does not submit the batch job immediately. A special background process will run periodically to find pending records and submit them. Depending on how often the special process checks for pending records and depending on how many other pending records are in the 'queue', there may be a slight lag in submission time. 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.

Override Nbr Records To Commit and **Override Max Timeout Minutes**. These parameters are optional and override each background process's Standard Commit Records and Standard Cursor Re-Initiation Minutes. (Each background process's Standard Commit Records / Standard Cursor Re-Initiation Minutes should be documented in the detailed description of the batch control record). Note that Max Timeout Minutes corresponds to the Cursor Re-initiation Minutes.

FASTPATH: Refer to *Parameters Supplied to Background Processes* for more information.

User ID is the user ID associated with the run of the background process. Refer to *Parameters Supplied to Background Processes* for more information about the significance of the user id.

NOTE: This field defaults to the id of the current user.

Password is not currently used.

Language Code is used to access language-specific control table values. For example, error messages are presented in this language code.

If you wish the system to notify you when the batch job is complete, enter your **Email ID**. Refer to *Email Notification* for more information.

NOTE: This field defaults to the email address for the current user, if populated on the *user* record.

The **Desired Execution Date/Time** defaults to the current date and time. Override this information if you wish the background process to be executed at some future date and time. Refer to *Submitting Jobs in the Future* for more information.

The **Batch Job Status** indicates the current status of the batch job. Refer to *Lifecycle of a Batch Job Submission* for more information.

The **Program Name** associated with the batch control code is displayed.

The following trace parameters may also be supplied to a background process and are only used during QA and benchmarking.

- **Trace Program Start** Turn on this switch if you wish a message to be written whenever a program is started.
- **Trace Program Exit** Turn on this switch if you wish a message to be written whenever a program is exited.

- **Trace SQL** Turn on this switch if you wish a message to be written whenever an SQL statement is executed.
- **Trace Output** Turn on this switch if you wish a message to be displayed for special information logged by the background process.

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.

NOTE: The location of the output of this trace information is defined by your system administrator at installation time.

If additional parameters have been defined for this background process on the Batch Control page, the **Parameter Name, Description, Detailed Description** and an indicator of whether or not the parameter is **Required** are displayed.

If a default parameter value is configured on the batch control configuration, that value is shown and may be overridden. Confirm or enter the appropriate **Parameter Value** for each parameter. Note that if the parameter value is configured to be Encrypted on the batch control configuration, the value here will be shown encrypted.

Once you have entered all the desired values, **Save** the record in order to include it in the queue for background processes.

If you wish to duplicate an existing batch job submission record, including all its parameter settings, display the submission record you wish to duplicate and use the **Duplicate and Queue** button. This will create a new Batch Job Submission entry in pending status. The new submission entry will be displayed.

If you wish to cancel a **Pending** batch job submission record use the **Cancel** button. The button is disabled for all other status values.

Tracking Batch Processes

The batch process pages show the execution status of batch processes. For a specified batch control id and run id, the tree shows each thread, the run-instances of each thread, and any messages (informational, warnings, and errors) that might have occurred during the run. Refer to *Defining Batch Controls* for more information on how batch control codes are defined.

Batch Run Tree - Main

This page allows you to view the status of a specific execution of a batch job. Navigate to this page using **Menu** > **Batch** > **Batch Run Tree**.

Description of Page

Select a **Batch Control** process and **Batch Number** to view information and statistics on the batch run's "threads". The following points should help understand this concept:

- 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.

The tree includes a node that displays the total number of records processed for the batch run, the total number of records in error for the batch run and the batch run elapsed time. The elapsed time is the longest elapsed time among the batch thread(s). The message is red if there are any records in error.

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 the tree. This information is not displayed for each thread, but rather all the To Do entries created for the batch run are grouped together. The To Do entries are grouped by their status.

The messages that appear under a thread always show the start and end times of the execution instance. If errors are detected during the execution of the thread, these error messages may also appear in the tree. Refer to *Processing Errors* for information about the types of errors that appear in the batch run tree.

Batch Run Tree - Run Control

By default, if a batch process fails, it will restart. This notebook tab allows you to modify the restart status of a failed run.

Navigate to this page using **Menu** > **Batch** > **Batch Run Tree** search for the desired batch control and then navigate to the **Run Control** page.

Description of Page

On the main page, you must select a **Batch Control**, **Batch Number**, and **Batch Rerun Number** to view a tree of the batch run. On this page, the following information is displayed:

- **Date Time** contains the date and time this batch run last start or last completed.
- **Batch Business Date** is the business date that was supplied to the background process (this date is used as the "system date" by the process).

Run Status indicates the status of the batch run. Valid values are: **In Progress**, **Error**, and **Complete**.

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), turn on **Do Not Attempt Restart**.

Service Health Check

The system provides a service that returns an overall assessment of the system's health. The overall response is expressed using an HTTP code. The codes supported by the service are defined in the lookup **HEALTH_RESPONSE_FLG** and are as follows:

- A value of 500 (One or More Critical Functions Degraded) is returned if there is any critical issue detected by the service.
- A value of 203 (Non-Critical Function Degraded) is returned if no critical issues are found and there is at least one non-critical issue detected by the service.
- Otherwise a value of 200 (All Checks Successful) is returned.

This health check service is accessible through the business service **F1–HealthCheck**. Also note that the system provides an *Inbound Web Service* for this business service (also called **F1–HealthCheck**) allowing external systems to use a web service to retrieve this information.

In addition, the product provides a portal that allows a user to view the detailed results of the health check service.

Navigate using **Admin** > **System** > **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 as described above.

The grid displays the detail of each individual component checked as part of the system health check. See below for more detail about what components are checked.

- **Health Component** indicate the type of health check performed. Currently the system supports **Batch Level of Service** component type.
- **Health Component Details** provides information about the individual entity checked. The information displayed here depends on the type of health component. If supported by the type of component, the column may be hypertext, allowing the user to drill into the entity itself.
- **Status** displays the status returned by the health component check for this individual entity. The information displayed here depends on the type of health component.
- **Status Reason** provides more detail about why the individual entity is in the indicated status. The information displayed here depends on the type of health component.
- **Response** shows the health check response code assigned to this individual entity's health check response. It is mapped based on the status returned by the health component check.

Health Component Type Details

The details returned by the business service for this portal depends on the health component type. The system supports the **Batch Level of Service** health component type.

This health component type finds all the batch controls that are configured with a *level of service* algorithm and invokes the algorithm 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 with the description of the Level of Service lookup value returned by the level of service algorithm for this batch control.
- The **Status Reason** is populated with the expanded text of the status reason returned by the level of service algorithm for this batch control.
- The **Response** is populated based on the value of the 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**.

The Big Picture of Requests

Requests enable an implementer to design an ad-hoc batch process using the configuration tools.

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. This is just one example. The request enables many types of diverse processing.

Request Type Defines Parameters

For each type of process that your implementation wants, you must configure a request type to capture the appropriate parameters needed by the process.

Previewing and Submitting a Request

To submit a new request, go to **Menu** > **Batch** > **Request** > **Add**. You must select the appropriate request type and then enter the desired parameter values, if applicable.

After entering the parameters, 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.

When a 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**.

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).

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.

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 that includes the Outbound Message Type and the corresponding External System.
- Create a Request for the created Request Type.

Exploring Request Data Relationships

Use the following links to open the application viewer where you can explore the physical tables and data relationships behind the request functionality:

- Click *F1-REQ-TYPE* to view the request type maintenance object's tables.
- Click *F1-REQ* to view the request maintenance object's tables.

Defining a New Request

To design a new ad-hoc batch job that users can submit via Request, first create a new Request Type business object. The base product BO for request type, **F1-TodoSumEmailTyp**, may be used as a sample.

The business object for the request includes the functionality for selecting the records to process, displaying a preview map for the user to review, and for performing the actual processing. The base product BO for request, **F1-TodoSumEmailReq**, may be used as a sample. The following points highlight the important configuration details for this business object:

- Special BO options are available for request BOs to support the Preview Request functionality.
  - **Request Preview Service Script**. This script retrieves the information that is displayed when a user asks for a preview of a request.
  - **Request Preview Map.** This map displays the preview of a request.
- The enter algorithm plugged into the Complete state is responsible for selecting the records that satisfy the criteria and processing the records accordingly.

Setting Up Request Types

Use the Request Type portal to define the parameters to capture when submitting a request. Open this page using **Admin** > **Request Type** > **Add**.

This topic describes the base-package zones that appear on the Request Type portal.

Request Type List. The Request Type List zone lists every request type. The following functions are available:

- Click a **broadcast** icon to open other zones that contain more information about the request type.
- Click **Add** in the zone's title bar to add a new request type.

Request Type. The Request Type zone contains display-only information about a request type. This zone appears when a request type has been broadcast from the Request Type List zone or if this portal is opened via a drill down from another page. The following functions are available:

- Click **Edit** to start a business process that updates the request type.
- Click **Delete** to start a business process that deletes the request type.
- Click **Deactivate** start a business process that deactivates the request type.
- Click **Duplicate** to start a business process that duplicates the request type.
- State transition buttons are available to transition the request type to an appropriate next state.

Please see the zone's help text for information about this zone's fields.

Maintaining Requests

Use the Request transaction to view and maintain pending or historic requests.

Open this page using **Menu** > **Batch** > **Request** > **Search**. This topic describes the base-package portals and zones on this page.

Request Query. Use the query portal to search for an existing request. Once a request is selected, you are brought to the maintenance portal to view and maintain the selected record.

Request Portal. This portal appears when a request has been selected from the Request Query portal. The following base-package zones appear on this portal:

- **Actions.** This is a standard actions zone.
- **Request.** The Request zone contains display-only information about a request. Please see the zone's help text for information about this zone's fields.
- **Request Log.** This is a standard log zone.

Defining 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

Many functions in the system are performed using a user-defined algorithm. For example, when a CSR requests a customer's recommended deposit amount, the system calls the deposit recommendation algorithm. This algorithm calculates the recommended deposit amount and returns it to the caller.

NOTE: Algorithm = Plug-in. We use the terms plug-in and algorithm interchangeably throughout this documentation.

So how does the system know which algorithm to call? When you set up the system's control tables, you define which algorithm to use for each component-driven function. You do this on the control table that governs each respective function. For example:

- You define the algorithm used to validate a phone number on your phone types.
- You define the algorithm in Oracle Utilities Customer Care and Billing used to calculate late payment charges on each Service Agreement Type that has late payment charges.
- The list goes on...

The topics in this section provide background information about a variety of algorithm issues.

Algorithm Type Versus Algorithm

You have to differentiate between the type of algorithm and the algorithm itself.

- An **Algorithm Type** defines the program that is called when an algorithm of this type is executed. It also defines the types of parameters that must be supplied to algorithms of this type.
- An **Algorithm** references an **Algorithm Type**. It also defines the value of each parameter. It is the algorithm that is referenced on the various control tables.

FASTPATH: Refer to *How to Add A New Algorithm* for an example that will further clarify the difference between an algorithm and an algorithm type.

How To Add A New Algorithm

Before you can add a new algorithm, you must determine if you can use one of the sample algorithm types supplied with the system. Refer to *List of Algorithm Types* for a complete list of algorithm types.

If you can use one of the sample algorithm types, simply add the algorithm and then reference it on the respective control table. Refer to *Setting Up 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.
- 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 inline 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.

Setting Up Algorithm Types

The system provides many algorithm types to support base product functionality. If you need to introduce a new type of algorithm, open **Admin** > **System** > **Algorithm Type**.

FASTPATH: 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.

Description of Page

Enter an easily recognizable **Algorithm Type** and **Description**.

Owner indicates if this algorithm type is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an algorithm type. This information is display-only.

Enter a **Detailed Description** that describes, in detail, what algorithms of this type do.

Use **Algorithm Entity** to define where algorithms of this type can be "plugged in". If a detailed description about an algorithm entity is available, a small help icon is visible adjacent to the dropdown. Click the icon to view the information.

NOTE: The values for this field are customizable using the *lookup* table. This field name is **ALG_ENTITY_FLG**.

Use **Program Type** to define if the algorithm's program is written using **Java**, a **Plug-In Script**, or **Java (Converted)**, meaning the program has been converted to Java.

NOTE: **Java (Converted)** program types are not applicable to all products.

Use **Program Name** to define the program to be invoked when algorithms of this type are executed:

- If the Program Type is **Java (Converted)**, enter the name of the converted program.
- If the Program Type is **Java**, enter the Java class name.
- If the Program Type is **Plug-In Script**, enter the plug-in *script* name. Only plug-in scripts defined for the algorithm entity may be used.

> **NOTE: 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 *Java docs viewer*. For plug-in scripts, drill into the plug-in script to view the details.

Use the **Parameter Types** grid to define the types of parameters that algorithms of this type use. The following fields should be defined for each parameter:

- Use **Sequence** to define the relative position of the **Parameter**.
- Use **Parameter** to describe the verbiage that appears adjacent to the parameter on the Algorithm page.
- Indicate whether the parameter is **Required**. This indicator is used when parameters are defined on algorithms that reference this algorithm type.
- **Owner** indicates if the parameter for this algorithm type is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an algorithm type with parameters. This information is display-only.

> **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.

Where Used

An Algorithm references an Algorithm Type. Refer to *Setting Up Algorithms* for more information.

List of Algorithm Types

The algorithm types available to use with the product may be viewed in the algorithm type page and in the *application viewer*'s *algorithm* viewer. If your implementation adds algorithm types or adds algorithms to reference existing algorithm types, you may *regenerate* the application viewer to see your additions reflected there.

Setting Up Algorithms

If you need to introduce a new algorithm, open **Admin** > **System** > **Algorithm**. Refer to *The Big Picture Of Algorithms* for more information.

Description of Page

Enter an easily recognizable **Algorithm Code** and **Description** of the algorithm. **Owner** indicates if this algorithm is owned by the base package or by your implementation (**Customer Modification**).

> **CAUTION:** Important! If you introduce a new algorithm, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Reference the **Algorithm Type** associated with this algorithm.

FASTPATH: Refer to *Algorithm Type Versus Algorithm* for more information about how an algorithm type controls the type of parameters associated with an algorithm.

The parameters available for an algorithm are defined on the algorithm type. The system allows a set of parameter values to change over time. Use the parameter scroll to view parameter values for a given **Effective Date**. The **Owner** of the collection of parameters is displayed. The collection shows the **Parameter** description, the **Sequence** and the **Value** for each parameter.

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 as follows: Click the "+" 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.

Where Used

Algorithms are plugged in on control tables throughout the system. Each algorithm type's Algorithm Entity indicates the name of the control table where it is plugged in. The *algorithm* viewer in the application viewer may also be used to see a list of plug-in spots along with their algorithm types and algorithms.

Defining 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 defined using *Business Process Assistant* (BPA) scripts. For example, your implementation could set up a BPA script to guide a user through your organization's payment cancellation process.
- Rules that control back-end processing are defined using *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

This section describes features and functions that are shared by both BPA scripts and server-based scripts.

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 select the customer / taxpayer using an appropriate search page
- 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 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 select the customer / taxpayer using an appropriate search page
- 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.

FASTPATH: Refer to *How To Set Up Each Step Type* for a detailed description of all available step types and how to set them up.

Designing And Developing Scripts

Constructing a script is similar to writing a computer program. We recommend that you follow the approach outlined below when you construct scripts:

- Thoroughly understand the business process to be scripted
- Thoroughly understand how the transactions and services that your script uses work
- Design the steps for the script "on paper"
- Determine the most maintainable way to set up your scripts. Rather than creating complex, monolithic scripts, we recommend dividing scripts into smaller sections. For example:
  - For BPA scripts,
    - 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. For example, if the main script were a BPA script, this would be invoked via 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. For example, if the main script were a BPA script, this would be invoked via a **Transfer control** step.
  - For server-based script, you can segregate reusable steps into "service scripts" and then use **Invoke service script** steps to execute the common logic.
- Add the script using *Script Maintenance*
- Thoroughly test the script

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 *Designing Generic Scripts* for an example of when this technique may be useful.

Designing Generic Scripts

Scripts may be designed to encapsulate an overall procedure common across different business objects.

For example, BPA scripts may implement a standard procedure to maintain business entities in which the first step obtains the entity's data, the second step presents its associated UI map to the user for update, and the last step updates the entity. Notice that in this case the only difference from one object to another is the data to capture. Rather than designing a dedicated BPA script with static data areas and invocation steps for each business object, you can design a single generic script that dynamically invokes a business object and its associated UI map.

This functionality is available only within an *Edit Data* step. With this technique, the name of the schema-based object is held in a variable or an XPath schema location and is used to both declare and invoke the object.

NOTE: Tips. Refer to the tips context zone associated with the script maintenance page for more information on edit data commands and examples.

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 and applies to service scripts and user-invocable BPA scripts only. 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.

The Big Picture Of BPA Scripts

FASTPATH: 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. The business process assistant allows you to 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
- 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
- ... (the list is only limited by your time and imagination)

Users execute these scripts via the *business process assistant* (BPA). Users can also define their favorite BPA scripts in their *user preferences*. By doing this, a user can execute a script by pressing an accelerator key (`Ctrl + Shift` + a number).

Don't think of these scripts as merely a training tool. BPA scripts can also reduce the time it takes to perform common tasks. For example, you can write a script that reduces the "number of clicks" required to add a new person to an existing account.

CAUTION: Future upgrade issues. Although we make every effort not to remove fields or tab pages between releases, there may be times when changes made by the base-package will necessitate changes to your scripts. Please refer to the release notes for a list of any removed fields or tab pages.

CAUTION: Scripts are not a substitute for end-user training. Scripts minimize the steps required to perform common tasks. Unusual problems (e.g., a missing meter exchange) may be difficult to script as there are many different ways to resolve such a problem. However, scripts can point a user in the right direction and reduce the need to memorize obscure business processes.

The topics in this section describe background topics relevant to BPA scripts.

How To Invoke Scripts

Refer to *Initiating Scripts* for a description of how end-users initiate scripts.

Developing and Debugging Your BPA Scripts

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**. The rest of the step types are procedural and involve no user interaction. For debugging purposes, you can instruct the system to display text in the script area for the latter step types. Also note, for debugging purposes, 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 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.

For example, imagine that through an interactive voice response system, a customer has keyed in their account ID and has indicated that they would like to stop an automatic payment. At the point when the IVR system determines that the customer must speak to a user, the interface can be configured to launch the application. When launched it passes the script name and account ID. It can also pass a *navigation option* to automatically load the appropriate page (if this information is not part of the script).

To do this, parameters are appended to the standard system URL. The following parameters may be supplied:

- script=<scriptname>
- ACCT_ID=<account id>
- location=<navigation option>

Parameters are added to the standard system URL by appending a question mark (?) to the end and then adding the "key=value" pair. If you require more than one parameter, use an ampersand (&) to separate each key=value pair.

For example, the following URLs are possible ways to launch the **StopAutoPay** script at startup, assuming your standard URL for launching the system is http://system-server:1234/cis.jsp:

- http://system-server:1234/cis.jsp?script=StopAutoPay
- http://system-server:1234/cis.jsp?script=StopAutoPay&ACCT_ID=1234512345
- http://system-server:1234/cis.jsp?script=StopAutoPay&ACCT_ID=1234512345&location=accountMaint

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=StopAutoPay&location=accountMaint
- http://system-server:1234/cis.jsp?ACCT_ID=1234512345&location=accountMaint&script=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'd also be a temporary storage variable called **ACCT_ID** that holds the passed value).

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 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

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.

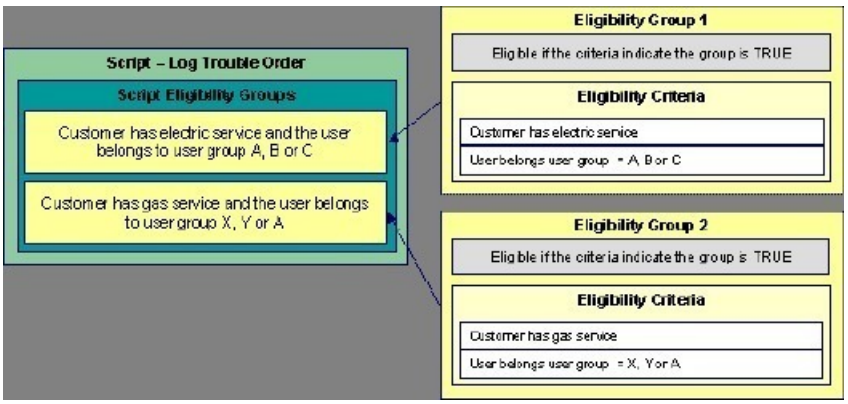
Criteria Groups versus Eligibility Criteria

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

We'll 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
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 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					
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). Refer to SECF-ACCTFLD in the product documentation for an example of an algorithm type that retrieves a field value from an account.

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).

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).

> **NOTE: The time span algorithm can be used to compare days, weeks, months, etc.** Refer to *SECC-TIMESPN* for more information about this algorithm.

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**
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 *SECF-USRNGRP* for an example of this type of algorithm.
- 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

FASTPATH: 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 two types of server-based scripts, **Plug-In** scripts and **Service** scripts.

- Plug-in scripts allow an implementation to develop routines that are executed from the system's various plug-in spots without coding. For example, an implementation could configure a plug-in script that is executed every time an adjustment of a given type is frozen.
- 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.

The topics in this section describe background topics relevant to server-based scripts.

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.

Rather than write a java program for a plug-in spot, you can create a plug-in using the scripting "language". In essence, this is the only difference between a program-based plug-in and a script-based one. Obviously, this is a significant difference as it allows you to implement plug-ins without programming (and compilers).

The following topics describe basic concepts related to plug-in scripts.

A Plug-In Script's API

Like program-based plug-ins, plug-in scripts:

- Run on the application server
- Have their API (input / output interface) defined by the plug-in spot (i.e., plug-in scripts don't get to declare their own API)
- Can only be invoked by the "plug-in spot driver"

The best way to understand a plug-in script's API is to use the **View Script Schema** hyperlink to view its parameters data area schema.

```
<schema>
  <parm type="group">
    <soft type="list">
      <value/>
    </soft>
    <hard type="group">
      <action use="input"/>
      <businessObject type="group" use="input">
        <id/>
      </businessObject>
```

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 (this is equivalent to what a Java programmer does for plug-ins written in Java).
- 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.

Setting Up Plug-In Scripts

You can write plug-in scripts for all plug-in spots that have been Java-enabled. 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).
- 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.

NOTE: No plug-in scripts are shipped with the base-package.

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 the scripting (rather than programming).

The following topics describe basic concepts related to 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: Schema Definition Tips. A context sensitive "Script Tips" zone appears when you open the *Script* page to assist you with the schema definition syntax. The zone provides a complete list of the XML nodes and attributes available to you when you construct a schema.

Invoking Service Scripts

Any type of script 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.

Debugging Server-Based Scripts

The server can create log entries to help you debug your server scripts. These logs are only created if you do the following:

- Start the system in **?debug=true** mode
- Turn on the **Global debug** checkbox in the upper corner of the browser. When you click this check box, a pop-up appears asking you what you want to trace - make sure to check box that causes script steps to be traced.

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.

You can view the contents of the logs by pressing the **Show User Log** button appears at the top of the browser.

Please note that all log entries for your user ID are shown (so don't share user IDs).

Maintaining Scripts

The script maintenance transaction is used to maintain your scripts. The topics in this section describe how to use this transaction.

FASTPATH: Refer to *The Big Picture Of Scripts* for more information about scripts.

Script - Main

Use this page to define basic information about a script. Open this page using **Admin** > **System** > **Script**.

NOTE: **Script Tips.** A context sensitive "Script Tips" zone is associated with this page. The zone provides useful tips on various topics related to setting up scripts.

Description of Page

Enter a unique **Script** code and **Description** for the script. Use the **Detailed Description** to describe the purpose of this script in detail. **Owner** indicates if the script is owned by the base package or by your implementation (**Customer Modification**).

CAUTION: Important! If you introduce a new script, carefully consider its naming convention. Refer to *System Data Naming Convention* for more information.

Script Type indicates if this is a **BPA Script**, **Plug-In Script** or **Service Script**. Refer to *The Big Picture Of BPA Scripts* and *The Big Picture Of Server Based Scripts* for more information.

Accessibility Option appears only for BPA scripts. 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 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.

Enter an **Application Service** if the execution of the script should be secured. The application service should include **Execute** as one of its access modes. Refer to *Securing Script Execution* for more information.

Algorithm Entity appears only for *plug-in scripts*. Use this field to define the *algorithm entity* into which this script can be plugged in.

Business Object appears only for business object related plug-in scripts. Enter the *Business Object* whose elements are to be referenced by the plug-in script.

Script Engine Version defines the version of the XML Path Language (XPath) to be used for the script. Script engine 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.

Notes regarding Script engine version 1: The XPath library used is Jaxen; for BPA scripts, use IE's built-in MSXML parser; 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.

Click the **View Script Schema** to view the *script's data areas* on the *schema viewer* window.

Click the **View XSD** hyperlink to view a service script's schema definition in XSD format.

The **View Script As Text** hyperlink appears for server-based scripts only. Click this link to view the internal scripting commands in a separate window. The presented script syntax is valid within *edit data* steps.

The *tree* summarizes the script's steps. You can use the hyperlink to transfer you to the **Step** tab with the corresponding step displayed.

Script - Step

Use this page to add or update a script's steps. Open this page using **Admin** > **System** > **Script** and then navigate to the **Step** tab.

NOTE: Time saver. You can navigate to a step by clicking on the respective node in the tree on the Main tab.

Description of Page

The **Steps** accordion contains an entry for every step linked to the script. When a script is initially displayed, its steps are collapsed. To see a step's details, simply click on the step's summary bar. You can re-click the bar to collapse the step's details. Please see *accordions* for the details of other features you can use to save time.

Select the **Step Type** that corresponds with the step. Refer to *How To Set Up Each Step Type* for an overview of the step types.

CAUTION: The Step Type affects what you can enter on other parts of this page. The remainder of this section is devoted to those fields that can be entered regardless of Step Type. The subtopics that follow describe those fields whose entry is contingent on the Step Type.

StepSequence defines the relative position of this step in respect of the other steps. The position is important because it defines the order in which the step is executed. You should only change a Step Sequence if you need to reposition this step. But take care; if you change the Step Sequence and the step is referenced on other steps, you'll have to change all of the referencing steps.

NOTE: Leave gaps in the sequence numbers. Make sure you leave space between sequence numbers so that you can add new steps between existing ones in the future. If you run out of space, you can use the **Renumber** button to renumber all of the steps. This will renumber the script's steps by 10 and change all related references accordingly.

Display Step is only enabled on BPA scripts for step types that typically don't cause information to be displayed in the *script area* (i.e., step types like **Conditional Branch**, **Go to a step**, **Height**, etc). If you turn on this switch, information about the step is displayed in the script area to help you debug the script.

CAUTION: Remember to turn this switch off when you're ready to let users use this script.

NOTE: If **Display Step** is turned on and the step has **Text**, this information will be displayed in the script area. If **Display Step** is turned on and the step does NOT have **Text**, a system-generated messages describing what the step does is displayed in the script area.

Display Icon controls the *icon* that prefixes the **Text** that's displayed in the script area. Using an icon on a step is optional. This field is only applicable to BPA scripts.

Text is the information that displays in the *script area* when the step executes. You need only define text for steps that cause something to display in the script area.

FASTPATH: Refer to *How To Substitute Variables In Text* for a discussion about how to substitute variables in a text string.

FASTPATH: Refer to *How To Use HTML Tags And Spans In Text* for a discussion about how to format (with colors and fonts) the text that appears in the script area.

The other fields on this page are dependent on the **Step Type**. The topics that follow briefly describe each step type's fields and provide additional information about steps.

Click on the **View Script Schema** hyperlink to view the script's data areas. Doing this opens the *schema viewer* window.

The **View Script As Text** hyperlink appears for server-based scripts only. Click this link to view the internal scripting commands in a separate window. The presented script syntax is valid within *edit data* steps.

How To Set Up Each Step Type

The contents of this section describe how to set up each type of step.

Common Step Types To All Script Types

The contents of this section describe common step types applicable to all script types.

How To Set Up 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:

- **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.

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.

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.

How To Set Up Edit Data Steps

Edit data steps provide a free format region where you can specify commands to control your script processing.

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**.

For server-based scripts, you may find it useful to create a few explicit step types and then use the **View Script as Text** hyperlink on the *Script - Step* page to better understand the edit data syntax.

> **NOTE:** Not all BPA step types are supported using the edit data syntax. **Tips.** Refer to the tips context zone associated with the script maintenance page for more information on edit data commands and examples.

Additional field required for **Edit data** steps:

Enter your scripting commands in the **Edit Data Text** field.

How To Set Up 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.

How To Set Up 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.

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**.

> **NOTE:** **Performance note**. The actions **Fast Add** and **Fast Update** should be used when the business object's data area does not need to be re-read subsequent to the **Add** or **Update** action. In other words, the **Add** and **Update** actions are equivalent to **Fast Add + Read** and **Fast Update + Read** .

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.

How To Set Up 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.

How To Set Up 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.

How To Set Up 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.

How To Set Up 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.
- **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**.
- **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 in a BPA script when the source value is a global variable.
- **Page Data Model**. Use this field type in a BPA script 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). Refer to *How To Find The Name Of Page Data Model Fields* for instructions on how to find the appropriate **Field Name**.
- **Portal Context**. Use this field type when the source value is a variable in the portal context.
- **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 **%ONAMEmerged 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**.

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.
- **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**.
- **Portal Context**. Use this field type in a BPA script when the destination to be updated is in the current portal context.
- **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.
- **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**.

NOTE: Conditional field types. The field types **Current To Do Information**, **Page Data Model** and **User Interface Field** are only applicable to BPA scripts.

How To Set Up 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:

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 the tips zone associated with the Script page for the actual syntax of initiating an error message.

NOTE: The ability to terminate a step in error is only supported for server-based scripts.

Step Types Applicable to BPA Scripts only

The contents of this section describe step types that are only applicable to BPA scripts.

How To Set Up Display Text Steps

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.

NOTE: **Conditional step type.** This step type is only applicable to BPA scripts.

How To Set Up Height Steps

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.

NOTE: **Conditional step type.** This step type is only applicable to BPA scripts.

How To Set Up Input Data Steps

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.

NOTE: Conditional step type. This step type is only applicable to BPA scripts.

How To Set Up Invoke Function Steps

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.

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.

FASTPATH: 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.

- **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).

NOTE: Conditional step type. This step type is only applicable to BPA scripts.

How To Set Up Invoke Map Steps

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*.
- 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.
- Select **Pop-up Window** if the map should be launched in a separate window.

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.
- **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.

NOTE: Conditional step type. This step type is only applicable to BPA scripts.

How To Set Up Mathematical Operation Steps

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.

- **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**.

NOTE: Conditional step type. This step type is only applicable to BPA scripts.

How To Set Up Navigate To A Page Steps

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 dashboard, 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*.

NOTE: Conditional step type. This step type is only applicable to BPA scripts.

How To Set Up Perform Script Steps

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:

Subscript is the name of the script that is performed.

NOTE: Conditional step type. This step type is only applicable to BPA scripts.

How To Set Up Press A Button Steps

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.

NOTE: Conditional step type. This step type is only applicable to BPA scripts.

How To Set Up Prompt User Steps

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.

- **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.

NOTE: Conditional step type. This step type is only applicable to BPA scripts.

How To Set Up Set Focus To A Field Steps

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.

NOTE: Conditional step type. This step type is only applicable to BPA scripts.

How To Set Up Transfer Control Steps

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.

> **NOTE: Conditional step type.** This step type is only applicable to BPA scripts.

Additional Topics

The contents of this section provide additional information about steps.

How To Find The Name Of User Interface Fields

Follow these steps to find the name of a field that resides on a page:

- Navigate to the page in question.
- Right click in the body of the page (but not while the pointer is in an input field). Note, if the field in question resides in a grid, you must right click while the pointer is in the section that contains the grid (but not while the pointer is in an input field in the grid) - this is because there's a separate HTML document for each grid on a page.
- Select **View Source** from the pop-up menu to display the source HTML.
- Scroll to the Widget Info section (towards the top of the HTML document). It contains a list of all of the objects on a page. For example, the following is an example from the Account - Main page:

```
widget Info:
    widget_ID , Element Type - label info - label
    ENTITY_NAME, IL - $ENTITY_NAME -  Name
    ACCT_ID, IT - $ACCT_ID -  Account ID
    ACCT_CHECK_DIGIT, IL - $ACCT_CHECK_DIGIT -  Account Check Digit
    IM_ACCT_ID, IM - $SEARCH_FOR_ACC_LBL -  Search for Account
    COLL_CL_CD, HD - $COLL_CL_CD -  Collection Class
    SETUP_DT, IT - $SETUP_DT -  Set Up Date
    CURRENCY_CD, IS - $CURRENCY_CD -  Currency Code
    CIS_DIVISION, IS - $CIS_DIVISION -  CIS Division
    PROTECT_DIV_SW, CB - CI_ACCT$PROTECT_DIV_SW -  Protect CIS Division
    CUST_CL_CD, IS - $CUST_CL_CD -  Customer Class
    ACCESS_GRP_CD, IT - $ACCESS_GRP_CD -  Access Group
    IM_ACCESS_GRP_CD, IM - $SRCH_ACC_GRP_CD -  Search for Access Group
    ACCESS_DESCR, IL - $DESCR -  Description
    ACCT_MGMT_GRP_CD, IT - $ACCT_MGMT_GRP_CD -  Account Management Group
    IM_ACCT_MGMT_GRP_CD, IM - $SEARCH_FOR_TDR_LBL -  Search for To Do Role
    MGMT_DESCR, IL
    ALERT_INFO, IA - $ALERT_INFO -  Alert Information
    BILL_CYC_CD, IS - $BILL_CYC_CD -  Bill Cycle
    BILL_AFTER_DT, IT - $BILL_AFTER_DT -  Bill After
    PROTECT_CYC_SW, CB - $PROTECT_CYC_SW -  Protect Bill Cycle
    BILL_PRT_INTERCEPT, IT - $BILL_PRT_INTERCEPT -  Bill Print Intercept
    IM_BILL_PRT_INTERCEPT, IM - $FOR_BILL_PRINT_LBL -  Search for User
    MAILING_PREM_ID, IT - $MAILING_PREM_ID -  Mailing Premise
    IM_MAILING_PREM_ID, IM - $SEARCH_FOR_MAI_LBL -  Search for Mailing Premise
    PREM_INFO, IL
    PROTECT_PREM_SW, CB - $PROTECT_PREM_SW -  Protect Mailing Premise
    dataframe, GD
```

The field names that you'll reference in your scripts are defined on the left side of the HTML (e.g., ENTITY_NAME, ACCT_ID, CUST_CL_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 persons scroll that appears on Account - Person. Notice that the fields in the scroll are prefixed with the name of the scroll plus a **$** sign. For example, the person's ID is called **ACCT_PER$PER_ID**.

```
widget Info:
    widget_ID , Element Type - label info - label
    ENTITY_NAME, IL - $ENTITY_NAME -  Name
    PREM_INFO, HD
    ACCT_ID, IT - $ACCT_ID -  Account ID
    ACCT_CHECK_DIGIT, IL - $ACCT_CHECK_DIGIT -  Account Check Digit
    IM_ACCT_ID, IM - $SEARCH_FOR_ACC_LBL -  Search for Account
    ACCT_PER$recordCount, SN - $OF_LBL -  of
    ACCT_PER$PER_ID, IT - $PER_ID -  Person ID
    IM_ACCT_PER$PER_ID, IM - $FOR_PERSON_LBL -  Search for Person
    ACCT_PER$ENTITY_NAME, IL - $ENTITY_NAME -  Name
    ACCT_PER$MAIN_CUST_SW, CB - $MAIN_CUST_SW -  Main Customer
    ACCT_PER$FIN_RESP_SW, CB - $FIN_RESP_SW -  Financially Responsible
    ACCT_PER$THRD_PTY_SW, CB - $THRD_PTY_SW -  Third Party Guarantor
    ACCT_PER$ACCT_REL_TYPE_CD, IS - CI_ACCT_PER$ACCT_REL_TYPE_CD -  Relationship Type
    ACCT_PER$WEB_ACCESS_FLG, IS - $WEB_ACCESS_FLG -  Web Self Service Access Flag
    ACCT_PER$PFX_SFX_FLG, IS - $PFX_SFX_FLG -  Prefix/Suffix
    ACCT_PER$NAME_PFX_SFX, IT - $NAME_PFX_SFX -  Pfx/Sfx Name
    ACCT_PER$RECEIVE_COPY_SW, CB - $RECEIVE_COPY_SW -  Receives Copy of Bill
    ACCT_PER$BILL_RTE_TYPE_CD, IS - $BILL_RTE_TYPE_CD -  Bill Route Type
    ACCT_PER$BILL_RTE_TYPE_INFO, IL
    ACCT_PER$BILL_RTG_METH_FLG, HD
    ACCT_PER$BILL_FORMAT_FLG, IS - $BILL_FORMAT_FLG -  Bill Format
```

The names of fields that reside in grids are in a slightly different format. The following is an example of the HTML for the names grid that appears on Person - Main. Notice that the fields in the grid are prefixed with the name of the grid plus a **:x $**. For example, the person's name is called **PER_NAME:x$ENTITY_NAME**. 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" (e.g., 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
    PER_NAME:x$NAME_TYPE_FLG, IS - $NAME_TYPE_FLG -  Name Type
    PER_NAME:x$ENTITY_NAME, IT - CI_PER_NAME$ENTITY_NAME -  Person Name
```

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

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:

- IM_GOBACK
- IM_HISTORY
- IM_GOFORWARD
- IM_menuButton
- IM_USER_HOME
- IM_MY_PREF
- IM_helpButton
- IM_aboutButton

If you want a **Press a button** step to press a button in the page actions toolbar, use one of the following names:

- IM_SAVE
- IM_REFRESH
- IM_CLEAR
- IM_COPY
- IM_DELETE
- IM_ScrollBack
- IM_ScrollForward

The following buttons are also supported:

- IM_TO_DO. This brings you to the *To Do Summary* page.
- IM_PrevTo Do. This simulates clicking the **Previous To Do** button in the *Current To Do Zone*.
- IM_NextTo Do. This simulates clicking the **Next To Do** button in the *Current To Do Zone*.
- IM_CurrentTo Do. This navigates to the *To Do Entry* page for the user's current To Do. Refer to *A User's Current To Do* for more information.
- IM_MINIMIZE_DASHBOARD. Pressing this will collapse the dashboard.
- IM_MAXIMIZE_DASHBOARD. Pressing this will expand the dashboard.

Follow these steps to find the name of other buttons that reside in the object display area:

- Navigate to the page in question.
- Right click in the body of the page (but not while the pointer is in an input field). Note, if the field in question resides in a grid, you must right click while the pointer is in the section that contains the grid (but not while the pointer is in an input field in the grid) - this is because there's a separate HTML document for each grid on a page.
- The option to select may differ based on the browser you are using. For example, for some browsers, the option may be **View Source**. For others, the option may be **This Frame** and then **Frame Source**
- Scroll to the Widget Info section (towards the top of the HTML document). It contains a list of all of the objects on a page, including buttons.
- 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 To Do Entry - Main page (notice the **IM** fields for the iconized buttons).

```
* Widget Info:
*     Widget_ID , Element Type - label info - label
*     TD_ENTRY_INFO, IL - $TD_ENTRY_INFO -  To Do Info
*     TD_ENTRY_ID, IT - CI_TD_ENTRY$TD_ENTRY_ID -  To Do ID
*     IM_TD_ENTRY_ID, IM - $TD_ENTRY_ID_SRCH -  Search for Entry Id
*     TD_TYPE_CD, IL - $TD_TYPE_CD -  To Do Type
*     TYPE_DESCR, IL
*     ROLE_ID, IL
*     ROLE_DESCR2, IL - $DESCR -  Description
*     FULL_MSG, PL - $GOTO_TD_ACTION_LBL -  Work on To Do
*     IM_EXP_MSG_LONG, IM - $DISPLAY_MESSAG_LBL -  Display Message Explanation
```

- Transaction-specific actions buttons (e.g., the buttons use to complete or forward a To Do) are represented as switches. The following is an example of the HTML on the To Do Entry - 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.

```
*     COMPLETE_SW, BU - $COMPLETE_SW -  Complete
*     FORWARD_SW, BU - $FORWARD_SW -  Forward
*     SEND_BACK_SW, BU - $SEND_BACK_SW -  Send Back
```

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.

Please refer to an HTML reference manual or website for more examples.

You can also use "spans" to customize the look of the contents of a text string. For example, your text string could be "Press Continue after you've selected the customer". This would make the word "Continue" appear as large, bold, Courier text. Please refer to a Cascading Style Sheets (CSS) reference manual or website for more examples.

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

As described above, some 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. The following global variables exist:

- **%PARM-<name>** 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** is to be used to compare against **%PARM-<name>** parameters to check if the parameter has been set or not when the application was launched. A parameter that has not been set would test as equal to this global variable. It is recommended to test parameters against this global variable before using them for the first time.
- **%CONTEXT-PERSONID** is a constant that contains the ID of the current person
- **%CONTEXT-ACCOUNTID** is a constant that contains the ID of the current account
- **%CONTEXT-PREMISEID** is a constant that contains the ID of the current premise
- **%BLANK** is a constant that contains a blank value, i.e. no value
- **%SPACE** is a constant that contains a single space value
- **%CURRENT-DATE** is the current date (as known by the browser, not the server)
- **%SAVE-REQUIRED** is a flag that contains an indication of whether the data on a page has been changed (and this 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**.
- **%NEWLINE** is a constant that contains a new line character (carriage return). Upon substitution, a line break is inserted in the resultant text.

> **NOTE:** The constant **%NEWLINE** 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.

In addition, if an **Invoke Function** step returns an error, the following global variables contain information about the error:

- **%ERRMSG-CATEGORY** and **%ERRMSG-NUMBER** contain the unique identifier of the error message number.
- **%ERRMSG-TEXT** contains the brief description of the error.
- **%ERRMSG-LONG** contains 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.

> **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
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.

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.
- **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 from the data area name. For example, use "CaseLogAdd/caseID" to reference a top-level "caseID" element in a script data area called "CaseLogAdd".

You don't have to type in long XPath notions. Use the **View Script Schema** hyperlink provided on the *Script - Step* tab page to launch the script's data areas schema.

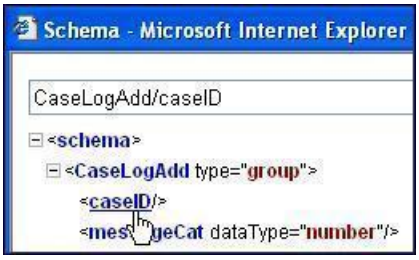


Figure 4: Schema Viewer

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 *Script - Data Area* to the same effect. These open up the schema viewer for a specific data area respectively.

Script - Data Area

Use this page to define the data areas used to pass information to and from the server or any other data area describing your temporary storage. Open this page using **Admin** > **System** > **Script** and then navigate to the **Data Area** tab.

Description of Page

The grid contains the script's data areas declaration. For steps that invoke an object that is associated with a schema, you must declare the associated schema as a data area for your script. In addition, if you have defined one or more data areas to describe the script's temporary storage, you need to declare them too. The following bullets provide a brief description of each field on a script data area:

- **Schema Type** defines the type of schema describing the data area's element structure.
- The data area's schema is the one associated with the referenced **Object**. Only objects of the specified Schema Type may be selected.
- **Data Area Name** uniquely identifies the data area for referencing purposes. By default, the system assigns a data area with the associated object name.
- Click on the **View Data Area** link to view the data area's schema in the *schema viewer* window.

The **View Service Script Data Area** link appears for service scripts only. Use this link to view the script's parameters data area schema in the *schema viewer* window.

The **View Plug-In Script Data Area** link appears for plug-in scripts only. Use this link to view the script's parameters data area schema in the *schema viewer* window.

FASTPATH: Refer to *A Script May Declare Data Areas* for more information on data areas.

Script - Schema

Use this page to define the data elements passed to and from a service script. Open this page using **Admin** > **System** > **Script** and then navigate to the **Schema** tab.

NOTE: **Conditional tab page.** This tab page only appears for *service scripts*.

Description of Page

The contents of this section describe the zones that are available on this portal.

The **General Information** zone displays the script name and description.

The *Schema Designer* zone allows you to edit the service script's parameters schema. The purpose of the schema is to describe the input and output parameters used when invoking the script.

> **NOTE: Script Definition Tips.** A context sensitive "Script Tips" zone is associated with this page. The zone provides a complete list of the XML nodes and attributes available to you when you construct a schema as well as other useful information assisting with setting up scripts.

The **Schema Usage Tree** zone summarizes all cross-references to this schema. For each type of referencing entity, the *tree* displays a summary node showing a total count of referencing items. The summary node appears if at least one referencing item exists. Expand the node to list the referencing items and use their description to navigate to their corresponding pages.

Script - Eligibility

Use this page to define a script's eligibility rules. Open this page using **Admin** > **System** > **Script** and then navigate to the **Eligibility** tab.

> **NOTE: Conditional tab page.** This tab page only appears for *BPA scripts*.

Description of Page

Use the **Eligibility Option** to indicate whether the script is **Always Eligible**, **Never Eligible** or to **Apply Eligibility Criteria**. The remaining fields on the page are only visible if the option is **Apply Eligibility Criteria**.

> **CAUTION:** The following information is not intuitive; we strongly recommend that you follow the guidelines under *The Big Picture Of Script Eligibility* before attempting to define this information.

The **Eligibility Criteria Group** scroll contains one entry for each group of eligibility criteria. The following fields may be defined for each group:

- Use **Sort Sequence** to control the relative order in which the group is executed when the system determines if the script should appear in the *script search*.
- Use **Description** and **Long Description** to describe the criteria group.
- Use **If Group is True** to define what should happen if the eligibility criteria (defined in the following grid) return a value of **True**.
  - Choose **Eligible** if this script should appear.
  - Choose **Ineligible** if this script should not appear.
  - Choose **Check Next Group** if the next criteria group should be checked.
- Use **If Group is False** to define what should happen if the eligibility criteria (defined in the following grid) return a value of **False**.
  - Choose **Eligible** if this script should appear.
  - Choose **Ineligible** if this script should not appear.
  - Choose **Check Next Group** if the next criteria group should be checked.

The grid that follows contains the script's eligibility criteria. Think of each row as an "if statement" that can result in the related eligibility group being true or false. For example, you might have a row that indicates the script is eligible if the current account in context belongs to the residential customer class. The following bullets provide a brief description of

each field on an eligibility criterion. Please refer to *Defining Logical Criteria* for several examples of how this information can be used.

- Use **Sort Sequence** to control the order in which the criteria are checked.
- Use **Criteria Field** to define the field to compare:
  - Choose **Algorithm** if you want to compare anything other than a characteristic. Push the adjacent search button to select the algorithm that is responsible for retrieving the comparison value. Click *here* to see the algorithm types available for this plug-in spot.
  - Some products may also include an option to choose **Characteristic**. Choosing this option displays adjacent fields to define the object on which the characteristic resides and the characteristic type. The objects whose characteristic values may be available to choose from depend on your product.
- Use **Criteria Comparison** to define the method of comparison:
  - Choose **Algorithm** if you want an algorithm to perform the comparison and return a value of True, False or Insufficient Data. Push the adjacent search button to select the algorithm that is responsible for performing the comparison. Click *here* to see the algorithm types available for this plug-in spot.
  - Choose any other option if you want to compare the **Criteria Field** using a logical operator. The following options are available:
    - Use >, <, =, >=, <=, <> (not equal) to compare the **Criteria Field** using standard logical operators. Enter the comparison value in the adjacent field.
    - Use **IN** to compare the **Criteria 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 **Criteria 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.
- The next three fields control whether the related logical criteria cause the eligibility group to be considered true or false:
  - Use **If True** to control what happens if the related logical criterion returns a value of True. You have the options of **Group is true**, **Group is false**, or **Check next condition**. If you indicate **Group is true** or **Group is false**, the script is judged **Ineligible** or **Eligible** based on the values defined above in **If Group is False** and **If Group is True**.
  - Use **If False** to control what happens if the related logical criterion returns a value of False. You have the options of **Group is true**, **Group is false**, or **Check next condition**. If you indicate **Group is true** or **Group is false**, the script is judged **Ineligible** or **Eligible** based on the values defined above in **If Group is False** and **If Group is True**.
  - Use **If Insufficient Data** to control what happens if the related logical criterion returns a value of "Insufficient Data". You have the options of **Group is true**, **Group is false**, or **Check next condition**. If you indicate **Group is true** or **Group is false**, the script is judged **Ineligible** or **Eligible** based on the values defined above in **If Group is False** and **If Group is True**.

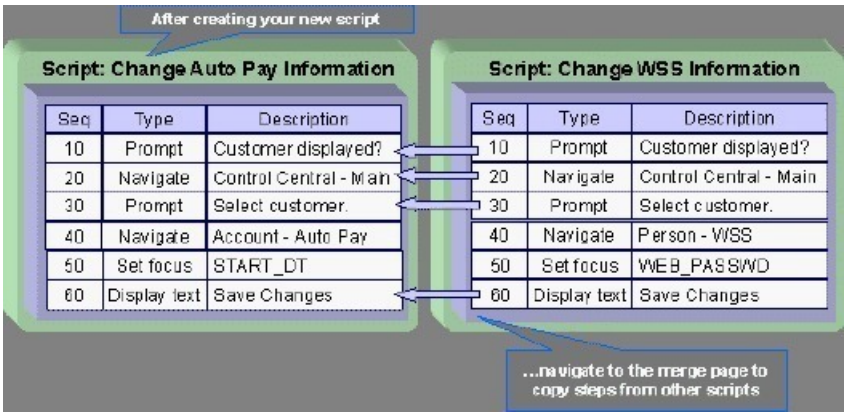
Merging Scripts

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.

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

Open **Admin** > **System** > **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.

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.

FASTPATH: Refer to *Editable Grid* in the system wide standards documentation for more information about adding records to a collection by selecting from a list and repositioning rows within a 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.

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	Descript
		Merge	40	Navigate to a page	Navigat userGro

	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	Descript
		Merge	40	Navigate to a page	Navigat userGro

	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

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

Use this page to define basic information about a function. Open this page using **Admin** > **System** > **Function**.

Description of Page

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:** In this release, only page services can be invoked.

Click the **View XML** hyperlink to view the XML document used to pass data to and from the service. Doing this causes the XML document to be displayed in the Application Viewer.

> **NOTE: XML document may not be viewable.** If you create a new page service and do not regenerate the application viewer, you will not be able to view its XML document.

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** > **Function** > **System** 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 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.

> **NOTE: Usability suggestion.** You populate a field's value in an XML document by specifying the appropriate XPath expression for each field. Rather than referring to an XPath manual, the system can create the XPath expression for you. To do this, click the adjacent **View XML** hyperlink. This will display the XML document used to communicate with the **Service** defined on the Main page. After the XML document is displayed, click the **XPath** hyperlink adjacent to

the desired field to see how the XPath expression looks. You can then cut / paste this XPath expression into the **XML Population Logic Field**.

Function - Receive Fields

Use this page to add or update the fields received from the service. Open this page using **Admin** > **System** > **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: Usability suggestion. You retrieve a field's value in an XML document by specifying the appropriate XPath expression for the field. Rather than referring to an XPath manual, the system can create the XPath expression for you. To do this, click the adjacent **View XML** hyperlink. This will display the XML document used to communicate with the **Service** defined on the Main page. After the XML document is displayed, click the **XPath** hyperlink adjacent to the desired field to see how the XPath expression looks. You can then copy / paste this XPath expression into the **XML Population Logic Field**.

NOTE: Fields in multiple lists. Note that the XPath expression generated in the application viewer refers to lists using a generic “list” reference. 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. Adjust the Application Viewer’s generated XPath by adding the list name, which can be found in the overview panel in the Service XML viewer. 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’]**.

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

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

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.

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** > **Business Object** > **Search** and search for business objects related to the Maintenance Object for Attachments (**F1-ATCHMT**).

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.

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.

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.

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. This typically entails the creation of a special zone that retrieves a list of existing attachment records that reference the current record as its foreign key (owner). The zone would include links or buttons to add, upload or view an attachment.

If your product already has support for viewing and maintaining owned attachments on one of the base portals, that may be used as an example to follow. If your product does not have support for owned attachments, contact customer support 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.

Maintaining Attachments

This section describes the functionality supported for viewing and maintaining attachments.

Navigate using **Admin** > **General** > **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.

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.

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 the file to upload. Once the 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.

Application Viewer

The Application Viewer allows you to explore meta-data driven relationships and other deliverable files online.

NOTE: Running Stand-Alone. You can also launch the Application Viewer as a stand-alone application (i.e., you do not need to start it from within the system). Refer to *Application Viewer Stand-Alone Operation* for more information about running the Application Viewer as a stand-alone application.

To open the application viewer from within your application, navigate to **Admin** > **Application Viewer**. The application viewer may also be launched from other locations for example when viewing a section of the online help files that contain hypertext for a table name, clicking on that hypertext brings you to the definition of that table in the data dictionary.

Application Viewer Toolbar

The Toolbar provides the main controls for using the Application Viewer. Each button is described below.

Data Dictionary Button

The **Data Dictionary** button switches to the Data Dictionary application.

Physical and Logical Buttons

The **Physical** button changes the display in the List Panel from a logical name view to a physical name view. Note that the Tables are subsequently sorted by the physical name and therefore may not be in the same order as the logical name view. Once clicked, this button toggles to the Logical button.

The **Logical** button changes the display in the List Panel from a physical name view to a logical name view. Note that the Tables are subsequently sorted by the logical name and therefore may not be in the same order as the physical name view. Once clicked, this button toggles to the Physical button.

These buttons are only available in the Data Dictionary.

Collapse Button

The **Collapse** button closes any expanded components on the list panel so that the child items are no longer displayed.

This button is only available in the Data Dictionary viewer.

Attributes and Schema Button

The **Attributes** button changes the display in the Detail Panel from a related tables view to an attribute view. Once clicked, this button toggles to the Schema button.

The **Schema** button changes the display in the Detail Panel from an attribute view to a related tables view. Once clicked, this button toggles to the Attributes button. Note that only tables have this view available. Columns are always displayed in an attribute view.

These buttons are only available in the Data Dictionary.

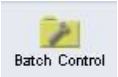
Maintenance Object Button

The **Maintenance Object** button switches to the Maintenance Object viewer application.

Algorithm Button

The **Algorithm** button switches to the Algorithm viewer application.

Batch Control Button



The **Batch Control** button switches to the Batch Control viewer application.

To Do Type Button

The **To Do Type** button switches to the To Do Type viewer application.

Description and Code Buttons

The **Description** button changes the display in the List Panel to Description (Code) from Code (Description). Note that the list is subsequently sorted by the description. Once clicked, this button toggles to the Code button.

The **Code** button changes the display in the List Panel to Code (Description) from Description (Code). Note that the list is subsequently sorted by the Code. Once clicked, this button toggles to the Description button.

These buttons are only available in the Batch Control and To Do Type viewers.

Service XML Button

The **Service XML** button switches to the Service XML viewer. This button is not available when you are already in the Service XML viewer.

You are prompted to enter the name of the service XML file you want to view. The name of the service XML file should be entered without the extension.

Select Service Button

The **Select Service** button loads another service XML file that you specify. This button is only available in the Service XML viewer.

You are prompted to enter the name of the service XML file you want to view. The name of the service XML file should be entered without the extension.

Java Docs Button

The **Java Docs** button switches to the Java Docs viewer.

Classic Button

This button is only available in the Java Docs viewer.

The **Classic** button launches the classic Javadocs viewer on a separate window. If you are more comfortable with that look you can use this viewer instead.

Preferences Button

The **Preferences** button allows you to set optional switches used by the Application Viewer. Refer to *Application Viewer Preferences* for more information.

Help Button

The **Help** button opens the Application Viewer help system. You used this button to access this information.

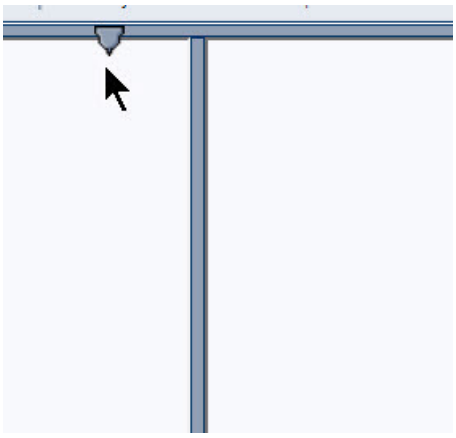
About Button

The **About** button opens a window that shows when was each Application Viewer data component recently built.

Data for all application viewer components may be regenerated to incorporate up-to-date implementation-specific information. Refer to *Application Viewer Generation* for further details.

Slider Icon

This "slider" icon allows you to resize the list panel and detail panel to your preferred proportions.



Data Dictionary

The data dictionary is an interactive tool that allows you to browse the database schema and to graphically view relationships between tables in the system.

To open the data dictionary, click the *Data Dictionary button*. You can also open the data dictionary by clicking the name of a table in other parts of the application viewer or in the online help documentation.

NOTE: Data Is Generated. A background process generated the data dictionary information. Refer to *Application Viewer Generation* for further details.

Using the Data Dictionary List Panel

The list panel displays a list of tables and their columns. The list panel can list the table names by either their logical names or their physical names. Click the appropriate *button* on the toolbar to switch between the two views. The list is displayed in alphabetical order, so the order may not be the same in both views. Both views function in a similar manner.

In the list panel, you can navigate using the following options:

- Click the right arrow icon to expand a table to show its columns.
- Click the down arrow icon to collapse the column list for a table. Optionally, collapse all column lists by using the **Collapse** button.
- Click the column name to display information about the column in the detail panel.
- If the detail panel is in *related table* view, click the table name to view its related tables. If the detail panel is in *table detail* view, click the table name to display its information.

Primary And Foreign Keys

The columns in the list panel may display key information as well as the column name:

- A yellow key indicates that the column is a primary key for the table.
- A light blue key indicates that the column is a foreign key to another table. If you hover the cursor over the icon, the tool tip indicates the foreign table.
- A dark blue key indicates that the column is a conditional foreign key. A 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.
- A red key indicates that the column is a logical key field. A logical key represents an alternate unique identifier of a record based on a different set of fields than the primary key.

If you hover your cursor over an icon, the tool tip indicates the key type.

Field Descriptions Shown

The language-specific, logical name of each field is shown adjacent to the physical column name in the data dictionary. You can enter an override label for a *table / field's* to be used throughout the system as the field's logical name. Here too it is the override label that is shown.

NOTE: Regenerate. You should regenerate the data dictionary after overriding labels. Refer to *Application Viewer Generation* for further details.

Using the Data Dictionary Detail Panel

The Data Dictionary detail panel displays the details of the selected item. There are three main displays for the Detail Panel:

- Related tables view
- Table detail view
- Column detail view

Related Tables View

The Related Tables view displays information about the table's parent tables and child tables. Click the *Schema* button in the toolbar to switch to related tables view.

In the related tables view, you can navigate using the following options:

- Click the left arrow and right arrow icons to view the related tables for that linked table. The List Panel is automatically positioned to the selected table.
- Click the maintenance object icon ( ) to view the table's maintenance object.
- If you want to position the *List Panel* to view the columns for different table click the name of the table for which you want to view the columns.

Table Detail View

The table detail view displays information about the selected table. Click *Attributes* (in the toolbar) to switch to the table detail view.

In the table detail view, you can navigate using the following options:

- If user documentation is available for the table, click the View User Documentation link to read the user documentation that describes the table's maintenance object.
- If the table has an associated Language Table, click the link to view the Language Table details.
- If there is an associated Maintenance Program, click the link to view the source code for the maintenance program (you are transferred to the *Java Docs Viewer*).
- If there is an associated Key Table, click the link to view the Key Table details.

Column Detail View

Click on a column name in the list panel to switch to the column detail view. The Column Detail view displays information about the selected column.

In the column detail view, you can navigate using the following options:

- If user documentation is available for the column, click the View User Documentation link to read about the column's related maintenance object.
- If the column is a foreign key, click the table name to switch to the Table Detail view for that table.
- If the column has a Value List available (normally only present for a subset of flag and switch fields), click the link to view the source code for the copybook (you are transferred to the *Java Docs Viewer*).

Lookup Values

If the selected column is a lookup field its valid values are also listed. Notice that you can enter an override description for *lookup values*. In this case the override description is shown.

NOTE: Regenerate. You should regenerate the data dictionary after overriding lookup value descriptions. Refer to *Application Viewer Generation* for further details.

Maintenance Object Viewer

The maintenance object viewer is an interactive tool that allows you to view a schematic diagram of a maintenance object. A maintenance object is a group of tables that are maintained as a unit.

To open the Maintenance Object Viewer, click the *Maint. Object* button in the application viewer or click a *maintenance object icon* in the Data Dictionary.

NOTE: Data Is Generated. A background process generated the maintenance object information. Refer to *Application Viewer Generation* for further details.

Using the Maintenance Object List Panel

The list panel displays a list of maintenance objects. In the list panel, you can click the maintenance object name to display information about the maintenance object in the detail panel.

Using the Maintenance Object Detail Panel

The Maintenance Object detail panel displays a schematic of the selected maintenance object.

In the detail panel, you can navigate using the following options:

- Click a table name to transfer to the Data Dictionary *table detail view* for a table. (Click the *Maint. Object* button in the toolbar to return to the maintenance object.)
- Click the service XML icon ( ) to view the XML file of the Service Program used to maintain the displayed object. (Click the *Maintenance Object* button in the toolbar to return to the maintenance object.)

Algorithm Viewer

The algorithm viewer is an interactive tool that allows you to view algorithm types (grouped by their plug-in spot) and their related algorithms.

To open the Algorithm Viewer, click the *Algorithm* button in the application viewer. The Algorithm viewer may also be opened from certain locations in the online help documentation.

NOTE: Data Is Generated. A background process generates algorithm information. Refer to *Application Viewer Generation* for further details.

Using the Algorithm Viewer List Panel

The list panel displays a list of algorithm types and their related algorithms, grouped by their plug-in spot.

In the list panel, you can navigate using the following options:

- Click the algorithm plug-in spot description to display information about the plug-in spot in the detail panel.
- Click the right pointer ▸ icon to expand a plug-in spot and view its algorithm types and their related algorithms.
- Click the down pointer ▾ icon to collapse the list of algorithm types for a plug-in spot.
- Click the algorithm type name to display information about the algorithm type in the detail panel.
- Click the algorithm name to display information about the algorithm in the detail panel.

Using the Algorithm Plug-In Spot Detail Panel

The Algorithm plug-in spot detail panel displays further information about the selected plug-in spot.

Using the Algorithm Type Detail Panel

The Algorithm Type detail panel displays further information about the selected algorithm type.

In the Algorithm Type detail panel, you can navigate using the following options:

- Click on the program name to view its source in the Java docs viewer.

Using the Algorithm Detail Panel

The Algorithm detail panel displays further information about the selected algorithm.

Batch Control Viewer

The batch control viewer is an interactive tool that allows you to view batch controls.

To open the Batch Control Viewer, click the *Batch Control* button in the application viewer. The Batch Control viewer may also be opened from certain locations in the online help documentation.

NOTE: Data Is Generated. A background process generates batch control information. Refer to *Application Viewer Generation* for further details.

Using the Batch Control Viewer List Panel

The list panel displays a list of batch controls. The list panel can display the list of batch controls sorted by their code or sorted by their description. Click the appropriate *button* on the toolbar to switch between sorting by the code and description.

In the list panel, you can click the batch control to display information about the batch control in the detail panel.

NOTE: Not All Batch Controls Included. Note that the insertion and key generation programs for conversion (CIPV*) are not included.

Using the Batch Control Detail Panel

The batch control detail panel displays further information about the selected batch control.

In the batch control detail panel, you can navigate using the following options:

- Click on the program name to view its source in the Java docs viewer.
- If a To Do type references this batch control as its creation or routing process, click on the To Do type to view its detail in the To Do type viewer.

To Do Type Viewer

The to do type viewer is an interactive tool that allows you to view to do types defined in the system.

To open the To Do Type Viewer, click the *To Do Type* button in the application viewer. The To Do Type viewer may also be opened from certain locations in the online help documentation.

NOTE: Data Is Generated. A background process generates To Do type information. Refer to *Application Viewer Generation* for further details.

Using the To Do Type Viewer List Panel

The list panel displays a list of To Do types. The list panel can display the list of To Do types sorted by their code or sorted by their description. Click the appropriate *button* on the toolbar to switch between sorting by the code and description.

In the list panel, you can click the To Do type to display information about the To Do type in the detail panel.

Using the To Do Type Detail Panel

The To Do type detail panel displays further information about the selected To Do type.

In the To Do type detail panel, you can navigate using the following options:

- If the To Do type references a creation process or a routing process, click on the batch process to view its detail in the batch control viewer.
- Click on the table listed in the drill key section to view its detail in the data dictionary.
- Click on the field(s) listed in the drill key section to view its detail in the data dictionary.

Service XML Viewer

The service XML viewer is an interactive tool that allows you to browse the XML files of service programs that execute on the application server.

You can access the service XML viewer as follows:

- The maintenance object viewer allows you to view the XML file of the maintenance object's service program. This feature is implemented by viewing the maintenance object and then clicking on the *Service XML icon*.
- When viewing a maintenance object on the *Maintenance Object* page, clicking the **View XML** hyperlink causes the service's XML document to be displayed in the Service XML Viewer.
- When viewing a business service on the *Business Service* page, clicking the **View XML** hyperlink causes the service's XML document to be displayed in the Service XML Viewer.
- When setting up a *Function*, you may want to view the XML document used to pass data to and from the service. Clicking the **View XML** hyperlink causes the XML document to be displayed in the Service XML Viewer.

Using the Service XML Viewer Overview Panel

The overview panel displays a high level nodes and list names structure of the XML document.

In the overview panel, you can click on any node item to position the detail panel to view that item.

Using the Service XML Viewer Detail Panel

The detail panel displays nodes and attributes of the selected XML file.

Click the **xpath** button to view the XML path that should be used to reference the selected node in the XML document. The box at the top of the overview panel changes to display this information.

NOTE: Fields in multiple lists. Note that the generated XPath expression refers to lists using a generic "list" reference. For example: **/pageBody/list/listBody/field[@name='FIELD_NAME']**. If a service has a field that appears in more than one list, the above XPath may not be sufficient for referencing that field. In this case, references to the XPath should be adjusted to include the list name. The list name is visible in the overview panel. To add the list name, use [@name='LIST_NAME']. For example: **/pageBody/list[@name='LIST_NAME']/listBody/field[@name='FIELD_NAME']**.

Java Docs Viewer

The Java Docs viewer is an interactive tool that allows you to browse Java documentation files (Javadocs) for Java classes that execute on the application server.

NOTE: Proprietary Java Classes. A small number of Java classes have been suppressed due to their proprietary nature.

NOTE: Classic view. If you are more comfortable using the classic Javadocs viewer you may use the *Classic* button.

To open the Java Docs viewer from within the application viewer, click the *Java Docs button*. Additionally, the *algorithm viewer* and the *batch control viewer* allows you to view the Javadocs of a program written in Java.

Using the Java Docs Viewer List Panel

The list panel displays a tree of Java packages where each package may be expanded to list the Java interfaces classes it includes.

In the list panel, you can navigate using the following options:

- Click the right arrow icon to expand a Java package to view the Java interfaces and classes it includes.
- Click the down arrow icon to collapse the list for a Java package. Optionally, collapse all lists by using the **Collapse** button.
- Click the Java interface or class name to display information about it in the detail panel.

The list details panel designates the interfaces and the classes as follows:

- A green dot indicates Java interfaces.
- A blue key indicates Java classes.

If you hover the cursor over the icon, the tool tip indicates whether it's an interface or a class.

Using the Java Package Detail Panel

The package detail panel displays a summary of the various Java classes that are included in the selected Java package.

Click the Java class name to display information about the Java class in the detail panel.

Using the Java Interface / Class Detail Panel

The detail panel displays Java documentation information about the selected Java interface or class.

You can navigate using hyperlinks to other locations in the current detail panel or to view the details of other Java interfaces / classes.

Application Viewer Preferences

This panel displays the Available Languages and allows you to select the language in which the labels and buttons are displayed. Select your desired language and click OK.

Application Viewer Stand-Alone Operation

You can run the Application Viewer as a stand-alone application (i.e., you do not need to launch it from the online application environment). To run it as a stand-alone application, you should copy the Application Viewer files (all files in the appViewer directory) and the online help files (all files in the help directory) to the server on which you want to run the Application Viewer.

> **NOTE:** Online Help. If you do not copy the online help files, online help will not be available for the Application Viewer, nor will you be able to view business descriptions of the tables' maintenance objects.

To start the application viewer in stand-alone mode, launch the appViewer.html file (located in the appViewer directory).

Stand-Alone Configuration Options

You can configure the Application Viewer for stand-alone operation by modifying options in a configuration file. The Application Viewer comes with a default configuration file called config_default.xml (located in the appViewer\config directory). Create a copy of the default configuration file and rename it to config.xml. Modify the options described in the following table to suit the needs of your installation.

NOTE: Default Configuration. If you do not create the config.xml file, the Application Viewer launches with its default (internal) configuration.

Option	Description
defaultLanguage	The default language used when the application viewer is started. Available values are those marked as language enabled on the language page.
defaultView	The default view then the application viewer is started. Available values include: - Data Dictionary
dataDictionary	Whether the Data Dictionary is available or not: - Y - N
sourceCode	This property is not being used. Simply enter 'N'.
baseHelpLocation	The location of the stand-alone online help in relation to the application viewer. Specify the directory structure relative to the location of the directory in which the Application Viewer files are located. Note that this is the directory in which the language subdirectories for the online help are located. The default location is: ../help
appViewerHelp	The default help topic that is launched when the Help button is clicked in the Application Viewer. Specify a help file and anchor that is under the appropriate language directory under the baseHelpLocation. The default is: Framework/Admin/91AppViewer.html#SPLINKApplication_Viewer

Example Application Viewer Configuration

The following excerpt shows an example Application Viewer configuration.

```
<?xml version="1.0" encoding="UTF-8" ?>
<configuration>
<option id="defaultLanguage">PTB</option>
<option id="defaultView">Data Dictionary</option>
<option id="dataDictionary">Y</option>
<option id="sourceCode">N</option>
<option id="baseHelpLocation">../help</option>
<option id="appViewerHelp">Framework/Admin/91AppViewer.html#SPLINKApplication_Viewer</option>
</configuration>
```

Application Viewer Generation

The Application Viewer is initially delivered with service XML information only.

The other components of the application viewer are generated on site.

- Use the background process **F1-AVALG** to regenerate algorithm information
- Use the background process **F1-AVBT** to regenerate batch control information.
- Use the background process **F1-AVMO** to regenerate maintenance object information
- Use the background process **F1-AVTBL** to regenerate data dictionary information.
- Use the background process **F1-AVTD** to regenerate To Do type information.

These processes have been introduced so that you can more easily incorporate your implementation-specific information into the application viewer.

To keep the information shown in the application viewer current it is important to execute these background processes after you introduce changes to the corresponding system data.

NOTE: Data Generation Is Not Incremental. Each new execution of these processes first deletes existing data (if any) in the corresponding folder before it generates new data.

NOTE: Other Extensions. Service XML may also be extended to include implementation-specific information. The base package is provided with special scripts that handle this type of extension. Refer to the Software Development Kit User Guide for further information on application viewer extensions.

NOTE: War File. If your application is installed in war file format, each generation of application viewer data rebuilds the corresponding war file. The web application server then needs to be "bounced" in order to make the newly generated data available to the application viewer. Please consult your system administrator for assistance.

NOTE: Certain Web Application Servers Are Special. WebSphere and Oracle Application web application servers require an additional step in order to make the newly generated data available to the application viewer. These web application servers require a rebuild of the application ear file and its redeployment in the web application server. This step is described in the installation document. Please consult your system administrator for further details.

Defining and Designing Reports

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

The topics in this section describe the approach for designing and defining your system reports.

Integration with BI Publisher and Business Objects Enterprise

Your DBMS, your product, and BI Publisher or Business Objects Enterprise / Crystal Reports 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.

Reports Must Be Multi-Language

The system supports a multi-language implementation and the reporting solution for the system must also support a multi-language implementation.

- If a French-speaking user requests a given report, all labels, headings and messages are in French. If the same report is requested by an English-speaking user, all information is in English
- Different fonts may be necessary for a given report (the font for Chinese is rather different than the font for English)
- Dates and numbers must be formatted as per the user's profile in your product
- Currency must be formatted as per the currency definition in your product

In order to provide the above functionality, the third party reporting tool must do the following:

- Access the system's field and message metadata for labels, headings and messages (as different values can be defined for different languages in system's metadata)
- Retrieve the appropriate font, size, and layout based on the requested report and the user's language
- Use the currency code information in the system to format currency-oriented information
- Use the user's display profile to format date and number fields

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.

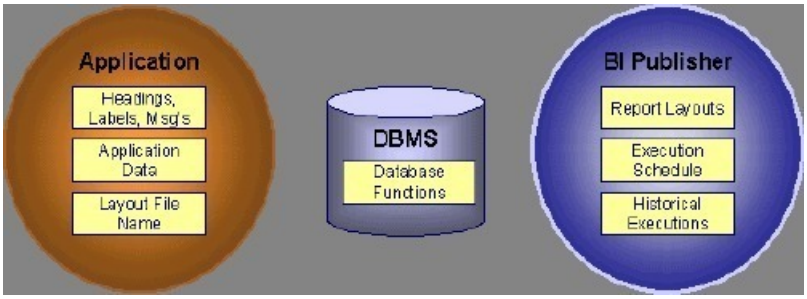


Figure 5: Application and BI Publisher

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 *Optional Products Installation Guide* for information on this configuration.

Overview of the Data - Business Objects Enterprise

The following diagram provides an overview of where data is stored for your reports for integration with Business Objects Enterprise.

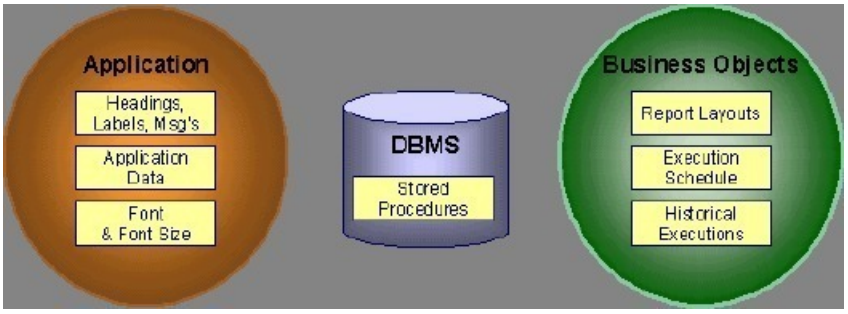


Figure 6: Application and Business Objects Enterprise

The application contains:

- The application data that appears on your reports.
- The language-specific headings, labels and messages on your reports.
- For Business Objects Enterprise, the font and size in which each report is rendered.

Business Objects Enterprise contains:

- How your reports look.
- When your reports are produced (the batch scheduler).
- Historical images of reports.

The DBMS contains the SQL used to retrieve the data on your reports (residing in stored procedures).

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* or *Configure The System to Invoke Business Objects Enterprise* 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

Crystal's report repository can be used to retrieve historical versions of a report. The *Report History* page allows users to open the Crystal'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

This section contains topics specific about configuring the product to interoperate with 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.

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.

NOTE: The *report history* page currently does not display historical reports for BI Publisher.

Configuring Business Objects Enterprise Reports

This section contains topics specific about configuring the product to interoperate with Business Objects Enterprise.

Configure the System to Invoke Business Objects Enterprise 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 Business Objects Enterprise, the system provides an algorithm type called *RPTE-INV*, which invokes Business Objects Enterprise.

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 one of the reporting tools, 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 Business Objects Enterprise

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 Business Objects Enterprise software to provide the batch scheduler functionality. Refer to Business Objects Enterprise documentation for details about configuring the batch scheduler.

The product provides a *report history* page to display report instances that were produced via the batch scheduler and are stored in a repository. The report history page relies on the *reporting tool algorithm* to invoke Business Objects Enterprise and display the historic instances for the selected report.

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** > **Reporting** > **Reporting Options**.

Description of page

The following information must be defined to interface with BI Publisher real-time. Contact your system administrator to report any problems with the settings defined here.

Reporting Folder defines the shared folder where reports are stored.

For Business Objects Enterprise, defines the name of the virtual directory on the server where Java Service pages (JSP) are located. The reporting tool algorithm uses this information to construct the URL to launch the reporting tool. The reporting tool algorithm assumes that a JSP named "logon.jsp" is located there.

Reporting Server 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>`.

Reporting Tool User ID is not applicable when integrating with BI Publisher.

For Business Objects Enterprise, defines the user id to use when logging in.

Reporting Tool Password is not applicable when integrating with BI Publisher.

For Business Objects Enterprise, defines the password to use when logging in.

> **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.

Report Definition - Main

Navigate to this page using **Admin** > **Reporting** > **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 *application security* 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**. Click *here* to see the algorithm types available for this system event.

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 CI_VACANT is named CI_VACANT_Base.

For Business Objects Enterprise, the **Report Font** and **Report Font Size** are used to control the display of the report information. If you wish to use one of the sample reports provided by the system, but wish to use a different font and font size, indicate your **Customer Specific Font** in the **Customer Specific Font/Layout** field and Business Objects Enterprise uses this information instead.

Report Definition - Labels

Navigate to this page using **Admin** > **Reporting** > **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 the *Reports Configuration* chapter of the *Installation Information*.

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** > **Reporting** > **Report Definition** and go to the **Parameters** tab **.**

Description of Page

The **Parameters** scroll contains one entry for every parameter defined for the report. To modify a parameter, simply move to a field and change its value. To add another parameter, click + to insert a row and then fill in the information for each field. The following fields display:

Parameter Code The identifier of the parameter. This must correspond to the parameter definition in the reporting tool.

Required Turn on this switch if the user must supply a value for the parameter when submitting the report.

Sort Sequence Indicate the sort sequence for this parameter. This 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 Indicate the characteristic type used to define this parameter.

Default Value Use this field to define a default value for this parameter. Default values are displayed to the user when the report is chosen on the *report submission* page.

Description Define a brief description of the parameter. This description is used when displaying the parameter on the *report submission* page.

Long Description Define 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

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

The *Installation Guide* provides 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*. For information about installing the company logo, refer to the *Reports Configuration* chapter of the *Installation Information*.
- Defining a user for integration with your product.
- Publishing the sample reports in BI Publisher or Business Objects Enterprise.

Contact your system administrator to verify that the above steps have occurred.

Subreports Used with Crystal Reports

The sample reports supplied with the system use several common subreports. Subreports are used in Crystal Reports to retrieve common data such as, labels and your company title. They are shared for all reports and may be reused for customer reports. Implementers may also use these subreports when designing new reports.

NOTE: Specific Subreports. This section only includes common subreports that may be reused by new reports. You may notice that other subreports are supplied with the system. These subreports provide functionality for a specific sample reports and are not meant for reuse.

Display Company Logo and Title

The subreport **CIZCOMP** receives the user id as a parameter and calls the stored procedure **CIZCOMP**. It retrieves the company's title in the user's language from the appropriate *installation message* record.

FASTPATH: Refer to the **Reports Configuration** chapter of the installation guide for more information about defining the location for the company logo.

Format Report Information

The subreport **CIZINST** defines shared variables that are used for formatting fields in the main report. It calls the stored procedure **CIZINST**. This subreport receives the user id and report code as parameters. It retrieves the font and font size from the *report definition*. It retrieves the format date/time and number format from the user's *display profile*. Finally, it retrieves the currency from the *installation* record and retrieves the currency symbol and position from the currency's record.

NOTE: Multi-currency. All reports support multiple currencies. Currency information is returned for each row by the appropriate stored procedure. This subreport retrieves the currency code from the Installation Options and should only be used in a report if there is no other currency information available.

Labels

The subreport **CIZLABEL** keeps all labels used in the main report. It calls the stored procedure **CIZLBALL** with the user ID as a parameter. This stored procedure returns all labels defined for all reports. The subreport selects labels specified for the current report and sets shared variables L001...L100 to store the labels. If more than 100 labels are required for a

new report, the version of the CIZLABEL subreport used for the new report should be changed to add additional shared variables.

How To Define A New Report

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.
- 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 or Business Objects Enterprise. Refer to the documentation for these products for details about publishing a report. Refer to *Publishing Reports in BI Publisher* and *Publishing Reports in Business Objects Enterprise* 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

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.

Publishing Reports in Business Objects Enterprise

Please refer to the documentation for Business Objects Enterprise 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 Business Objects Enterprise.

Business Objects Enterprise Database Access

When publishing a report in Business Objects Enterprise, 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 stored procedures related to this report in your database.

Verify Parameter Definition

This section describes how to verify parameter definitions in the Crystal Management Console (CMC).

- Once your report has been published, navigate to the CMC. This is the web-based administration component for Business Objects Enterprise and provides access to all administrative functions.
- To verify/change the settings of a report in the CMC go to the Objects management area and select the desired report by clicking its link located in the Object Title column.
- Once you have selected your report, click the **Parameters** tab to change the settings.
- If your report requires parameters to be provided by the user, you must configure the parameter settings in the CMC to ensure that parameter values are passed from the system when submitting the report via the *Report Submission* page. If you plan to submit reports from within your product, the **Prompt the user for new value(s) when viewing** check box should be checked.
- Click **OK** on this window and then click **Update.**

NOTE: Submitting Reports Through Business Objects Enterprise. If you plan to submit reports from Business Objects Enterprise, you must also define an appropriate initial value for each parameter, if applicable.

NOTE: User ID. The user id is defined as the first parameter in every sample report. This parameter is hidden when the report is submitted from within your product, but it must be defined in the Crystal report.

Verify Business Objects Enterprise User Access Rights

To verify the access rights for a user in CMC:

- Navigate to the **Rights** tab in the Objects management area of the CMC and check that the user has correct security level for the report.
- Integration with your product requires an access level of **View On Demand** for the user.

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

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 types* 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
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.

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** > **System** > **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.

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.

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

This section provides information about support for incoming messages.

Inbound Web Services

Inbound web service functionality is provided to support receiving web service requests from an external system.

Overview

The following topics provide overview information about inbound web services (IWS).

Multiple Operations

An inbound web service supports the configuration of one or more operation 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. In addition, each operation may define a transaction type, which is essentially an action that is supported by the schema-based object.

By default, Inbound Web Services 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 Schemas with the appropriate Request and Response XSL to transform into the relevant schema formats.

Annotations Used for Security

When preparing to deploy inbound web services, the security aspects of the service must be decided. There are three options available:

- Attach a security policy to the IWS via a Web Service Annotation. The product supplies the security policy **Username Token Policy** that may be used. This attaches a policy file (UsernameToken.xml) to the Inbound Web Service at deployment time.
- Attach security policies to the Inbound Web Service via the J2EE Web Application Server. This allows for multiple policies to be attached as support by the J2EE Web Application Server.
- A combination of the internal and external security policies.

Inbound Web Service Deployment

An Inbound Web Service must be deployed to the J2EE Web Application Server in order for it to be available to the Web Service Clients to access the system. Refer to *Deploying Web Services* for more information.

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 J2EE 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 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 J2EE 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 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.

Configuring Inbound Web Service Options

This topic describes the configuration needed for using inbound web 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.

Maintaining Web Service Annotation Types

The product provides the annotation type **Policy Annotation** that defines the WS-Policy annotation. If your implementation wishes to define additional annotation types, use the Web Service Annotation Type portal. Open this page using **Admin** > **External Message** > **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 J2EE Web Application Server are not sufficient for your implementation's needs.

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.

Maintaining Web Service Annotations

The product provides the annotation **Username Token Policy**, which references the annotation type **Policy Annotation** and enables WS-security. If your implementation wishes to define additional annotations, use the Web Service Annotation portal. Open this page using **Admin** > **External Message** > **Web Service Annotation.**

This is a standard *All-in-One portal*.

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 several inbound web services out of the box. 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** > **External Message** > **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.

The Inbound Web Service zone displays the configuration information for the record, including its annotations, if applicable and its operations.

Deploying Web Services

This topic describes the configuration needed for using inbound web services.

Once an Inbound 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 Web Services to the J2EE 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 J2EE 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 J2EE Web Application Server. This can also be done manually for clustered deployments, if desired.

There are two methods available for deploying inbound 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 recommended for development and non-production environments.

Inbound Web Service Deployment Portal

To use the online Inbound Web Service Deployment portal, navigate using **Admin** > **External Message** > **Inbound Web Service Deployment**.

The following sections describe the base zones that are provided on the portal.

Deploy Inbound Web Services

The Deploy Inbound Web Services zone provides information about the last deployment. 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 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 Deploy**.

- 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.

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 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 Deploy**. 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 Undeploy**. Indicates that the IWS is marked as inactive but the IWS is found to be deployed at this time.

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 choses 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.
- **Needs Deploy**. 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 Undeploy**. 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 Deploy" in cases where a redeployment may not be necessary. The recommendation when this occurs is to simply Deploy again to be safe.

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.

NOTE: The framework does not provide a sample algorithm for this plug-in spot. Your specific product may provide an algorithm and additional support for guaranteeing messages. Refer to your product documentation for more information.

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.

- **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

Outbound messages provide functionality for routing XML messages to an external system real-time or in near real time. In addition the functionality supports batching related messages 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

- 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.

NOTE: For implementations that continue to use MPL and XAI, there is additional functionality related to outbound messages. Refer to *Outgoing Messages* for more information.

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 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 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.

FASTPATH: Refer to the whitepaper 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
  - 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 configuration of real time messages is similar to the configuration of near real-time ones, with the following exceptions:

- The processing method defined for the outbound message type and an external system must be **Real-time**.
- The *message sender* defined for the outbound message type and an external system has to be set up with **Real-time** invocation type.

Just like near real-time messages, you can easily create outbound message records 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.

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 a business service called "Outbound Message Dispatcher (**F1-OutmsgDispatcher**)" that further facilitates making web service calls, allowing the calling script to configure the following behavior:

- Whether or not the sent message is captured as an actual outbound message record.
- 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.

Refer to the description of the business service for a better understanding on how it works.

NOTE: HTTP Sender. In the current release of the product, only senders that communicate via HTTP are supported.

Configuring 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 Type

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 fields that make up the XML source field. These are the fields that are the basis for the XML message. XSL transformations may be applied to this XML source to produce the XML message.

Once you have your business object and schema, define an *outbound message type* for each unique outbound message.

Define the Message Sender

When messages are routed to an external system real-time using the outbound message dispatcher or using the real-time send email business service, there must be a *Message Sender*, which tells the system how to send the message. The two different mechanisms differ in how the system knows which sender to use:

- For sending emails, the default sender may be defined 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. Senders of this type should be configured with the **RTEMAILSNDR** class.
- For other outbound messages that are routed using the real-time outbound message dispatcher, the sender to use is defined on the *external system* / outbound message type collection. Refer to *Real Time Messages* for more information. Senders of this type should be configured with the **RTHTTPSNDR** class.

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.

Message Sender

The topics in this section describe the maintenance of a message sender

Message Sender - Main

To define a new sender, open **Admin** > **External Message** > **Message Sender.**

Description of Page

Enter a unique **Message Sender** and **Description**.

Use **Invocation Type** to define whether the sender is a **Real-time** sender or called by **MPL** to route near real-time messages.

NOTE: The MPL invocation type remains in the product for upgrade purposes but is not recommended.

Indicate the **Message Class** for this sender. The class should be one that is defined for a sender. The real-time sender classes are **EMAILSENDER**- Email sender and **HTTPSNDR**- HTTP sender.

The following sender classes are related to MPL processing and remain in the product for upgrade purposes: **DWNSTGSNDR**- Download Staging sender, **FLATFILESNDR**- Flat file sender, **JMSSENDER**- JMS Queue sender, **STGSENDER**- Staging Upload sender, **TPCSNDR**- JMS Topic sender and **UPLDERRHNDLR**- Upload Error Handler.

Indicate whether or not this sender is currently **Active**.

Indicate whether the **MSG Encoding** is **ANSI message encoding** or **UTF-8 message encoding**.

If the Message Class is **JMSSENDER** or **TPCSNDR** indicate the appropriate **XAI JMS Connection**

FASTPATH: Refer to *XAI JMS Connection* for more information.

If the Message Class is **JMSSENDER**, use the **XAI JMS Queue** to define where the response is to be sent.

FASTPATH: Refer to *XAI JMS Queue* for more information.

If the Message Class is **TPCSNDR**, use the **XAI JMS Topic** to define where the response is to be sent.

FASTPATH: Refer to *XAI JMS Topic* for more information.

If the Message Class for this sender is **STGSENDER** indicate the **XAI JDBC Connection**.

FASTPATH: Refer to *XAI JDBC Connection* 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** > **External Message** > **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 some examples of context for different types of senders.

NOTE: The values for the Context Type field are customizable using the Lookup table. This field name is SENDER_CTXT_FLG.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_SENDER*.

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 **EMAILSENDER**. 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.

Context Type	Description
SMTP Username	The user ID used to access the SMTP server.
SMTP Password	The password used to access the SMTP server.
Response Time Out	The amount of time the system should wait for a real time response.

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 **HTTPSNDR**.

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?
- 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.	
HTTP Method	The HTTP method used to send the message.	**POST** or **GET**
HTTP Proxy Host	If connecting to the remote system requires using an HTTP Proxy, then this context field can be used to configure the HTTP Proxy Host. If the Proxy Host is set, the Sender class must use the value specified to connect to the remote system via a proxy.	
HTTP Proxy Port	If connecting to the remote system requires using an HTTP Proxy, then this context field can be used to configure the HTTP Proxy Port. If the Proxy Port is set, the Sender class must use the value specified to connect to the remote system via a proxy. If the HTTP Proxy Host is not set, HTTP Proxy Port is ignored and the connection will be made directly to the remote system.	

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.	**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. 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. The MPL server builds formData by concatenating the individual parts. You may use substitution variables when entering values for Form Data.	
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	

Context Type	Description	Values
	x is the header name and *y* is the value for the header	
HTTP Time Out	Indicates the amount of time to wait for a connection to be established with the remote system.	
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 a real time response.	

Defining Outbound Message Types

Use this page to define basic information about an outbound message type. Open this page using **Admin** > **External Message** > **Outbound Message Type.**

NOTE: This page is not available if the **External Message** module is *turned off*.

Description of Page

Enter a unique **Outbound Message Type** and **Description**. Use the **Detailed Description** to describe the outbound message type in detail.

Indicate the Business Object that defines business rules and the schema for outbound messages of this type.

Indicate the relative **Priority** for processing outbound message records of this type with respect to other types.

This bottom of this page contains a *tree* that shows the various objects linked to the outbound message type. You can use this tree to both view high-level information about these objects and to transfer to the respective page in which an object is maintained.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *F1_OUTMSG_TYPE*.

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

Open this page using **Admin** > **External Message** > **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**.

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. If the value is **XAI** or **Real-time**, indicate the appropriate **Message Sender**. If the value is **Batch**, indicate the appropriate **Batch Control**.

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**.

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**.

Response XSL will have the same search service as is used for the existing Message XSL field. This field will only be displayed when the processing method is **Real-time**. Refer to *Real Time Messages* for more information on how it is used.

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** > **External Message** > **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.

Managing Outbound Messages

Use this page to view information about outbound messages.

Outbound Message - Main

Open this page using **Menu** > **External Message** > **Outbound Message**.

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, through the **XAI** tool or **Real-time**. 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 used by the XAI tool to keep track of how many times the tool tried to process this record and could not process the record, resulting in an error.

The **Creation Date** indicates the date that this record was created.

If the processing method is **XAI**, **Status** defines the state of the outbound message record. Refer to *Lifecycle of Outbound Message* for more information.

For messages in **error** status, click **Pending** to change the status back to pending for reprocessing.

For messages in **pending**, **error**, or **in progress** status, click **Cancel** to cancel the message and prevent further processing.

Outbound Message - Message

Use this page to view the XML source used to build an outbound message. Open this page using **Menu** > **External Message** > **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** > **External Message** > **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.

Message Option

The Message Option page defines various system settings used by the system when processing external messages.

Note that some of the options are only applicable to implementations still using the XAI and MPL servers. The settings here may be overridden by the *AdHoc Parameters section* of the XAIParameterInfo.xml or MPLParameterInfo.xml.

To define options for your environment, open **Admin** > **External Message** > **Message Option**.

Description of Page

The following options are supported.

Option	Description	MPL / XAI Option Name
Automatically Attempt Resend to Unavailable Sender (Y/N)	Set to **Y** if you wish to enable *Automatic Resend*. Set to **N** if you wish to log errors when the system fails to send an outgoing message.	shouldAutoResend
Default Email Sender	This is the default Message Sender used for sending e-mails when no explicit Message Sender is specified.	defaultEmailSender
Default Response Character Encoding	Determines the character encoding to be used when a response is sent. For example, you may specify **UTF-8** or **UTF-16**. If no value is specified then the default is **UTF-8**. If no special encoding should be done, then enter the value **none**.	defaultResponseEncoding
Default User	The default user is used by XAI to access your product when no other user is explicitly specified. Refer to *Server Security* for more information. Additionally, the Default User is used for MPL transactions where there is no facility to provide a User ID. For example, no facility exists to provide a user id when reading messages from a JMS Queue. In these messaging scenarios, the system will use the Default User for authorization purposes.	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
JDBC Connection Pool Max size	The MPL uses a pool of JDBC connections to connect to the database. This option determines the maximum number of JDBC connections that can be opened in the pool. The default value is 100.	JDBCConnPoolMaxSize
Maximum Errors for a Sender	This value is required if you have enabled *Automatic Resend*. It defines how many errors you receive from a sender when attempting to send an outgoing message before you mark the sender **unavailable**.	maxSendingErrors
Messages JDBC Connection	Specifies the JDBC connection that XAI uses to read the text for its messages.	messagesJDBCConnection
Messages Language	The default language to use for the messages.	language
MPL Administrator Port	The port number to be used for receiving MPL operator commands.	adminPort
MPL HTTP Server Authentication Method	This setting, along with the MPL HTTP Server User and Password are used to secure commands received by your MPL (such as those issued via *XAI Command*) through HTTP. Currently only **BASIC** authentication is supported.	MPLHTTPAuthMethod
MPL HTTP Server Password	This setting, along with the MPL HTTP Server Authentication Method and User are used to secure commands received by your MPL (such as those issued via *XAI Command*) through HTTP. The password should be in encrypted form, using the same encryption that is used for the database password. .	MPLHTTPAuthPassword
MPL HTTP Server User	This setting, along with the MPL HTTP Server Authentication Method and Password are	MPLHTTPAuthUser

	used to secure commands received by your MPL (such as those issued via *XAI Command*) through HTTP.	
MPL Log File	The MPL Log File setting is used to specify the name of the file where MPL log information is to be written. The log contains technical information about the operation of the MPL.	MPLLogFile
MPL Trace File	The MPL Trace File setting is used to specify the name of the file where MPL trace information is to be written.	MPLTraceFile
MPL Trace Type	The MPL Trace Type is used to enable or disable tracing of the MPL. The possible values are **FULL**- All trace messages are written to the log file and **NOLOG**- No information is written to the log file.	MPLTraceType
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
Privileged Users	Comma separated list of users that are allowed to specify an effective User or effective User Id via framework custom SOAP Headers.	superUsers
Records MPL Receiver Will Process At a Time	If your implementation has *configured multiple MPL servers*, indicate the number of records that each MPL receiver should process.	Not currently used
Schema Directory	The full path of the virtual directory where XML schemas are stored. For example: http:/ localhost/cisxai/schemas. If this option is not specified, the XAI uses the current directory, from where it is being run, to locate schemas.	schemaDir
Schema Validation Flag	Enter **Y** to turn on *schema validation for outbound messages*. Enter **N** to turn this off.	xaiSchemaValidationCheck
Send SOAP Fault as HTTP 500	Enter **Y** to ensure that a SOAP error is reported as an HTTP 500 "internal server error".	sendErrorAsHttp500
Sender Retry Seconds	This value is required if you have enabled *Automatic Resend*. It defines how many seconds to wait after marking a sender **unavailable** before you mark the sender **available** again (and retry sending messages to it).	senderWaitTime
System Error JDBC Connection	When a request fails to execute due to a system error, the MPL retries its execution several times. The MPL registers the system error in a table and uses this table for the retries. This setting specifies the JDBC connection required to access this table. Only enter a value in this field if it is different from the database environment used to read the XAI registry.	systemErrorTableJDBCConnection
System Error Max Retry	When a request fails to execute due to a system error, the MPL retries its execution several times until a maximum number of retries is reached. This option specifies the maximum number of retries.	systemErrorMaxRetries
System Error Retry Interval	When a request fails to execute due to a system error, the MPL retries its execution several times. This option specifies the number of seconds the MPL server waits between retries.	systemErrorRetryInterval

Thread Pool Initial Size	The MPL uses a thread of pools to enhance performance. The MPL starts with a minimum number of threads and grows/shrinks the pool based on the MPL system load. This option specifies the initial number of threads in the thread pool. The minimum number of threads is 12.	threadPoolInitialSize
Thread Pool Max Size	This option specifies the maximum number of threads in the thread pool.	threadPoolMaxSize
Thread Pool Non Activity Time	This option specifies how long a thread in the pool may be inactive before it is timed out and released from the pool.	poolNoneActivityTime
To Do Type for Inbound JMS Message Errors	To Do type for inbound JMS message errors. The inbound message processor uses this To Do type when creating To Do entries for inbound JMS messages that cannot be successfully processed. The system provides the To Do type **F1-INJMS** that may be used here.	toDoTypeforInboundJMSMessageErrors
To Do Type for Outbound Message Errors	To Do type for outbound message errors. The outbound message receiver uses this To Do type when creating To Do entries for outbound messages that cannot be successfully processed. The system provides the To Do type **F1-OUTMS** that may be used here.	outboundErrorTodo
WSDL Service Address Location	Specifies the SOAP address location that XAI uses in creating a WSDL. If no value is present, the XAI's URL is used.	wsdlAddressLocation
XAI Authentication Password	The multi-purpose listener uses this field in combination with the **XAI Authentication User** when attempting to communicate with the XAI server over HTTP, which is running on a secured servlet and requires authentication.	HTTPBasicAuthPassword
XAI Authentication User	The multi-purpose listener uses this field in combination with the **XAI Authentication Password** when attempting to communicate with the XAI server over HTTP, which is running on a secured servlet and requires authentication.	HTTPBasicAuthUser
XAI Trace File	The full path name for the file, where the XML messages should be written. For example: c:\inetpub\wwwroot\cisxai\xai.log.	traceFile
XAI Trace Type	Use this option to specify the level of logging. The possible values are **FULL**- All XML messages are written to the log file and **NOLOG**- No information is written to the log file. **FASTPATH:** Refer to *Server Trace* for more information about tracing.	traceType
XSL Directory	The full path of the virtual directory where XSL transformation scripts are located. XSL transformation scripts can be defined for each service. By default, this is the same directory as the schemas directory.	XSLDir

Where Used

Used by the XAI tool to obtain various required settings and locations.

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
- 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

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.
- 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

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** > **External Message** > **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.

FASTPATH: 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”. 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. It also supports sending attachments. The SMTP information (host, user name and password) may be provided or may be defined on a message sender, that may be provided as input. Review the business service schema for information about the input elements.

  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.

- Staging records to be emailed in “near real time”. This option may be used by options that are creating emails in bulk. This technique uses the outbound message table to capture the details of the email message.

XML Application Integration

This section describes the XML Application Integration (XAI) utility, which enables you to configure your system to receive information from and to send information to external applications using Extensible Markup Language (XML) documents.

NOTE: The XAI functionality is legacy functionality and not recommended for new implementations. The topics for the functionality outlined in the previous sections describe the recommended features for supporting sending and receiving external messages. The XAI information remains in the documentation for upgrade purposes.

The Big Picture of XAI

The XML Application Integration (XAI) module provides the tools and infrastructure that businesses require for integrating their applications with your product. The integration your product with other systems across organizational boundaries or business is made possible, regardless of the platforms or operating system used. XAI provides an integration platform that enables the following:

- Integrate with Customer Relationship Management (CRM) systems
- Provide information feeds for web based customer portals
- Fit seamlessly with web based applications
- Facilitate fast implementation of batch interfaces
- Integrate with other XML compliant enterprise applications

XAI exposes system business objects as a set of XML based web services. The service can be invoked via different methods, e.g., Hypertext Transfer Protocol (HTTP) or Java Message Service (JMS). Consequently, any application or tool that can send and receive XML documents can now access the rich set of system business objects. Business-to-Business (B2B) or Business-to-Consumer (B2C) integration with other enterprise applications as well as the setup of web portals is made very simple and straightforward.

XAI Architecture

The XAI architecture contains 3 major components:

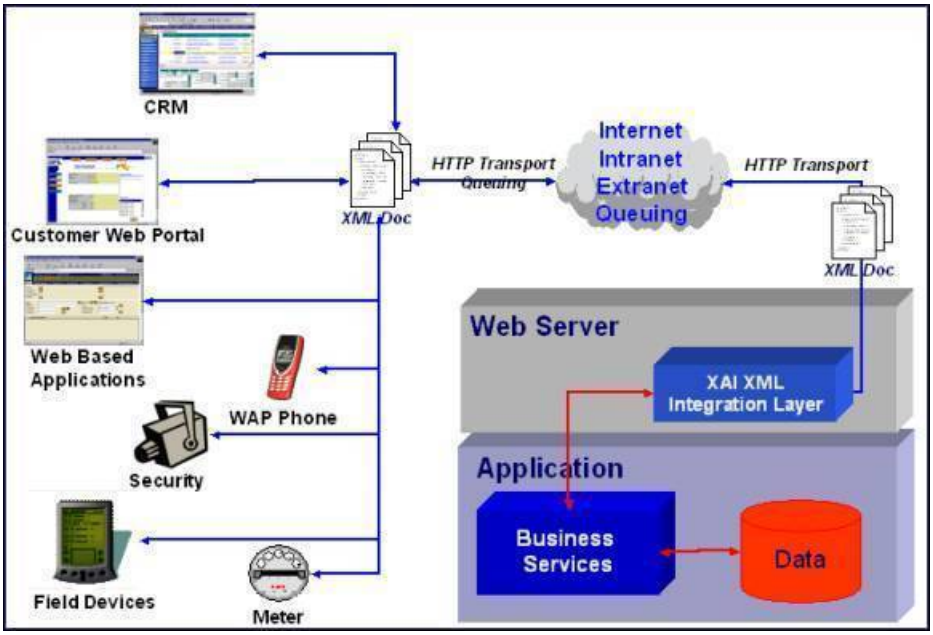
- The Core Server Component

- The Multi Purpose Listener (MPL)
- The Client Component

The Core Server Component

The core server component is responsible for receiving XML requests, executing the service and returning the response to the requester.

The following diagram shows the XAI tool operating on a web server and providing integration between the system business objects and various external applications.



The core is built in Java, using a layered, scalable architecture. The basic transport protocol supported by the core is SOAP/HTTP.

FASTPATH: Refer to *SOAP* for more information.

The XAI core server provides a Java servlet to process requests through HTTP. You may also use other messaging mechanisms such as message queuing, publish/subscribe or a staging table. The multi-purpose listener processes the messages.

The Multi Purpose Listener (MPL)

NOTE: Multi Purpose Listener functionality is legacy functionality that is not recommended going forward. The Oracle Service Bus (OSB) is the recommended tool. This section remains in place for upgrade purposes.

The Multi Purpose Listener (MPL) is a multi-threaded Java server that constantly reads XML requests from various external and internal data sources, such as a Java Message Service (JMS) message queue, a JMS topic or system staging tables.

The MPL can be used to process inbound messages (those sent by an external application to invoke a system service), or outgoing messages (those sent by your product to external applications). The MPL uses different receivers to process messages from different data sources.

A receiver is implemented using 3 distinct layers:

- The Receiving Layer

- The Execution Layer
- The Response Layer

The Receiving Layer
This layer deals with polling various locations to determine if new records, files or incoming requests exist. The various locations include:

- Staging tables, including *XAI staging control*, *XAI upload staging*, notification download staging (certain products only), and *outbound message*.
- An external directory that contains a file, for example a comma delimited file or an XML file.
- A JMS queue/topic.

A separate receiver is defined to read requests from each of these locations. When the MPL server starts, it looks for all defined active receivers in the *XAI Receiver* table, and for each receiver it starts a thread that constantly fetches messages from the message source.

Once a request message is read, it is passed to an execution thread that implements the execution layer. Each receiver references an *Executer* that is responsible for executing the request.

Configuring Multiple MPL Servers
A single MPL server may only run one of each of the above staging table receivers for a given JDBC connection. To enhance the performance of the processing of the staging tables, you may define multiple MPL servers where each one runs the active receivers defined in the receiver table.

To ensure that each staging table receiver processes its own set of records in the staging table, the receiver selects a set number of records (specified as *Message option***Number of Records an MPL Receiver Will Process At a Time**) and marks those records with the IP address and port number of the MPL.

The Execution Layer
The execution layer sends the XML request to the *XAI core server* and waits for a response.

> **NOTE:** Currently the only type of *executer* supported is the XAI servlet running either on an XAI server or locally under the MPL. However the architecture allows for executing a request on other execution environments.

The executer is invoked and is passed in an *XAI Inbound Service* that specifies an XML request schema and an *adapter*. Adapters tell XAI what to do with a request. The adapters point to a specific Java class that renders a service.

For example you can configure an Adapter to invoke any published application object (by pointing it to the appropriate java class). This adapter accesses system objects through the page service. You can think of an adapter as a plug-in component.

Once the executer processes the request and a response is received, it is transferred to the next layer, the *response* layer.

The Response Layer
The response layer is responsible for "responding" to the execution. The responses are handled by invoking an appropriate *sender* defined on the receiver's response information. Each sender defined in the system knows how to process its response. For example:

- The JMS queue sender and the JMS topic sender post responses to the appropriate queue / topic.
- The *staging control sender* handles errors received during the execution of the staging control request.
- The *upload staging sender* updates the status of the upload staging record based on the success or failure of the staging upload request.
- The download staging sender is a bit unusual because it is helping to build the message being sent (Oracle Customer Care and Billing only).

> **NOTE:** There are some cases where a response is not applicable. For example, the file scan receiver creates a staging control record to process a file that exists in a directory. There is no "response" applicable for executing this request.

The XAI Client Component

The XAI Client component is the set of online control tables and tools used to manage your XAI environment.

The ***Schema Editor*** is a tool used to create and maintain XAI schemas.

FASTPATH: Refer to *XAI Schema* for more information.

The **Registry** is a term used to refer to all the tables required to "register" a service in the system. It includes the *XAI Inbound Service* and a set of control tables defining various options.

The ***Trace Viewer*** is installed with your XAI client tools and is used to view traces created on the XAI server.

XML Background Topics

The following section introduces some background information related to XML.

XAI Schemas

NOTE: Business Adapter. The **BusinessAdapter** adapter supports communication to configuration tool objects: *business objects*, *business services* and *service scripts* through their own schema API. When communicating to these objects, it is not necessary to create XAI schemas for the schemas associated with the objects. As a result, there is no need to use the XAI schema editor when defining *XAI Inbound Services* for this adapter.

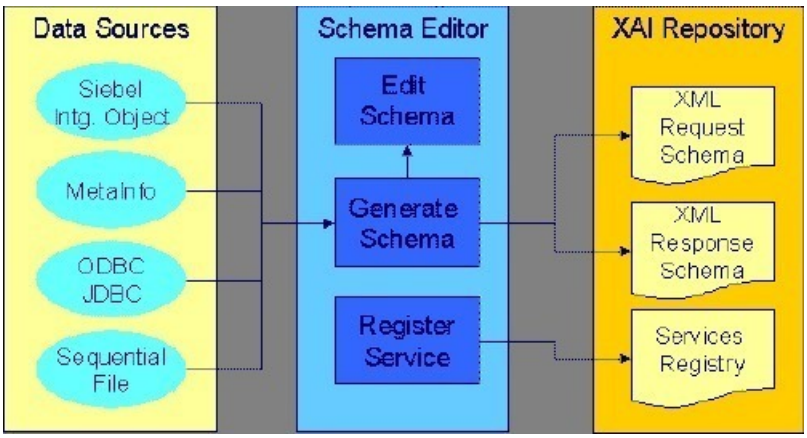
At the core of XAI are XML web services based on XML schemas. XML schemas define the structure of XML documents and are the infrastructure of e-business solutions. They are used to bridge business applications and enable transaction automation for e-commerce applications. Industry standard schemas document common vocabularies and grammars, enhancing collaboration and standardization. Validating XML processors utilize XML schemas to ensure that the right information is made available to the right user or application.

The system exposes its application objects as XML schemas that define the interface to system services. Every service (e.g., CreatePerson or AccountFinancialHistory) is defined using a pair of schemas: the Request Schema and the Response Schema. The request and response schema can be identical.

The Request Schema defines the XML document structure describing the "inputs" for a service.

The Response Schema defines the XML document structure describing the "outputs" of a service.

The Schema Editor
To facilitate the process of exposing business objects as XML schemas, we use the Schema Editor, a graphical tool to create, import and maintain schemas. The Schema Editor provides automated wizards to import schemas residing in existing data structures and documents. The Schema Editor can import schemas from the following sources: system business objects, ODBC data sources, sequential files.



Before the XAI tool can use a service, it must be registered or published.

FASTPATH: Refer to *Schema Editor* for more information.

XSL Transformations

XSL Transformations (XSLT) is a language used to transform an XML document into another XML document or another document format such as HTML. It is part of the Extensible Stylesheet Language (XSL) family of recommendations for defining XML document transformation and presentation. It is defined by the World Wide Web Consortium (W3C) and is widely accepted as the standard for XML transformations. Several tools are available on the market to generate XSLT scripts to transform an XML document defined by a source schema to an XML document defined by a target schema.

In XAI you can use XSL to:

- Transform an inbound message into the structure required by the XAI request schema for that service.
- Transform the response to an inbound message into a format defined by a schema provided by the requesting application.

  FASTPATH: Refer to *XAI Inbound Service* for more information.

- Transform an outgoing message before it is sent out.

  FASTPATH: Refer to *XAI Route Type* for more information.

- Transform data from an external source before it is loaded into the staging upload table.

  FASTPATH: Refer to *XAI Inbound Service Staging* for more information.

SOAP

SOAP stands for Simple Object Access Protocol. The SOAP "Envelope" is the wrapping element of the whole request document that may be used by messages going through the XAI tool.

The following diagram shows a simple XML request using the SOAP standard.

```
<SOAP-ENV:Envelope>
  <SOAP-ENV:Header>
      <CorrelationID>1234</CorrelationID>
      <SOAPActionVersion>1.2</SOAPActionVersion>
  </SOAP-ENV:Header>
  <SOAP-ENV:Body>
    <CISAccount transactionType='Read'>
        <CISAccountService>
            <CISAccountHeader
                AccountID='1234'
            />
        </CISAccountService>
    </CISAccount>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

XPATH

The XML Path Language (XPath) is an expression language used by XSLT to access or refer to parts of an XML document. It is part of the XSL recommendations maintained by the W3C. XPath provides the syntax for performing basic queries upon your XML document data. It works by utilizing the ability to work with XML documents as hierarchically structured data sets.

In the following XML document, some examples of XPath references are:

- authors/author/name
- authors/*/name
- authors/author[nationality]/name
- authors/author[nationality='Russian']/name
- authors/author[@period="classical"]

```
<?xml version='1.0'?>
<authors>
  <author period="classical">
    <name>Sophocles</name>
    <nationality>Greek</nationality>
  </author>
  <author>
    <name>Leo Tolstoy</name>
    <nationality>Russian</nationality>
  </author>
  <author period="classical">
    <name>Plato</name>
    <nationality>Greek</nationality>
  </author>
</authors>
```

In the XAI tool, XPath is used to construct outgoing messages.

Server Security

XAI server security supports the basic HTTP authentication mechanism as well as web service security (WS-Security) to authenticate the user requesting service. When authenticating using WS-Security, the SOAP header contains the authenticating information.

The base package provides two XAI server URLs, one that uses basic HTTP authentication ('/classicxai') and another that supports both methods ('/xaiserver'). Regardless of which authentication method is practiced, it is the latter you should

expose as your main XAI server. The main XAI servlet gathers authentication information from the incoming request (HTTP or SOAP header) and further calls the internal ("classic") servlet for processing.

The "classic" XAI server security uses the basic HTTP authentication mechanism to authenticate the user requesting service. It assumes the requester has been authenticated on the Web server running the XAI servlet using the standard HTTP (or HTTPS) basic authentication mechanism. The authenticated user-id is passed to the application server, which is responsible for enforcing application security. This requires the system administrator to enable basic authentication for the Web server running the XAI servlet. To enable HTTP basic authentication, the XAI server '/classicxai' should be defined as a url-pattern in the web resource collection in the web.xml file. When the XAI server is not enabled for basic authentication, it transfers the user-id specified on the **Default User***Message option* to the application server.

By default, the system would always attempt to further authenticate using SOAP header information. This is true even if the request has already been authenticated via the Web server. Use the **Enforce SOAP Authentication***Message Option* to override this behavior so that a request that has been authenticated already by the Web server does not require further authentication by the system.

If SOAP authentication information is not provided, the system attempts to authenticate this time using information on the HTTP header. You can force the system to solely use SOAP authentication using the **Attempt Classic Authentication***Message Option*.

Currently the system only supports the standard *Username Token Profile* SOAP authentication method where "Username", "Password" and "Encoding" information is used to authenticate the sender's credentials. The following is an example of a *Username Token Profile* in a SOAP header:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV = "urn:schemas-xmlsoap-org:envelope">
<SOAP-ENV:Header xmlns:wsse="http://www.w3.org/2001/XMLSchema-instance">
<wsse:Security>
<wsse:UsernameToken>
<wsse:Username>MYUSERID</wsse:Username>
<wsse:Password Type="PasswordText">MYPASSWORD</wsse:Password>
</wsse:UsernameToken>
</wsse:Security>
<SOAPActionVersion>2.0.0</SOAPActionVersion>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
...
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

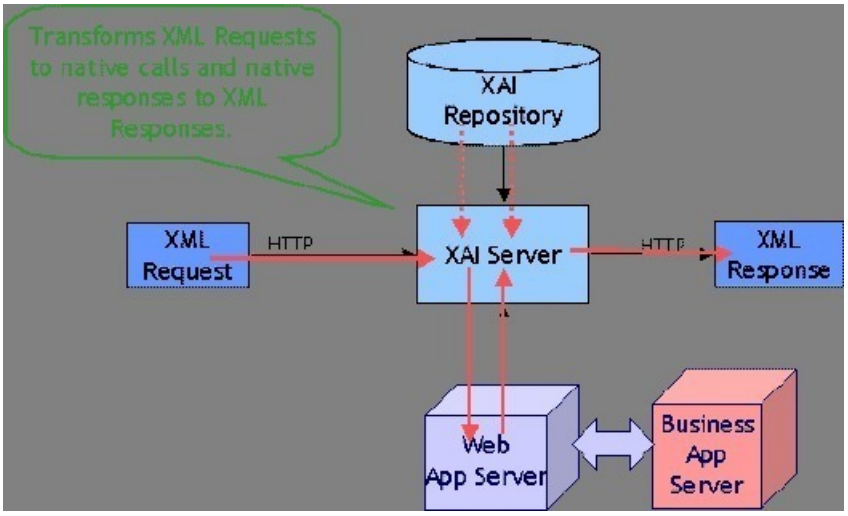
By default both user and password are authenticated. You can use the **System Authentication Profile***Message Option* to change this.

NOTE: Custom authentication. You can override the base package user credentials authentication logic using the **System Authentication Class***Message Option*.

Inbound Messages

Inbound messages are XML messages sent by an external application to invoke a system service. Inbound messages can be sent one at a time or in batches of several messages in a file. Third party integration points can import web services for inbound service calls. The standard method of doing this is by publishing a WSDL (Web Service Definition Language) definition for each exposed service.

Synchronous Messages



Synchronous service requests are sent using the HTTP protocol to the XAI servlet, which runs under a web application server such as WebLogic.

- The service request XML document must conform to the request schema that defines the service.
- The XAI servlet on the web server receives the service request XML document and based on the service name in the document identifies the appropriate XAI Inbound Service. Once the service is identified, the XAI servlet accesses the XAI Inbound Service record to find out the properties of the service.
- Based on the service properties, the XAI module loads the request and response schemas from the schemas repository (and caches them in memory).
- Based on the Adapter referenced by the service, it calls the appropriate adapter. The adapter performs most of the work to service the request.
  - The adapter connects to the application server, based on the connection information in the registry control tables.
  - It then parses the request document using the request schema.
  - Once the request document has been validated, the adapter converts the XML request document into a call to the application server.
- The response returned by the application server is then converted into a service response XML document, based on the response schema.
- The XML response document is shipped back to the caller over HTTP.

Using HTTP for Synchronous Service Execution
Invoking a service is not much different from sending a regular HTTP request. Here the HTTP request contains the XML as a parameter. The XAI server handling requests via the HTTP protocol is implemented using a Java servlet running on the web server.

Microsoft Visual Basic/C Example

Microsoft provides an easy way to send XML requests over HTTP. To send and receive XML data over HTTP, use the Microsoft XMLHTTP object

set xmlhttp = createObject("Microsoft.XMLHTTP")

xmlhttp.Open "POST", http://Localhost:6000/xaiserver, false

xmlhttp.Send XMLRequest

XMLResponse = xmlhttp.ResponseText

Here **http://localhost:6000/xaiserver** is the URL of the XAI server. **XMLRequest** contains the XML request to be processed by XAI and **XMLResponse** contains the XML response document created by the XAI runtime.

Java Example

Java provides a very simple way to send a request over HTTP. The following example shows how a request can be sent to XAI from an application running under the same WebLogic server as the one XAI runs. In this example, we use the "dom4j " interface to parse the XML document.

```
import com.splwg.xai.external.*;

import org.dom4j.*;

String xml;

xml = "<XML request>";

XAIHTTPCallForWebLogic httpCall = new XAIHTTPCallForWebLogic();

String httpResponse = httpCall.callXAIServer(xml);

Document document = DocumentHelper.parseText(httpResponse);
```

Asynchronous Messages

Various types of *receivers* running under the MPL server (rather than the XAI server) handle asynchronous inbound messages from several sources.

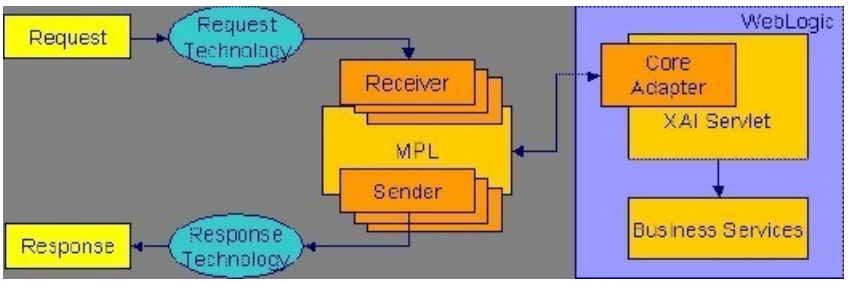
Requests may be received via the following:

- MQSeries, TIBCO or any JMS compatible messaging system
- The XAI Upload Staging table

The response is returned to the JMS queue/topic or to the staging table.

FASTPATH: Refer to *Designing XAI Receivers* for more information about the different receivers provided by the product for the different data sources.

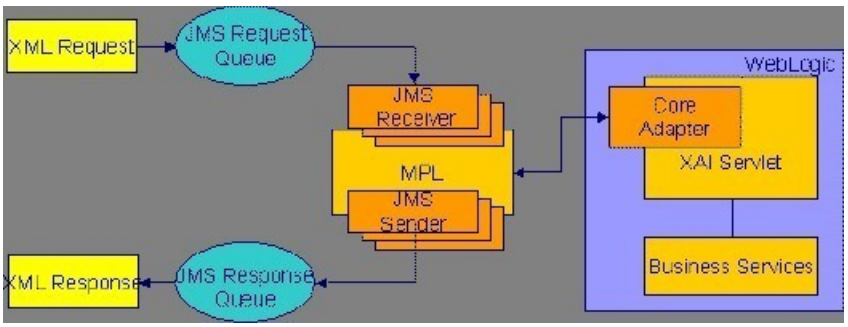
The following diagram shows the flow for asynchronous inbound messages.



Using JMS
Java Message Services (JMS) is a standard Java 2 Platform, Enterprise Edition (J2EE) protocol to send/receive asynchronous messages using a queue or topic message protocol.

XML messages may be received and sent via JMS using either a JMS Queue or JMS Topic. In order to access a JMS provider such as MQSeries, TIBCO or WebLogic, the MPL must first connect to the appropriate server using a JMS Connection.

The following diagram depicts a message sent and received through a JMS Queue.



Using JMS Queues

JMS Queues are used to receive and send messages using the message queue protocol. Products that support this protocol include MQSeries.

The following describes events that take place when a JMS queue is used:

- The requester places the XML request message on a JMS queue. The request contains both the XML message and the name for the *reply queue*.
- The *JMS Queue Receiver* waits for messages on that queue. When the message arrives it is selected from the queue and executed using the adapter for the requested service.
- The XML response message is placed on the reply queue specified in the request. It is the requester's responsibility to fetch the response message from the queue.

The MPL uses a *JNDI server* to locate the queue resource.

FASTPATH: Refer to *Designing XAI JMS Queues* for more information.

Using JMS Topics

JMS Topics are used to send and receive messages using the publish/subscribe messaging model. Products that support this protocol include TIBCO, MQSeries and WebLogic.

The MPL uses a *JNDI server* to locate the topic resource.

- Define a *JMS Topic receiver*, listening to a predefined JMS Topic.
- The other application builds an XML message based on the schema defined for that service.
- It sends the XML request to the predefined topic and specifies the reply topic name.
- The MPL reads the message from the Topic, executes the service and returns the response to the reply topic specified in the inbound message.

FASTPATH: Refer to *Designing XAI JMS Topics* for more information.

Staging Upload

The system provides a staging table, where an interface can store XML requests to perform a service in the system.

Some external systems interfacing with the system are not able to produce XML request messages. Or you may have external systems that produce XML messages but the messages are sent in a batch rather than real time. The system provides the capability to read an external data source containing multiple records, map the data to an XML request and store the request on the *XAI upload staging* table. These records may be in XML requests, sequential input files or database tables.

The XAI upload staging table may be populated in one of the following ways:

- When a collection of messages in a file or database table must be uploaded, a *staging control* record should be created for each file/database table. The *Staging Control Receiver* processes each file or database table and creates records in the XAI upload staging table for each message.

- The *XML File Receiver* creates records directly in the XAI upload staging table. Note, in addition, the XML File Receiver creates a staging control record to group together these records.
- XAI creates records in the XAI upload staging table for *inbound messages in error* that are configured to post the error.
- It is possible that when a response to a notification download staging message is received (Oracle Customer Care and Billing only), the response requires some sort of action. If this is the case, the system creates an XAI upload staging record (and an XAI staging control record) for the response.

Staging Upload Receiver
Once the XML requests are in the staging table, the *Staging Upload Receiver* reads the requests from the XAI upload staging table and invokes the XAI server (via the executer) with the appropriate XAI inbound service. Inbound service records typically point to the core *adapter* used to invoke system services.

Staging Upload Sender
The staging upload *sender* handles "responses" to the execution of the message in XAI upload staging. If the execution is successful, the sender updates the status of the upload staging record to **complete**. If the execution is unsuccessful, the sender updates the status to **error** and creates a record in the *XAI upload exception* table.

NOTE: Configuration required. The above explanation assumes that you have correctly configured your upload staging receiver to reference the upload staging sender. Refer to *Designing Responses for a Receiver* for more information.

Staging Control
The *staging control* table is used to indicate to XAI that there is a file or table with a collection of records to be uploaded. The special *Staging Control Receiver* periodically reads the staging control table to process new records.

The XAI staging control table may be populated in one of the following ways:

- To process a specific sequential input file, manually create a staging control record and indicate the location and name of the file and the XAI inbound service to use for processing. Use this mechanism to process ad-hoc uploads of files.
- If a file is received periodically, you may define a *File Scan Receiver*, which periodically checks a given file directory for new files. The file scan receiver creates a new staging control record to process this file.
- The *XML File Receiver* processes a file containing a collection of XML messages to be uploaded. The XML file receiver creates a staging control record and creates records directly into the XML upload table. The staging control record is automatically set to a status of **Complete** and is used to group together the XML upload records. Refer to *Processing Staging Upload Records for a Staging Control* for more information.
- To upload records from a database, manually create a staging control record and indicate an appropriate XAI inbound service, which contains the information needed by the system to access the appropriate table. Use this mechanism to process ad-hoc uploads of files.

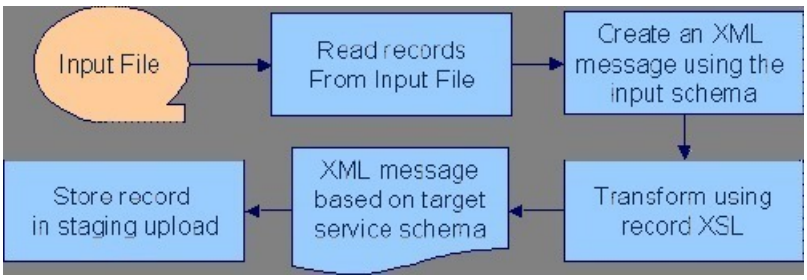
NOTE: To upload records from a database table, you must create a staging control record. There is no receiver that periodically looks for records in a database table.

- Whenever an *XAI upload staging* record is created, an XAI staging control record is created as well.

FASTPATH: Refer to *Batch scenarios* for more information about configuring the system to populate the staging control with requests from external files.

Staging Control Receiver
The Staging Control *Receiver* processes staging control records and invokes XAI (via the executer) to execute the request. The executer uses the appropriate adapter to generate records in the *XAI Upload Staging* table - one for reach record in the file or table.

The diagram below illustrates the information used by the staging control receiver to load data onto the staging table from a sequential input file.



The staging control *adapter* does the actual work. It reads the individual records in the input file and applies the XSL transformation script indicated on the XAI inbound service record to the input data to produce an XML request in the XAI upload staging table.

Processing Staging Upload Records for a Staging Control

In some cases, a process may populate records directly into the XML staging upload table. An example of such a process is the *XML File Receiver*. In this case, a staging control record is also created and used to group together the staging upload records.

The staging control contains information needed to process a group of staging upload records:

- The user related to these records. This user is for application security purposes. The user indicated here must have the proper rights for the application service and transaction type to be executed by XML upload records processed for this staging control.
- An indication of whether or not the records should be processed *sequentially*.

Processing Staging Records in Sequential Order

In some cases, a collection of messages uploaded together in a file must be processed in the order the messages are received. For example, if messages to add a person and add an account for this person are received together, the message to add the person must be processed before the message to add the account.

If messages received in a file must be processed sequentially, turn on the Sequential Execution switch on the *staging control* record. When the staging control receiver creates records in the XML upload table, the identifier of each record is built as a concatenation of the staging control record and a sequential number. If your staging control record indicates that the XML upload records should be processed in sequential order, the records are processed in primary ID order.

> **NOTE: Non-sequential processing**. If your staging control does not indicate that the related XML records should be processed in sequential order, the records are processed by the staging control receiver using a random, multi-threaded mechanism.

If you have defined a *receiver* to periodically search for files and populate records in the staging control table, you may turn on the Sequential Execution switch on the receiver. This ensures that records processed as a result of this receiver are executed in sequential order.

Staging Control Parameters

If your staging control accesses the data from a database table, you have the capability of defining the selection criteria. *XAI inbound services* that reference the **CISStagingUpload** adapter may contain a collection of fields that are used in an SQL WHERE clause. When adding a new *XAI Staging Control* record, you can define the values for the WHERE clause.

For example, imagine that you have a work management system where new premises are defined. Rather than waiting for this system to "push" new data to you, you design the interface to have the system "pull" the new data by looking directly at the "new property" database table.

The Request XML for your XAI service contains SQL statements used to access the data. You could define a Staging Control Parameter of "Add Date". When creating your staging control, you may enter a parameter value of today's date. When this record is processed, it only retrieves new properties from this work management table whose Add Date is today.

The following example shows part of the Request XML schema for an XAI Service that SELECTs premises based on postal code.

```
- <Schema xmlns="urn:schemas-microsoft-com:xml-data" xmlns:dt="urn:schemas-microsoft-
    com:datatypes" xmlns:d="urn:schemas-microsoft-com:datatypes" xmlns:b="urn:schemas-
    microsoft-com:BizTalkServer" b:root_reference="TestDuplicatePremise">
  - <ElementType name="TestDuplicatePremise" content="eltOnly">
      <b:property name="adapter">CISStagingUpload</b:property>
      <b:property name="stagingUploadType">DB</b:property>
      <element type="Request" />
      <element type="Response" />
    </ElementType>
  - <ElementType name="Request" content="eltOnly">
      <AttributeType name="Postal" d:type="string" d:maxLength="12" />
      <b:RecordInfo />
      <attribute type="Postal" />
    </ElementType>
  - <ElementType name="Response" content="eltOnly">
      <b:RecordInfo />
      <element type="Premises" />
    </ElementType>
  - <ElementType name="Premises">
      <b:RecordInfo />
      <b:property name="SQL">SELECT PREM_TYPE_CD, KEY_SW, OK_TO_ENTER_SW,
        TREND_AREA_CD, ADDRESS1, MAIL_ADDR_SW, POSTAL FROM CISADM.CI_PREM WHERE
        POSTAL = @TestDuplicatePremise/Request/Postal</b:property>
      <b:property name="tableName">CISADM.CI_PREM</b:property>
    - <AttributeType name="PREM_TYPE_CD" d:type="string" d:maxLength="008">
        <b:property name="dataType">string</b:property>
        <b:property name="uniqueId">PREM_TYPE_CD</b:property>
        <b:FieldInfo />
      </AttributeType>
    - <AttributeType name="KEY_SW" d:type="string" d:maxLength="001">
        <b:property name="dataType">string</b:property>
        <b:property name="uniqueId">KEY_SW</b:property>
```

The postal code value to substitute into the WHERE clause is defined on the individual XML Staging Control records.

FASTPATH: Refer to *XAI Staging Control* for more information.

Staging Control Sender

Before the staging control receiver invokes the executer, it changes its status to **complete**, assuming that there will be no problems. If the executer detects an error condition, the staging control sender updates the status of the staging control record to **error** and removes any XAI upload staging records that may have been created.

NOTE: Configuration required. The above explanation assumes that you have correctly configured your staging control receiver to reference the staging control sender. Refer to *Designing Responses for a Receiver* for more information.

Inbound Message Error Handling

For messages that are processed using the *staging upload* table, application errors that prevent XAI from successfully processing the message cause the staging record to be marked in error and highlighted via a To Do entry.

For messages that are not processed via staging upload, your implementation should consider what should happen to application errors. If the origin of the message is able to handle an immediate error returned by XAI, then no special configuration is needed. An example of this is an HTTP call to our system where the originator of the message is waiting for a real-time response.

Otherwise, for messages where errors should not be returned to the originator, but should be highlighted in this system for resolution, be sure to mark the **Post Error** switch on the *XAI inbound service*. When this switch is turned on and an application error is received by XAI when processing the message an *XAI upload staging* record is created (along with a staging control record) and marked in **error**.

For example, if a message is received via a JMS queue, application errors that prevent XAI from processing the message should not be returned to the queue because there is no logic to route the error to the sending system.

Integration Scenarios

Integration Using an EAI (or Hub)

It is possible for your various systems to be integrated with each other using a hub. The hub is implemented using an Enterprise Application Integration (EAI) tool provided by a third party vendor. Most hubs support HTTP and/or JMS and can work with XML schemas or document type definitions (DTDs).

- XAI services are presented to the EAI tool as schemas or as DTDs, immediately making the system callable from the hub.
- Integration scripts or workflow processes are defined in the EAI tools.
- At run time the hub uses HTTP or JMS to access the system using inbound messages.
- Outgoing messages are used to notify the hub about events occurring in the system. The messages are sent using HTTP or JMS.

Batch Scenarios
Messages may be sent in batch files, or may be retrieved from a database. In all cases, the system needs to be able to read the file and identify each individual message in order to create an XML request that can be processed by the XAI server. Once each individual message is identified, a request is stored on the XAI Staging Upload table for later execution.

XML Message File
It is possible for you to receive a file containing a collection of XML messages. The system identifies each separate message within the file and creates an entry for each message on the XAI upload staging table. It also creates a staging control record to group together each newly created XAI upload record. This staging control is created in **Complete** status and is not processed by the staging control receiver.

Since external applications may send messages in a format unknown to XAI, the system needs a mechanism for identifying the messages and mapping them to an XAI service.

XAI Groups
First the system associates the entire XML file with an XAI Group. You can think of the XAI Group as a categorization of the collection of messages. For example, you may have a separate XAI Group for each third party who sends you a collection of XML messages.

The system uses an *XPath* and XPath value to identify the correct XAI Group for the XML file.

Attachments and Rules
After identifying the appropriate group to which an XML file belongs, the system takes each message in the file and applies the appropriate XSL transformation to the message to produce a record on the upload staging table.

To process the messages in a file, the system needs to know how to identify each message in a file containing multiple messages. A file may use the same root element for each message or different root elements for different types of messages. For each XAI group, you must indicate the root element(s) that identifies a message by defining one or more attachments. Each attachment defines a root element, which tells the system when a new message begins.

Once the system has identified each separate message in the file, it must determine the correct XSL transformation script to apply. Once again the system uses an *XPath* and XPath value to identify the correct XSL to apply. For each XAI group, you define one XAI rule for every possible type of message you may receive in the file. Each XAI rule defines an XPath, XPath value and XSL transformation script.

Note you may assign a priority to each of your rules. The rules for more common messages may be assigned a higher priority. This enhances performance by ensuring that rules for more common messages are processed before rules for less common messages.

NOTE: Include parent elements. If the XML message includes parent elements (such as a transmission id or a date/time) that are needed for any of the separate child messages that are posted to the upload staging table, you can configure the appropriate attachment to include **parent** elements.

FASTPATH: Refer to *Designing an XML File Receiver* for more information about defining receivers that process XML files.

Sequential Input File

You may receive messages in a sequential input file, such as a comma-delimited file.

The following steps should be performed when configuring the system to enable data to be uploaded from an input file into the staging upload table:

1. Create an XML Schema that describes the records in the sequential input file.
2. Create the XSLT transformation that maps a record in the input file to an XML service request in your product.
3. Create an *XAI service* representing the batch process that loads the input file into the staging table.
4. If desired, create a new file scan receiver, which waits for an input file to appear in a particular directory. (If you do not take this step, then you need to create a *staging control* when you want a file to be processed.)

NOTE: Character Encoding. If the file is encoded with a specific character encoding, you may indicate the encoding as part of the file name to be uploaded. If the file name ends with **?enc=?x**, where x is the file character encoding, the adapter processes the file accordingly. For example, the file name may be specified as **premiseUpload.csv?enc=?UTF-8**. If the encoding is not specified as part of the file name and the file is in UTF-16 or UTF-8 with byte order mark, then the adapter can recognize the encoding.

Database File
It is possible for you to define an interface where inbound messages are retrieved by reading records in a database table.

The following steps should be performed when configuring the system to enable data to be uploaded from a database table into the staging upload table:

- Create an XML Schema that describes the records in the database table.
- Create the XSLT transformation that maps a record in the database table to an XML service request in your product.
- Create an *XAI service* representing the process that loads the records from the database table into the staging table.

WSDL Catalog

Web Service Definition Language (WSDL) is a language for describing how to interface with XML-based services. It acts as a "user's manual" for Web services, defining how service providers and requesters communicate with each other about Web services.

The base package provides the ability to publish a WSDL definition for each service exposed as an *XAI Inbound Service*. In addition, it is possible to request a catalog of all the XAI Inbound Services and a link to each WSDL. To view the catalog, launch a new browser session and enter the URL **http://$host:$port/XAIApp/xaiserver?WSDL** where $host and $port are replaced by the appropriate values for the current environment.

Outgoing Messages

This section describes outgoing message functionality related to MPL, which is no longer recommended.

- Outbound messages. As described in *Outbound Messages*, outbound messages are supported for sending outgoing messages. This functionality includes support that is only related to MPL.
- Notification download staging (NDS) messages. This method is only supported by *Oracle Utilities Customer Care and Billing*. Using this method near real-time, a record is written to the NDS staging table referencing only key fields. MPL then polls the records, invokes a service to build the message, applies the XSL and routes the message. If sent real-time, no record is posted to the staging table but rather the message dispatcher routes the message immediately. Refer to Oracle Utilities Customer Care and Billing help, Workflow and Notifications, Notification and XAI for more information.

The following sections describe the outbound messages topics specific to MPL in more detail.

Outbound Message Receiver

The outbound message *receiver* processes records in the outbound message table that have a processing method flag equal to **XAI** and a status of **pending** and changes the status to **in progress**. The receiver then retrieves the message XSL and the message sender defined for the external system / outbound message type.

> **NOTE: Template external system**. If the outbound message's external system references a template external system, the outbound message type configuration for the template external system is used.

It applies the message XSL (if supplied). If the option to *validate outbound message schemas* is turned on, the schema validation is performed.

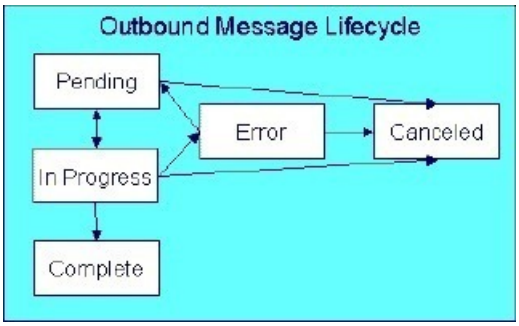
Refer to *Outbound Message Error Handling* for information about error handling.

If no errors are received, control is turned over to the *outbound message sender* for routing.

> **NOTE: Initialization of receiver**. During the initialization of this receiver (for example if there is a problem with MPL and it is restarted) any records that are found to be **in progress** are changed to **pending** so that those messages are sent properly.

Lifecycle of Outbound Message

The outbound message receiver processes outbound message records based on their status. The following diagram describes the lifecycle of an **XAI** type outbound message.



- Records are created in **pending** status.
- The outbound message receiver processes pending records and changes the status to **in progress**.
- If the message is sent successfully the system changes the status to **complete**.
- If there was a problem sending the message the system changes the status to **error**.
- When the user resolves the error they can change the status back to **pending**.
- A user can change the status of a **pending** or **error** record to **canceled**.
- For the rare cases where there is a problem with MPL and a message is left in the status **in progress**, users may manually change the status to **canceled**. In addition the outbound message receiver includes a step at startup to find **in progress** messages and change them to **pending**.

Outbound Message Sender

The outbound message sender is responsible for routing the message to the *Message sender* determined by the receiver. If the routing is successful the outbound message status is marked **complete**. If the routing is unsuccessful, the status is marked in **error**.

Refer to *Outbound Message Error Handling* for information about error handling.

NOTE: Automatic Resend. If you have configured the system for *automatic resend* and the system detects that the error is due to the sender being unavailable, the message remains in **pending** status.

NOTE: Configuration required. The above explanation assumes that you have correctly configured your outbound message receiver to reference the outbound message sender. Refer to *Designing Responses for a Receiver* for more information.

Outbound Message Error Handling

If the outbound message receiver or the outbound message sender detects an error while attempting to process the outbound message, it marks the message in **error**, captures the error message and its parameter values and creates a To Do entry using the To Do type specified in the Message option **To Do Type for Outbound Message Errors**.

A separate background process *F1-DTDOM* is responsible for completing To Do entries for outbound messages no longer in **Error**.

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.

- 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 validate against

You may turn on or off this validation checking using an Message option **Schema Validation Flag**.

Automatic Resend

If a system error is received by the MPL when attempting to route the message to a sender, (using the outbound message method or the NDS message method), the system marks the appropriate table in **error**. This is true even if the reason for the error is that the connection to the sender is unavailable. When the connection is restored, a user must change the status of the appropriate record to **pending** (for outbound messages) or **retry** (for NDS messages) in order for the message to be resent.

Alternatively, you can configure your system to attempt to automatically resend the message. This section describes the logic available for auto resend. To enable automatic resend, you must set the flag **Automatically Attempt Resending to Unavailable Senders** on *Message option* appropriately.

If an error is received by the MPL when it attempts to invoke a sender and the auto resend option is on, the system does not mark the record in **error**. It continues to attempt sending messages to the sender until the number of errors has reached a predefined maximum error number (defined as an *Message option*). When the maximum is reached, the sender is marked as **unavailable** and an MPL log entry is created. The MPL ignores messages for **unavailable** senders.

The system tries to resend messages to this sender the moment the sender is reset to be **available**. The following points describe how a sender becomes **available**:

- MPL attempts to retry sending messages to unavailable senders every X minutes, where X is defined on *Message option*.
- On MPL startup all senders are marked as **available**
- A user may navigate to the *XAI Command* page and issue a command **MPL Refresh Sender** to refresh the cached information for a particular sender

Designing Your XAI Environment

This section guides you through the steps required to design the tables that control your XAI processing.

Installation

The XAI server is installed with default configuration. This section describes how you may customize the XAI server configuration.

Startup parameters are defined in two parameters files

- The XAIParameterInfo.xml file is used by the XAI HTTP server. This file is found within the XAI directory in the path (...\splapp\xai).
- The MPLParameterInfo.xml file is used by the MPL server. This file is found within the XAI directory in the path (...\splapp\mpl).

Both files store the parameters as XML files with the following elements (sections):

- Source
- ParameterVariables
- AdHocParameters

The XAI Source Section

The XAI tool accesses XAI *registry* information through the standard system programs. The `<Source>` section in the `XAIParameterInfo.xml` file tells XAI the user ID for accessing the registry information. It contains the following attributes:

Attribute Name	Description
Source Type	This should be set to **CorDaptix**, which tells XAI to access the registry through the standard access to system programs.
CorDaptixUser	The user ID to use when accessing the registry data.

The MPL Source Section

The `<Source>` section in the `MPLParameterInfo.xml` file defines the database connection information used to connect to the database storing the XAI table information. It contains the following attributes:

Attribute Name	Description
Source Type	Defines the source of the data, for example **ORACLE** or **DB2**.
jdbcURL	The URL used to connect to the product database. For example: **jdbc:oracle:thin:@//server-name:1234/DBNAME**
databaseUser	The Oracle User Id used to connect to the database. For example: `sysuser`
databaseUserPassword	The Oracle password used to connect to the database. For example: `sysuserpassword`

The Parameter Variables Section

When defining values for fields in certain control tables in the registry, you may reference substitution variables that point to the `<ParameterVariables>` section of the installation files. Substitution variables provide for dynamic substitution of values based on parameters provided at server startup.

To specify a substitution parameter in a string value you enter the name of the substitution parameter enclosed with `@`.

For example if you have a field in the XAI control tables that should contain the URL for the XAI HTTP servlet, you could enter the value in the following way: **http://@HOST@:@PORT@/xaiserver**.

In the parameters section, define the appropriate values for these parameters, for example:

```
<ParameterVariables>
<ParameterVariable name="HOST" value="localhost" />
<ParameterVariable name="PORT" value="8001" />
</ParameterVariables>
```

At run time, the system builds the URL as `http://localhost:8001/xaiserver`.

Every substitution parameter is defined using an `<ParameterVariable>` element with the following attributes:

Attribute Name	Description
Name	The name of the substitution parameter
Value	The value to replace an occurrence of the substitution parameter in an XAI control table field

NOTE: Substitution parameters can only be used for string fields, and not for fields that are foreign keys to other objects.

The AdHoc Parameters Section

The <AdHocParameters> section is used to provide registry definitions that override the existing ones. Unlike the <ParameterVariables> section, a whole registry object definition can be specified in this section. When the XAI server starts, it first reads the registry definitions from the database and then it reads the <AdhocParameters> section. If it finds an object definition in this section, it uses it to replace the one read from the database.

Attribute Name	Description
Object Name	The object name may be one of the following objects: Option Receiver Sender
Object Attributes	The attributes of the object. Each object type has its own set of attributes:
'Option' object attributes	
name	The option flag. Must be defined in the OPTION_FLG table
value	The value for that option
'Receiver' object attributes	
name	The receiver ID
Class	The JMS provider. May be 'MQ'
TargetClient	The client type writing/reading to the JMS queue/topic. May be 'JMS' or 'MQ'. Only relevant for interfacing with MQSeries
JMSProvider	The JMS provider. May be 'MQ'
TargetClient	The client type writing/reading to the JMS queue/topic. May be 'JMS' or 'MQ'. Only relevant for interfacing with MQSeries
Executer	The XAI Executer ID for this receiver
'Sender' object attributes	
Class	The JMS provider. May be 'MQ'
JMSProvider	The JMS provider. May be 'MQ'
TargetClient	The client type writing/reading to the JMS queue/topic. May be 'JMS' or 'MQ'. Only relevant for interfacing with MQSeries

Designing XAI Inbound Services

When designing your XAI environment, you should first identify the services that you would like to perform. Determining your services facilitates your design for the other registry options.

To design your inbound services,

- Determine each service that needs to be performed
- Determine the correct *adapter* that is needed by your service.
- Determine the required layout of the request and response messages and specify the request *schema* and response *schema*.
- If a transformation of the data is required, you need to design the appropriate request XSL and response *XSL transformation* scripts.
- If the service references the staging upload adapter, determine the staging file type and design the record XSL transformation script. In addition, determine if you want to enter an input file name and interface name. Finally, determine whether or not you need to indicate a special *JDBC connection*.
- As new releases of the system are installed, it may be necessary to modify your service for the new release. If this is the case, you need to design separate versions of the inbound service.

FASTPATH: Refer to *XAI Inbound Services* for more information.

Designing XML Schemas

You need XML schemas for the services you designed in *Designing XAI Inbound Services*.

For each message, identify what service you need to invoke and what action you need to perform. If you have multiple actions that you may need to perform for the same service, you may choose to create a single generic XML schema or you may choose to create multiple schemas, which are more specific. For generic messages, the transaction type, indicating the action to perform would be passed in on the XML request document to indicate what must be done. For more specific messages, you may be able to indicate the transaction type directly on the schema and it would not need to be overwritten at run time.

You need to create a response schema for each request schema. It is possible for you to use the same schema for both functions.

FASTPATH: Refer to *Schema Editor* for more information.

Designing XSL Transformations

You need an XSL transformation script for each service you designed in *Designing XAI Inbound Services*, where you determined a transformation is necessary. In addition, you need XSLT scripts for your outgoing messages. Each sender, which receives a message, probably requires a transformation of the message into a local format. Refer to *Outgoing Messages* for more information.

For each message requiring transformation, determine the format used by the external system. In most cases, it is not the same format recognized by the system. For each case, you must create an XSL transformation, which maps the message format from the external format to one expected by your product or from your product format to one expected by the external system.

When identifying the required XSL transformations, remember to take into consideration the data that is processed by the staging control table. This service reads data stored in a file or database table and uses the Record XSL to map the individual records to an individual service request.

FASTPATH: Refer to *XAI Inbound Service* for more information.

Designing Your Registry Options

The XAI registry is a set of control tables that is used to store service definitions as well as various system information required by the XAI and MPL servers. The following sections describe each table in the registry.

Designing XAI JNDI Servers

The XAI tool, including receivers and senders, uses a Java Name Directory Interface (JNDI) server to locate resources on the network. JDBC connections, JMS connections, JMS queues and JMS topics should be defined on the JNDI server. In addition, adapters that need to access your product information reference the JNDI server to determine where your product is running.

Design your JNDI server values as follows:

- Define a JNDI server that indicates where the system is running.
- If you are using JMS resources, such as JMS Queue or JMS Topic, and these are located in a server other than the one where the system is running, define the server where these resources are located.
- If there are any other resources that may be needed by XAI, define a JNDI server to indicate where these are located.

The product is shipped with a JNDI server running under the same Weblogic server used for the system.

When defining the URL, you may use substitution parameters such as those shown in the example below. XAI uses the parameter variables section of your start up parameters to build the appropriate URL. Refer to *Installation* for more information

JNDI Server	Description	Provider URL
WLJNDI	Weblogic JNDI Server	t3://@WLHOST@:@WLPORT@

Designing XAI JDBC Connections

If you need to access a database table to process your messages, XAI needs to know the location of the database and how to access it. If the tables are located in the same database used for the system (defined in your *Installation*), then you do not need to enter any extra JDBC Connections. If you need to access data that lives in another database, design the additional JDBC Connections and determine the type of connection and connection information.

FASTPATH: Refer to *XAI JDBC Connections* for more information about defining XAI JDBC Connections.

Designing XAI JMS Connections

If you are using JMS to send and receive messages, then you must define a JMS Connection to indicate the JNDI server to use to locate these resources. For each JMS connection defined, the *MPL* server creates a pool of connections that are later shared by multiple threads.

FASTPATH: Refer to *XAI JMS Connections* for more information about defining XAI JMS Connections.

Designing XAI JMS Queues

If your business uses JMS Queues to send and receive messages, then you need to add an entry on the *XAI JMS Queue* page, defining the JNDI server and Queue Name.

Designing XAI JMS Topics

If your business uses JMS Topics to send and receive messages, then you need to add an entry on the XAI JMS Topic page, defining the JNDI server and Topic Name.

Designing XAI Formats

The Formats section of the registry is used to define data formats. Data formats can be used in schema definitions to specify data transformations. To determine what data formats you need to define for your XAI environment, you must review the expected format of data that you will be exchanging and determine whether or not data transformation is required.

The following sections describe the four different types of formats and some guidelines in their use.

Date Formats
Date formats may be specified using any valid Java format supported by the java.text.SimpleDateFormat class.

To specify the time format use a time pattern string. For patterns, all ASCII letters are reserved. The following usage is defined:

Symbol	Meaning	Presentation	Example
G	era designator	Text	AD
y	year	Number	1996
M	month in year	Text & Number	July & 07
d	day in month	Number	10
h	hour in am/pm (1~12)	Number	12
H	hour in day (0~23)	Number	0
m	minute in hour	Number	30
s	second in minute	Number	55
S	millisecond	Number	978
E	day in week	Text	Tuesday
D	day in year	Number	189
F	day of week in month	Number	2 (2 nd Wed in July)
w	week in year	Number	27
W	week in month	Number	2
a	am/pm marker	Text	PM
k	hour in day (1~24)	Number	24
K	hour in am/pm (0~11)	Number	0
z	time zone	Text	Pacific Standard Time
'	escape for text	Delimiter	
''	single quote	Literal	'

Currency Formats
Currency formats are used to specify formatting for elements representing currencies. They may include the following:

Symbol	Meaning
#	number place holder
,	thousands separator
.	decimal point
$	currency sign

For example to define the currency format for US dollar, indicate: $#,#.00

Phone Formats

Phone formats can be used to specify formats for telephone numbers. The supported format specification is limited to the following format characters:

Symbol	Meaning
0	number place holder
\0	0

Any other character appearing in the formatting expression is a placeholder for that character. To specify the '0' character, use '\0'.

Phone Format Example: (000) 000-0000

Text Formats
Text formats are used to specify formats for character string attributes. The following expressions are supported:

Symbol	Meaning
\cUpperCase	Translate the string to upper case.
\cLowerCase	Translate the string to lower case.
\cProperCase	Translate the string to proper case. The first character of every word is translated to uppercase. The remaining characters are translated to lowercase.

FASTPATH: Refer to *XAI Format* to define your XAI Formats.

Designing XAI Adapters

The product provides a set of adapters to process your XML requests. The adapters point to a specific Java class that renders a service. If you find that you need to use a protocol, which is not supported by the adapters provided, you will need to add a new Message Class (which points to a Java class) and a new XAI Adapter. It is recommended that your implementers contact customer support. The following adapter classes are provided.

- **BASEADA:** This is the core adapter class that provides access to any published system service. This adapter accesses system objects through the page server. Services with this adapter need to indicate the object (application service), which should be invoked.
- **BUSINESSADA**: This is the core adapter class that provides access to schema-based objects. This adapter accesses *business objects*, *business services* and *service scripts* through their schema API. Services with this adapter need to indicate the schema of the object, which should be invoked. When communicating to these objects, it is not necessary to create XAI schemas for the schemas associated with the objects. XAI is able to directly communicate with these objects using their existing schema definitions. As a result, there is no need to use the XAI schema editor when defining XAI Inbound Services for this new adapter.
- **STGUPADA**: This staging upload adapter class is used when an extra step is required prior to using a service with the core adapter. For example, perhaps you need to read a file, which is not in XML format, and convert it to an XML format recognized by the system. Services with this type of adapter do not need to indicate an application service but must indicate information about the file to be converted. Refer to *XAI Staging Control* for more information.
- **XAICMNDADA:** This is an internal adapter. It is used to send commands to the XAI Server.
- **LDAPIMPRTADA:** This adapter is no longer supported .
- **SIEBELADA:** This adapter is no longer supported.

Designing XAI Executers

The executer is responsible for executing messages received through a message receiver. The product provides an executer, which uses the XAI server; however the architecture allows for implementing additional execution classes. If you require a different executer and therefore a different execution class, it is recommended that your implementers contact customer support.

FASTPATH: Refer to *XAI Executer* for more information.

Designing Message Senders

This section only describes message sender functionality that is only related to the XAI/MPL processing. Refer to *Define the Message Sender* for details about other types of senders that are supported independent of XAI/MPL.

Message senders are responsible for define outgoing message destinations and for " *responding*" to the XAI executer.

- For NDS messages, the sender to use is defined on the *XAI route type* for the notification download profile.
- For outbound messages, the sender to use is defined on the *external system* / outbound message type collection.
- For responding to the XAI executer, the sender to use is defined on the *receiver*.

For each sender, you must reference an appropriate Message Class. The information in this section describes the sender classes that are provided with the system.

You must create senders to "respond" to the various staging table receivers in the system.

- Create a sender to be used for "responses" to messages processed by the staging control receiver. You should create one sender, which points to the Message Class **UPLDERRHNDLR**. Refer to *Staging Control Sender* for more information about this sender.
- Create a sender to be used for "responses" to messages processed by the upload staging receiver. You should create one sender, which points to the Message Class **STGSENDER**. Refer to *Staging Upload Sender* for more information about this sender.
- Create a sender to be used for messages processed by the download staging receiver. You should create one sender, which points to the Message Class **DWNSTGSNDR**. (DWNSTGSNDR is not supported in all products.)
- Create a sender to be used for messages processed by the outbound message receiver. You should create one sender, which points to the Message Class **OUTMSGSNDR**. Refer to *Outbound Message Sender* for more information about this sender.

Next, design the senders for "responses" to other receivers, for example the JMS queue receiver or JMS topic receiver. The system provides message classes to use for these senders. Use the class **JMSSENDER** for a JMS queue sender and **TPCSNDR** for a JMS topic sender.

Finally, review all your *outgoing messages* and determine the mechanism for communicating with the target system for each message.

- For all senders that are used for *real time messages*, define a context entry with a context type of **Response Time Out** to define the amount of time the system should wait for a real time response.
- An HTTP sender is one that sends messages to an HTTP server using the HTTP protocol. For an HTTP sender, reference a message class of **HTTPSNDR**. In addition, the context described in *Message Sender — Context* for the **RTHTTPSNDR** apply to this sender as well.
- An email sender allows for XML messages to be sent as email messages through an SMTP server. It can be used in notification download processes to send a response as an email message. The email sender supports standard email functionality such as "CCs" and attachments. The content of the email message is controlled by the XSL script defined in the *XAI route type* of the NDS message. The XSL script has access to all context records of the NDS message as well as the input XAI message that was created by processing the NDS. Reference a message class of **EMAILSENDER**. In addition, the context described in *Message Sender — Context* for the **RTHTTPSNDR** apply to this sender as well.
- If you want XML messages to be written to a flat file, use a flat file sender. For example, it can be used in the notification download process to write a response message to a flat file. Flat file senders should reference an Message Class of **FLATFILESNDR**. In addition, the following context records should be defined for senders of this type.

Context Type	Description	Values
Flat file output directory	Directory in the file system where to write the file	
Flat file filename pattern	The name of the output file. The file name may be a literal constant, or generated dynamically. To create a dynamic filename use <file name>$$ID, where $$ID is replaced at run time by the ID of the NDS message that triggered the response message. If no file name is defined for the sender, the XAI server generates a file name with the following format 'XAI$$ID.xai'.	
Append data to file	This parameter controls whether the content of the response message is appended to an existing file, or a new file is created (possibly replacing an existing one).	**YES** or **NO**
Character Encoding	Indicates if the message should be sent with character encoding. The sender will write the content of the file with encoding specified in the context value. If no value is specified, the sender uses the default Java system encoding, which is determined according to the operating system locale.	**UTF-8** or **UTF-16**

The topics below describe configuration required for senders that route a message via an HTTP sender, a flat file sender or an email sender.

Designing XAI Groups

XAI groups are used by the system to process an XML file containing multiple messages to be uploaded into the system. One or more groups may be defined for an *XML file receiver*.

FASTPATH: Refer to *XML Message File* for more information about how groups are used to process an XML file.

When setting up your XAI environment, identify the interfaces that require uploading an XML file containing multiple XML messages into the system through XAI.

First you need to categorize the XML files that you may receive. Define an XAI Group for each logical categorization. For example, you may want to define a separate XAI Group for each third party who may send you a collection of XML messages. Or, if all third party service providers send direct access messages in a standard format, you may want to define a single XAI Group for direct access messages.

For each group, you need to identify the root elements that indicate when a new message is starting. This collection of unique root elements for a group is called the attachments.

For each group, you must identify every possible message that may be sent. For every message, define an XAI Rule. The rule indicates the XSL transformation script to be executed along with the XPath and XPath value that the system uses to identify each message.

FASTPATH: Refer to *XAI Group* to define groups, their attachments and their rules.

Designing XAI Receivers

Receivers define small pieces of code that wait for requests to be received through various sources. Each receiver references an Message Class where the small piece of code is defined. The following receiver classes are provided:

- **STGRCVR** The receiver that references this class polls the XAI upload staging table for new inbound requests.
- **STGCTLRCVR:** The receiver that references this class polls the XAI staging control table for new upload processes.
- **DWNSTGRCVR:** The receiver that references this class polls the notification download staging table (NDS) for new messages. (Not available in all products).
- **OUTMSGRCVR:** The receiver that references this class polls the outbound message table for new messages.
- **JMSRCVR**: Receivers that reference this class receive requests through a message queue that supports the JMS Queue interface, such as IBM MQSeries.
- **TPCRCVR:** Receivers that reference this class receive requests through a publish/subscribe model, such as TIBCO, or any system supporting the JMS Topic interface.
- **FILESCANRCVR:** Receivers that reference this class poll a given directory for files with a given file name pattern.
- **XMLFILERCVR:** Receivers that reference this class poll a given directory for XML files with a given file name pattern.

Multiple receivers may be defined for these receiver classes. For example, the XML file receiver defines the scan directory. If you have multiple directories that contain files to be uploaded, define a receiver for each directory.

All types of receivers reference an Message Class and XAI Executer. If you require a new Message Class or Executer because you use a protocol that is not currently supported, it is recommended that your implementers contact customer support.

Designing Responses for a Receiver

Once a request has been sent for execution to the XAI server (via the executer), *the response layer* processes the response. For some receivers, a response may not be applicable. For example, a file scan receiver reads flat files in a given directory and posts records to the XAI staging control table. Responses are not applicable for this type of receiver.

The response may be conditional on the outcome of the request and may be sent to more than one destination (*sender*). To design your receiver responses, determine the conditions under which a response should be sent for each request processed by each receiver:

- Never send a response
- Send a response if the request was successful
- Send a response if the request was unsuccessful due to a system error
- Send a response if the request was unsuccessful due to an application error

Once you determine when to send a response, you must determine where to send the response. Responses for different conditions may be sent to different Message Senders or to the same Message Sender.

Designing Receivers that Poll Staging Tables

The following receivers are needed to poll the various system staging tables.

- Create a *staging upload receiver* that references the Message Class **STGRCVR**. For responses, **All Events** should reference the *staging upload sender*.
- Create a *staging control receiver* that references the Message Class **STGCTLRCVR**. For responses, **All Events** should reference the *staging control sender*.
- If your implementation uses the NDS message method of communicating outgoing messages, create a staging download receiver that references the Message Class **DWNSTGRCVR**. For responses, **All Events** should reference the download staging sender. NDS messaging is not supported in all products.
- If your implementation uses the *outbound message* method of communicating outgoing messages, create an *outbound message receiver* that references the Message Class **OUTMSGRCVR**. For responses, **All Events** should reference the *outbound message sender*.

For all the above receivers, if you need to access multiple environments, simply create receivers for each JDBC connection. Note that you should not add more than one of each of the above receivers pointing to the same JDBC connection. To improve performance for a single JDBC connection you may *configure multiple MPL servers*.

NOTE: Sample Data for Initial Install. When first installing the system, records for each of the above receivers are provided. Your implementation may use these records or remove them and create your own.

Designing a JMS Queue Receiver
If you need to receive messages through a JMS compatible queue, you need to define a JMS Queue receiver. When designing a JMS Queue receiver you first need to design a *JMS Connection* and a *JMS Queue*.

If you would like to post *responses* back to the JMS queue, you may create an *Message sender* to send the response to the JMS queue.

Designing a JMS Topic Receiver
If you need to receive messages through a JMS Topic using the publish/subscribe model, you need to define a JMS Topic receiver, which receives messages published under a specific topic. When designing a JMS Topic receiver you first need to design a *JMS Connection* and a *JMS Topic*.

If you would like to post *responses* through a JMS Topic using the publish/subscribe model, you may create an *Message sender* to send the response to the JMS topic.

Designing a File Scan Receiver
The file scan receiver constantly looks in a given directory for files with a given pattern. When it finds a matching file, it creates a record in the *staging control* table to upload the contents of the file into the *upload staging* table.

When setting up your XAI environment, identify the interfaces that require uploading a file from a directory into the system through XAI. For each unique file, define a file scan receiver. For each receiver record, indicate the Scan Directory, where new files will be placed, the Scan File, which is the naming pattern to look for and the XAI Inbound Service to use for mapping the data into a system service.

In addition, if you want to specify a character encoding, the following Context record should be defined.

Context Type	Description	Values
Character Encoding	Indicates that the message is character encoded. When the receiver creates a staging control entry for a file, it will add ?enc=?x to the name of the file in the table where *x* is the value of this parameter. Refer to *Sequential Input File* for more information.	**UTF-8** or **UTF-16**

Designing an XML File Receiver
The XML file receiver constantly looks in a given directory for XML files with a given pattern. When it finds a matching file, it goes through steps to identify each separate message in the file, determine the appropriate XSL transformation and create a record in the staging upload table.

FASTPATH: Refer to *XML Message File* for more information.

When setting up your XAI environment, identify the interfaces, which require uploading an XML file containing multiple XML messages into the system through XAI. For each unique file, define an XML file receiver. For each receiver record, indicate the Scan Directory, where new files will be placed, the Scan File, which is the naming pattern to look for and the collection of XAI groups. XAI groups are used by the system to identify each separate message in the file and to determine the appropriate XSL transformation for each message.

FASTPATH: Refer to *Designing XAI Groups* for more information.

Configuring the System for NDS Messages

Refer to the documentation for your product to find out if NDS messaging is supported.

Schema Editor

The Schema Editor is a Graphical User Interface (GUI) tool to create XML schemas. The tool provides wizards to generate schemas from various sources.

Opening the Schema Editor

After launching the schema editor, you are asked to connect to a database. On the Connect dialog:

- Select an ODBC data source pointing to the desired database.
- Enter the data source, user ID, password and database owner required to log on to that database.
- Click **Connect**.

After connecting, the schema editor appears.

Use the File/Open dialogue to select a schema from the schema directory. Refer to *The Options Menu* for information about setting the default schema directory.

> **NOTE:** When opening a schema, the schema editor validates the schema and any errors are displayed. Refer to *Validating a schema* for more information.

Schema Editor Window

The schema editor allows you to modify individual elements and attributes of a given schema.

Description of Page

Refer to *System Wide Functions for Schema Editor* for information about the various menu options available for the schema editor.

Service Name Enter the name of the service to be created in the service name text box. This is the name of the first element under the Body element in the XML document.

> **CAUTION:** Important! When adding new schemas, carefully consider the naming convention for the Service Name. Refer to *System Data Naming Convention* for more information.

Adapter The adapter used to process services using this schema.

Internal Service Name If the schema is for an adapter that should invoke a system service, this is the internal name of the service.

Transaction Type Select the transaction type performed by the service. The available values are **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.

Left Panel

The left panel of the schema editor displays a tree view of the hierarchical elements in the schema. The (+) expands a node, the (-) collapses a node.

Right Panel

The following attributes appear on the right panel of the Schema Editor. Some fields cannot be modified in the schema editor. The field description indicates when the field is protected.

Tag Name The XML element tag name. This field is protected, but you may modify this attribute to give the element a self-explanatory name by right-clicking on the element name in the left tree-view.

MetaInfo Name Maps the element to a fully qualified field name in the service, for example PER_ID. This field is protected.

Internal Type This property is populated automatically when you generate the schema from your product. The values further define elements and attributes. The values are **page**, **pageBody**, **list**, **listHeader**, **listBody**, **searchHeader**, **codeTableDesc**, **Private**. The values of **codeTableDesc** and **Private** are used to define special types of attributes.

Private attribute A field that does not exist on the server side, but one that you still want to have in the schema.

Description A description of this field.

Content The element type. This field is only available for elements. Possible values are **eltOnly**- element may contain only other elements and no text, **TextOnly**- element may only contain text.

Search Type Services, which perform a Search, may allow searching based on different criteria. The values are taken from the system meta information when the schema is generated. The possible values are **Main**, **Alternate1**, **Alternate2**, **Alternate3**, **Alternate4**, **Alternate5** and **Alternate6**.

> **NOTE:** You would not typically modify this value because it corresponds to a value in the meta information. However, the value is modifiable to accommodate the rare case in which a service may change in a new release. In this scenario, you may prefer to update the schema manually rather than regenerate a new schema for the new version.

Is Part of Primary Key Used to indicate to the XAI server whether or not this field makes up part of the primary key of the record. The values are taken from the metadata information when the schema is generated. Value may be **true** or **false**.

> **NOTE:** Typically you would not modify this value because it corresponds to a value in the meta data information. However, the value is modifiable to accommodate the rare case where a service may change in a new release. In this scenario, you may prefer to update the schema manually rather than regenerate a new schema for the new version.

Min Occurs This field is available for elements only and is used for repeating elements. It defines the minimum number of occurrences for an element. Value may be 0 or 1.

Schema Max Occurs This field is available for elements only and is used for repeating elements. It defines the maximum number of occurrences for an element. Value may be 0, 1 or *.

Limit Number of occurrences This field is available for elements only and is used for repeating elements. If the **Schema Max Occurs** field has been set to '*', define the number of max occurrences here.

XML Data Type The data type for the attribute. Possible values are **number**, **string**, **decimal**, **date**, **dateTime**, and **boolean**.

Server Data Type Indicates the data type of this attribute on the server. This field is protected.

Service Format The format expected by the service. At runtime, XAI converts the Tag format to the Service Format before executing the request. Formats are defined in *XAI Format*.

Tag Format The format used to format an element/attribute in the schemas. Formats are defined in *XAI Format*.

Min Length Use this property to define the minimum length of the attribute, if applicable.

Max Length Use this property to define the maximum length of the attribute, if applicable.

Precision This is used for decimal attributes to define the maximum number of digits.

Scale This field is used for decimal attributes to define the number of digits at the right of the decimal point.

Required A value of **Y** indicates that the element must appear in XML document. A value of **N** indicates that the element is optional.

Default value Default value to be used for Request schema, when the element is not supplied as part of the XML request document.

Fixed Value Fixed value to be used for Request schema. This value is used regardless of the value supplied in the request document.

Code Table Field This property is used for attributes that are descriptions of a code table, where the description is not automatically returned by the system service. Use this property to indicate the code whose description should be retrieved by the XAI server.

Code Table Program This property is used for attributes that are descriptions of a code table, where the description is not automatically returned by the system service. Use this field to indicate the program that XAI should call to access the description for the **Code Table Field**.

Creating a Schema

Usually you do not create schemas from scratch; rather you use Schema Creation Wizards to import existing data structure definitions from a variety of data sources:

- System services
- Comma Delimited Files (CSV)
- Database Extract
- Any XML document

Once a schema is created based on the existing data structure, it is displayed in a TreeView on the left panel. Once the imported schema has been edited, it serves as the basis for creating the request and response schemas. When imported, the schema exposes all fields defined in the service. You may want to remove some attributes/elements from the request or response schema.

NOTE: Although the main purpose of the editing process in the creation of the request and response schemas is the elimination of elements, which makes the schema shorter and more understandable, it is not required for processing purposes. Therefore, if you don't mind that you have not used elements in your schemas, you could stay with one schema, which serves as both the request and response schema.

1. Save the Schema as a Request schema with an appropriate name, for example PersonInfoRequestSchema.xml

2. To create the Response schema, which is identical to the request schema, use the Save As Response menu option. This renames the top element of the schema to ServiceNameResponse, for example PersonInfoResponse and save the schema under a different name i.e. PersonInfoResponseSchema.xml. Note that if the request and response schemas are identical then one schema may be used for both and there is no need to create separate schemas.

3. Read in the Request Schema (File/Open) and modify its structure. Depending on the service type, you'll have to modify the contents of the Request Schema. This is usually required when the service is an "Info" service, which requires very few input elements. In such cases you'll delete most of the elements on the schema and only leave the necessary elements required to invoke the service. For example: in the PersonInfo request, you only need the PersonId and the Company elements in the request schema.

4. Read in the Response Schema (File/Open) and Modify its structure. Depending on the service type, you'll want to modify the contents of the Response Schema. This is usually required when the service is an "Add" or "Delete" service, which returns very few input elements. In such cases you'll delete most of the elements on the response schema and only leaves the necessary elements required by the requester of the service.

Adding an Element/Attribute

Usually, you won't have to add element or attributes to a schema. However if the schema already exists and you want to add an element/attribute, you can follow this procedure. Be aware that any element/attribute added here must also exist on the xml metainfo.

- Select the element's node on the TreeView.
- Right click on it and select the 'Add Element' or 'Add Attribute' option in the pop-up menu
- Enter the element/attribute name in the prompt dialog box and click OK.

Removing Elements/Attributes

When generating a schema using one of the wizards, the generated schema may contain information that you do not want to publish as part of the service, or is not required for a particular service. You can remove elements/attributes from the schema, and though these elements/attributes may still exist on the service they are not seen by the XAI service using this schema. To remove an element or attribute:

- Select the node to be removed.
- Right click and select "Delete" from the popup menu.

Renaming an Element

To rename an element:

- Select the element's node on the TreeView.
- Right click it and select the Rename option in the pop-up menu
- Enter the new name in the prompt dialog box and click OK.

NOTE: The information in this table is cached by the XAI server and by the MPL server. Changes to values in this table do not affect the runtime copy of these servers. Refer to *XAI Command* for information about refreshing a schema.

Validating a Schema

Although a schema is validated against the metainfo XML file when it is read into the editor or before it is saved, you can perform the validation at any time while the schema is being edited. To validate a schema, click on the toolbar "Validate" button  . If the schema fails to validate the schema errors dialog is displayed.

Schema Validation Errors

When the editor fails to validate a schema against the xml metainfo file, it pops up a dialog that lists the errors found in the schema definition. These errors may be of two types:

- An element or attribute in the schema could not be found in the xml metainfo file. You can click **Remove** to remove the element from the schema.
- The data type of an attribute does not match the one defined in the metainfo file. You can click **Correct**, and the editor fixes the data type so it does match.

The **Correct All** button can be used to correct all fields that have data types that do not match the one in the XML metainfo file.

NOTE: Correcting errors does not save the schema definition into a file. You have to save it manually.

If you **Exit** without correcting the errors, the schema displays with the mismatch information highlighted in red.

Registering a Service

Before a service can be used it must be defined in the *XAI Inbound Service* table in the XAI registry. A service can be registered in the XAI registry directly from the schema editor. Go to the menu item 'Register Service' in the 'Schemas' menu. The Register service UI page appears. Fill in the required fields.

NOTE: The registry entry for the service can be later modified using the *XAI Inbound Service* page.

Testing a Schema

The schema editor provides a testing option.

NOTE: Testing in your product. You may also test your schemas and your services using either *XAI Submission* or *XAI Dynamic Submission*.

System Wide Functions for Schema Editor

Because the schema editor is in an application outside of the standard products, this section introduces some general functions related to the application.

Application Standards

- The schema editor is a Multiple Document Interface (MDI) windows application. It may contain multiple active windows. You may jump from one window to the other using the Window menu option.
- The Editor window is always active. Closing the schema editor window quits the application.
- In the Editor window, a splitter bar is available to resize the schema tree view horizontally.
- Actions may be performed using menu items or by clicking on toolbar buttons.
- All messages are displayed on a status bar at the bottom of the screen. Some may also be displayed using message boxes.

The File Menu

Use the File menu to open existing schemas and to save a schema to a file.

Connect

Connects to the database.

Open - Loading an existing schema into the editor

You can read an existing schema into the editor.

1. Click on the Open toolbar button or select the File/Open menu option.
2. A file selection dialog is shown. Select the schema file name.
3. The editor first validates the schema against the xml metainfo file. If it fails to validate it shows the *Schema Validation Errors* dialog.

Save

Save the current schema to a file. Using the current file name.

To save a Schema, click on the Save toolbar button, or select the File/Save menu option. When you save a schema, the editor first attempts to validate the schema. If it fails to validate it against the XML Metainfo file, you are prompted to save it with inconsistency errors or to return to the editor.

Save As

Save the current schema to a file. Use a different file name.

Save As Response

Save a copy of the current schema to a file as a response schema. Use a different file name.

The View Menu

Use the view menu to perform actions on the Tree View nodes or to view errors. The following menu options are available:

Expand All

Expand all nodes in the Tree View

Collapse All

Collapse all nodes in the Tree View

Expand Branch

Expand the selected node and all the node's children

Search (`Ctrl+F`)

Find a node with a node name containing a given string

Search Again (`F3`)

Find the next node with containing the search string

View Schema Errors

Display the Schema Validation Errors dialog.

Web Browser

Display the current schema definition on a web browser page

The Schemas Menu

Use the Schemas menu to create, test, validate and register schemas.

- To create schemas from various sources use the **Create menu**.
- To *validate a schema* select the **Validate** option (`Ctrl+V`).
- To create a sample instance and test the schema, select the **Test** option (`Ctrl+T`).
- To create an entry in the service registry for a service represented by the current schema, select the **Register** Service option (`Ctrl+R`). Refer to *Registering a Service* for more information.

The Export Menu

The options on this menu are no longer supported.

The Options Menu

Always Save As W3C

Turn on this option to save schemas in W3C format by default instead of XDR format.

Always Save As DTD

Turn on this option to save schemas in DTD format by default instead of XDR format.

Preferences

The following options may be set on the preferences dialog (Select Options and then Preferences):

- The Default Date Time Format - used for schema date fields
- The default Schema Directory - used to read/save schemas

- The default Metainfo Directory - used to create/validate schemas
- The XAI Servlet URL - used when executing requests from the test schema dialog.
- The Default Account Id - used when generating sample instances of a schema
- Language - used to access language specific data

The Tools Menu

Schemas tools can be invoked from the **Schema Editor Tools** menu.

Converting Schemas to a W3C compatible schema

Schemas generated in the Microsoft BizTalk-compatible format (XDR format) may be saved in a format compatible with the *October 2000, W3C XML* schema standard. To save a schema in a W3C format:

- Select **Convert to W3C** from the **Tools** menu. The **Convert to W3C** dialog box appears.
- Select the schema(s) to be converted. Multiple schemas may be converted in a single step.
- The name of the W3C schema is the same name as the schema but with an ".xsd" file extension, and is saved to the same directory as the original schema.
- Click **Convert**.

Converting Schemas to a DTD

Schemas generated in the Microsoft BizTalk-compatible format (XDR format) may be saved as a DTD.

- Select the **Convert to DTD** option from the **Tools** menu. The **convert DTD** dialog box appears.
- Select the schema(s) to be converted. Note that multiple schemas may be converted in a single step.
- The name of the W3C schema is the same name as the schema but with a ".dtd" file extension, and is saved to the same directory as the original schema.
- Click **Convert**.

Validating multiple schemas

The schema validation tool can be used to validate the correctness of an XAI schema when compared to the metainfo xml definition used to generate the schema. For each validated schema, the validation tool scans the list of elements/attributes and compares them with those defined in the XML metainfo file. Select **Validate Schemas** in the **Tools** menu.

- The **Validate Schema** dialog box appears.
- The left list box is used to select the directory where the schemas to be validated are stored. By default this is the **Schema Directory** as defined in the preferences.
- On the right, the list of schemas is displayed on a grid.
- Multiple schemas may be validated in a single step.
- To select a schema click on the left button (the first column in the row).
- To select multiple schemas, hold the `Ctrl` key and select the required schemas.
- Click `Validate Schemas`.
- The schema grid is updated. When an attribute defined in the schema is missing from the metainfo file or when the properties of the element do not match defined in the metainfo, a button is displayed at the right of the schema name. Clicking on the **edit** button loads the schema into the editor and displays the *Schema **Validation Errors*** dialog for that schema. You can correct the schema and save it.

Setting Up Your XAI Environment

This section describes the control tables available to administer your XAI environment.

Message Class

The Message Classes are references to actual Java classes. The Message Class defines the Java class used to implement Receivers, Senders, Adapters and Executers. This information is provided with the system and does not need to be modified for a specific installation.

To view an Message Class, open **Admin** > **XAI** > **Message Class**.

Description of Page

The **Message Class** and **Description** are unique identifiers of the Message Class. The **Class Definition** indicates the Java class, implementing the adapter, receiver, sender or executer.

Owner indicates if this Message Class is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an Message Class. This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_CLASS*.

XAI Envelope Handler

To view your envelope handlers, open **Admin** > **XAI** > **XAI Envelope Handler**. This information is provided with the system and does not need to be modified for a specific installation.

Description of Page

Enter a unique **XAI Envelope Handler ID** and **Description**.

Indicate whether the **Envelope Type** is **Custom SOAP Envelope**, **Default** (no SOAP environment) or **SOAP Envelope**. Note that the values of **Siebel Integration Message** and **Siebel VBC** are not supported.

When the envelope type is **SOAP Envelope**, indicate the **Envelope URI**.

Owner indicates if this XAI envelope handler is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an XAI envelope handler. This information is display-only.

Setting Up Your Registry

The following section describes the control tables that are logically considered part of the XAI Registry.

XAI JNDI Server

To define a new JNDI Server, open **Admin** > **XAI** > **XAI JNDI Server**.

Description of Page

Enter a unique **XAI JNDI Server** and **Description**.

Indicate the Provider URL, which is the URL of the *JNDI server*.

Indicate the **Initial Context Factory**, which is a Java class name used by the*JNDI server*provider to create JNDI context objects.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_JNDI_SVR*.

XAI JDBC Connection

To view an XAI JDBC Connection, open **Admin** > **XAI** > **XAI JDBC Connection**.

Description of Page

Enter a unique **XAI JDBC Connection** and **Description**.

Use the **Connection Type** to indicate how the JDBC connects to a database. The following connection types are valid:

- **Oracle Defined Connection** indicates the connection is to an Oracle database through a JNDI entry.
- **DB2 Defined Connection** indicates the connection is to a DB2 database through a JNDI entry.
- **JNDI Defined Connection** indicates the connection is using the MQ series classes implementing JMS.
- **Determined by parameter file** indicates that the connection information should be determined by looking at the parameters defined at *Installation*.

For connection types of **Oracle** or **DB2**, use the **JDBC URL** to indicate URL of the database connection to be initialized at XAI/MPL startup time. Indicate the **Database User** and **Database Password** required for accessing the database. The JDBC connection URL can either be a Type 2 or a Type 4. For example:

- Type 2: jdbc:oracle:oci8:@CD200ODV
- Type 4: jdbc:oracle:thin:@myhost:1521/ CD200ODV

For a connection type of **Determined by parameter file**, indicate the parameter substitutions, which should be accessed from the parameter file for the JDBC URL, database user and database password, for example, @JDBCURL@, @DBUSER@ and @DBENCPASS@.

When the connection type is **JNDI**, indicate the **XAI JNDI Server** and the **JNDI Data Source** name as defined in the JNDI.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_JDBC_CON*.

XAI JMS Connection

To define a JMS Connection, open **Admin** > **XAI** > **XAI JMS Connection**.

Description of Page

Enter a unique **XAI JMS Connection** and **Description**.

Indicate the **XAI JNDI Server** to be used. Refer to *XAI 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

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_JMS_CON*.

XAI JMS Queue

To define your JMS Queue values, open **Admin** > **XAI** > **XAI JMS Queue**.

Description of Page

Enter a unique **XAI 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 **XAI JNDI Server** where the queue is defined. Refer to *XAI JNDI Server* for more information.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_JMS_Q*.

XAI JMS Topic

To define your JMS Topic values, open **Admin** > **XAI** > **XAI JMS Topic**.

Description of Page

Enter a unique **XAI JMS Topic** and **Description**.

Select the **XAI JNDI Server** where the topic is defined. Refer to *XAI JNDI Server* for more information.

Enter the **Topic Name** as defined in the JNDI server. This is the JNDI lookup name identifying the topic.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_JMS_TPC*.

XAI Format

Open **Admin** > **XAI** > **XAI Format** to define the various formats.

Description of Page

For each new format, specify a unique **XAI Format** name and **Description**.

Indicate whether the Format Type is a **Currency formatting string**, a **Date/Time formatting string**, a **Phone formatting string** or a **Text formatting string**.

Finally, indicate the **Format Expression**, which defines the formatting pattern to be applied.

Owner indicates if this format is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an XAI format. This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_FORMAT*.

XAI Adapter

To define a new adapter, open **Admin** > **XAI** > **XAI Adapter**.

Description of Page

Indicate a unique **Adapter Name** and **Description**.

Indicate the **Message Class**, which is the name of the Java class, implementing the adapter. The class should be one that is defined for an adapter. The adapter classes provided with the product are **BASEADA**- Core Adapter, **BUSINESSADA**- Business Requests Adapter and **XAICMNDADA**- XAI Command Adapter. Note that the values **LDAPIMPRTADA**, **SIEBELADA** and **STGUPADA** are no longer supported.

FASTPATH: Refer to *Message Class* for more information.

The following fields are not applicable for the **BusinessAdapter** adapter.

Use the **XAI JNDI Server** to indicate the name of the WebLogic JNDI server running your product. Refer to *XAI JNDI Server* for more information.

Indicate the **Default User** to be passed to your product server when this adapter is executed.

NOTE: If the XML request is sent over an HTTP connection, which has been authenticated, the authenticated User Id is passed to your product.

The **Default Date** format and the **Default DTTM** (date / time) **Format** specify date and date/time *formats* to use when a schema does not explicitly indicate formats.

Owner indicates if this XAI adapter is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an XAI adapter. This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_ADAPTER*.

XAI Executer

To define a new Executer, open **Admin** > **XAI** > **XAI Executer**.

Description of Page

Enter a unique **Executer ID** and **Description**.

Indicate the **Message Class** for this executer. The class should be one that is defined for an executer. The executer class provided with the product is **XAIURLEXEC**- XAI Executer.

Indicate the appropriate **Executer URL**.

Owner indicates if this XAI executer is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an XAI executer. This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_EXECUTER*.

XAI Group

XAI groups are used to process XML files, which contain a collection of *XML messages* to be uploaded in batch.

XAI Group - Main
To define your XAI groups, open **Admin** > **XAI** > **XAI Group**.

Description of Page

Enter a unique **Group** and **Description** for the XAI Group.

Indicate the **Parser** used for this group. Possible values are **Dom Parser** and **StAX Parser**.

NOTE: **Dom Parser** reads the full XML document into memory and therefore is not ideal for larger XML documents.

Indicate the **XPath** and **XPath Value**, which an XML file receiver uses to identify which group a given XML file belongs to.

- For **StAX Parsers** the XPath is limited to the root element.
- For **Dom Parsers**, the XPath supports defining elements at a lower level than the root element.

XAI Group - Attachments
Open **Admin** > **XAI** > **XAI Group** and navigate to the **Attachments** tab to define attachments for your group.

Description of Page

For each entry in the attachments collection, indicate the **Sequence** and the **Root Element**. Use **Include Elements** to indicate if **Parent** elements should be included along with the current element when applying the XAI rules.

FASTPATH: Refer to *XML Message File* for more information about how this is used.

XAI Group - Rules
Open **Admin** > **XAI** > **XAI Group** and navigate to the **Rules** tab to define rules for your group.

Description of Page

For each entry in the rules collection, indicate the **Sequence**, the **Priority**, the **XPath** name and **XPath Value** and the **XSL File Name**.

NOTE: **Include Parent**. If your attachment indicates that **Parent** elements should be included, be sure that the parent element is included in the XPath defined here.

FASTPATH: Refer to *XML Message File* for more information about how this is used.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_RGRP*.

XAI Receivers

XAI Receiver - Main
To define your XAI receivers, open **Admin** > **XAI** > **XAI Receiver**.

Description of Page

Enter a unique **Receiver ID** and **Description** for the XAI Receiver.

Indicate the **Message Class** for this receiver. The class should be one that is defined for a receiver. The receiver classes are **DWNSTGRCVR**- Download Staging receiver, **FILESCANRCVR**- Upload Files from a directory, **JMSRCVR**- JMS Queue receiver, **OUTMSGRCVR**- Outbound Message receiver, **STGCTLRCVR**- Staging Control receiver, **STGRCVR**- Staging Upload Receiver and **TPCRCVR**- JMS Topic receiver, **XMLFILERCVR**- XML File receiver.

FASTPATH: For more information, refer to *Designing XAI Receivers* about different types of receivers.

Indicate whether or not this receiver is currently **Active**.

Identify the **Executer ID**. Select the XAILOCAL executer if the Message Class for this receiver is STGCTLRCVR. Select the BYPASSXAI executer if the Message Class for this receiver is OUTMSGRCVR. For all other receivers select the XAIURL executer. For more information, refer to *XAI Executer*.

Indicate whether the **MSG Encoding** is **ANSI message encoding** or **UTF-8 message encoding**.

The **Read Interval** indicates the number of seconds between read cycles.

Start At Time and **Duration** are not currently in use.

If the Message Class for this receiver is **FILESCANRCVR**, **STGRCVR**, **STGCTLRCVR** or **XMLFILERCVR**, indicate the **XAI JDBC Connection**.

FASTPATH: Refer to *XAI JDBC Connection* for more information.

Turn on **Sequential Execution** if the received requests should be processed in *sequential order* (instead of multithreaded). If this value is turned on then XAI staging control records created by this receiver are marked for sequential execution.

JMS Information

The following information is only available if the Message Class is **JMSRCVR** or **TPCRCVR**.

Indicate the appropriate **XAI JMS Connection**

FASTPATH: Refer to *XAI JMS Connection* for more information.

Indicate the appropriate **XAI JMS Queue.**

FASTPATH: Refer to *XAI JMS Queue* for more information.

Indicate the appropriate and **XAI JMS Topic**.

FASTPATH: Refer to *XAI JMS Topic* for more information.

File Information

The following information is only available if the Message Class is **FILESCANRCVR** or **XMLFILERCVR**.

Use the **Scan Directory** to indicate where to look for new files.

In **Scan File**, indicate the file pattern. All files with names matching the pattern are uploaded into the staging upload table. For each file found, a record in the staging control table is created.

CAUTION: WARNING. MPL expects all files conforming to the Scan File pattern to be complete. If a file is in the process of being copied into the scan directory and its name conforms to the naming pattern, MPL still attempts to process it and may issue an error for the incomplete file. It is suggested that files first be copied into the scan directory with a different name that does not conform to the naming pattern, for example filename.xml.inprocess. Once the file copy/transfer is complete, rename the file to one that conforms to the naming pattern, for example, filename.xml.

The following information is only available if the Message Class is **FILESCANRCVR**.

Use the **XAI In Service Name** to indicate how the records in the file are mapped and how they are transformed to match a system service request structure.

XAI Receiver - Context
Open **Admin** > **XAI** > **XAI Receiver** and navigate to the **Context** tab to define context for your receiver.

Description of Page

The Context collection enables you to define a collection of **Context Types** and **Context Values** defining. Use this collection when you need to store an attribute of a receiver that is not catered for in the current table.

NOTE: The values for the Context Type field are customizable using the Lookup table. This field name is RCVR_CTXT_FLG.

XAI Receiver - Response
Open **Admin** > **XAI** > **XAI Receiver** and navigate to the **Response** tab to define where to send responses to requests made by this receiver. Refer to *Designing Responses for a Receiver* for more information.

Description of Page

The response collection enables you to define the destination (**Message Sender**) where responses to a request may be sent under various circumstances (**Event**). The events currently defined with the product are **All events**, **Message executed OK**, **Application Error**, **System Error**.

NOTE: The values for this field are customizable using the Lookup table. This field name is ON_EVENT_FLG.

XAI Receiver - Groups
Open **Admin** > **XAI** > **XAI Receiver** and navigate to the **Groups** tab to the valid XAI groups for an XML file receiver.

Description of Page

This collection is only available if the Message Class is **XMLFILERCVR**.

For each entry in the Group collection, indicate the **Priority** and the **Group**. Refer to *XAI Groups* for more information about defining groups.

Where Used

Receivers are used by the XAI server and by the MPL server to process messages sent to the system from various sources.

XAI Inbound Services

The XAI Inbound Services section in the registry is the main section of the registry. It is used to define the service characteristics. Basically, a service is defined by an Adapter responsible for executing the service, a pair of XML schemas and connection attributes. The Adapter defines the interface with the target application server, while the schemas define the structure of the request XML document expected by the service and the structure of the response XML document generated by the service.

XAI Inbound Service - Main
To update an inbound service, open **Admin** > **XAI** > **XAI Inbound Service**.

> **CAUTION:** Important! When adding new inbound services, carefully consider the naming convention of the XAI In Service Name. Refer to *System Data Naming Convention* for more information.

Description of Page

Define a unique **XAI In Service Name**. This information 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 system generates a unique **XAI Service ID**, which serves as the primary key.

Owner indicates if this XAI inbound service is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an XAI inbound service. This information is display-only.

Indicate the **Adapter**, which defines the interface with the target application server.

> **FASTPATH:** Refer to *XAI Adapter* for more information.

If adapter for this service should invoke a system service, then indicate the appropriate **Service Name**.

> **FASTPATH:** Refer to *Service Program* for more information about defining services.

If adapter is the base package **Business Adapter** then **Service Name** does not appear. Instead, use **Schema Type** to indicate the type of object this service invokes and **Schema Name** to reference the object to invoke. Using this adapter, you may set up service to invoke *business objects*, *business services* and *service scripts*.

> **FASTPATH:** Refer to *Designing XAI Adapters* for more information about the **Business Adapter**.

Use the **Description** and **Long Description** to describe the service.

Check the **Active** switch if this service is enabled and available for execution. If this switch is unchecked, then the service is defined in the registry, but not yet available for public use.

Check the **Post Error** switch to support *inbound message error handling* for messages that are not processed via the staging upload table.

Check the **Trace** switch if you would like the trace to be on for this particular service. If the general trace option is not activated, you can force a trace for a particular service.

> **FASTPATH:** Refer to *Server Trace* for more information about trace functionality.

When the **Debug** switch is checked, debug information is generated on the XAI console when this service is executed. The debug information can be useful to resolve problems.

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 were created using the *Schema Editor* and 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.

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.

> **NOTE:** Refer to *WSDL Catalog* for information on how to obtain the WSDL catalog for all XAI Inbound Services.

XAI Inbound Service - Staging
The staging tab is used to define parameters for services that use the Staging Upload adapter.

FASTPATH: Refer to *XAI Upload Staging* for more information.

Open **Admin** > **XAI** > **XAI Inbound Service** and navigate to the **Staging** page to define attributes for your upload staging adapters.

Description of Page

Indicate the **Staging File Type** to be processed by the staging upload service. Possible values are **Comma Delimited file**, **Database Extract** and **Sequential file**.

The format of the records in the input file are not in an XML format and do not correspond to an XAI service schema. As a result, the input record must be transformed into an XML message that conforms to an XAI service request schema. Enter the **Record XSL**, which indicates the XSL transformation script used to transform the input record into the appropriate XML message.

For **sequential files** and **Comma delimited files**, indicate the **Input File Name** to be processed.

NOTE: This parameter can be overridden in the **Staging Control** table when a request to execute such a service is made.

When the service takes its input from a **Database extract**, indicate the **JDBC Connection** used to connect to the database that contains the input data.

NOTE: If this value is not populated XAI uses the default JDBC connection, which is the current product database.

FASTPATH: Refer to *XAI JDBC Connection* for more information about defining these values.

Use the **Interface Name** to provide a description of the interface being implemented through this service.

XAI Inbound Service - Parameters
This tab enables you to define parameters that are used as selection criteria by the DB Extract staging upload service.

Open **Admin** > **XAI** > **XAI Inbound Service** and navigate to the **Parameters** page.

Description of Page

The **Parameters** that were defined under the Request element in the schema are displayed here. They are used to drive the extraction process. This tab only displays the list of parameters. The values for these parameters can later be entered when the control record to invoke this service is created.

FASTPATH: Refer to *Staging Control Parameters* for more information.

Owner indicates if this XAI inbound service is owned by the base package or by your implementation (**Customer Modification**). The system sets the owner to **Customer Modification** when you add an XAI inbound service. This information is display-only.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_XAI_IN_SVC*.

NOTE: The information in this table is cached by the XAI server and by the MPL server. Changes to values in this table do not affect the runtime copy of these servers. Refer to *XAI Command* for information about refreshing a service.

XAI Route Type

Refer to the documentation for your product to find out if XAI Route Type is supported.

Running Your XAI Environment

NOTE: The XAI functionality is legacy functionality and not recommended for new implementations. This information remains in the documentation for upgrade purposes. Refer to *Incoming Messages* and *Outgoing Messages* for information about the recommended features for supporting sending and receiving external messages.

The *XML Application Integration* (XAI) module provides the tools and infrastructure that businesses require for integrating their third-party systems with the application.

This section describes the pages used to manage incoming and outgoing information via the XAI tool.

XAI Staging Control

Refer to *Staging Control* for more information about the purpose and functionality of this page.

Navigate to this page using **Menu** > **External Message** > **XAI Staging Control**.

Description of Page

The **XAI Staging Control** ID is a system generated unique identifier of this record.

The **XAI Staging Control Status** indicates the current state of this record.

Pending This status indicates that this record needs to be processed.

In Progress This status indicates that the background process, which uploads the staging records, is currently processing this record.

Error This status indicates that the background process found a problem with this record. When the data related to this record has been fixed, change the status back to **Pending** so that it will be processed again.

Complete This status indicates that this record has been processed.

The **Number of Uploaded Records** indicates how many XAI staging records related to this staging control record were uploaded.

The **Run Date Time** indicates the date and time this record was processed by the upload process.

The **User**, who created this staging control record, is captured.

If the data to be uploaded is found in a file, indicate the **Upload File Name**, which should include the directory path and file name.

NOTE: **Character Encoding**. Refer to *Sequential Input File* for information about specifying character encoding for a file.

NOTE: **Complete File**. MPL expects this file to be complete. If the file is in the process of being copied into the directory, MPL still attempts to process it and may issue an error for the incomplete file. The staging control record should only be created once the complete file is ready for upload.

Enter a description of the **XAI Interface Name**. This is simply information and is not used by the system.

Turn on **Sequential Execution** if you want the XAI upload staging records related to the staging control record to be processed in *sequential order* (instead of multithreaded).

The **XAI Service ID** tells the system how to create the XML related to the XAI upload staging record to be created. In Oracle Utilities Customer Care and Billing, for example, XAI Services with an adapter type of **CISStagingUpload** may be indicated here.

FASTPATH: For more information about XAI services, refer to *XAI Inbound Service*.

Use the **Comments** to provide free format information related to this staging control record.

The collection of staging control parameters is used to define selection criteria when the staging control is accessing data from a database table. The **Staging Control Parameter** defines the field used in the WHERE clause and **XAI Staging Control Parm Value** defines the value to be used in the WHERE clause.

Refer to *Staging Control Parameters* for more information.

The **Message** collection displays any completion messages for XML requests related to the staging control record.

XAI Upload Staging

The XAI upload page allows you to view the details or to fix errors for a request in the Staging Upload table. This page displays the text of the XML request document linked to the upload.

XAI Upload Staging - Main

To view or modify an XAI upload document, navigate to **Menu** > **External Message** > **XAI Upload Staging** and navigate to the main tab.

Description of Page

The **XAI Upload Staging ID** is a system assigned identifier of the XAI upload staging record.

The **Application Service** identifies the internal system service called by the XAI tool to load/update the system data.

NOTE: The upload process does not use this. Rather, the application service is part of the XML Request. This field is used to help in searching for XAI Upload records.

The **XAI Staging Control** ID related to this XAI upload staging record is displayed.

The status of the upload is indicated by the **XAI Upload Staging Status**. Values are **Pending**, **In Progress**, **Complete**, and **Error**. If the record is in error, an error is written to the *XAI Upload Exception* table.

Create Date/Time indicates when the record was posted.

Completion Date/Time indicates when the work was completed.

If this XAI upload staging record is a response to an **XAI Download Staging** record, information about the related download staging record is displayed.

If there is an error with this record, you will see the error **Message** associated with this record. The message area is suppressed if there are no problems with the record.

Click the adjacent button to view the long explanation. The long explanation provides information about the cause of the error (and how to fix it).

The upload staging data appears in the **XML Request** text box.

XAI Upload Staging - Response

To view the response to a completed XAI upload staging document, navigate to **Menu** > **External Message** > **XAI Upload Staging** and go to the **Response** page.

Description of Page

The **XAI Upload Staging ID** is a system assigned identifier of the XAI upload staging record.

The system's response to the upload XML appears in the **XML Response** text box.

Uploading XAI Staging Records

Staging Control Layout

In order to load XML requests from flat sequential files, comma separated value (CSV) files and from database tables, you need to create a staging control record. The name of this table is **CI_XML_STG_CTL**. The following table describes each column on this table.

Column Name	Length	Req'd	Data Type	Comments
XML_STG_CTL_ID	10	Y	N	This is the unique identifier of the record. This value does NOT have to be a random number, but it does need to be unique.
RUN_DTTM	26	N	Date/Time	Date and time this record was executed.
XAI_IN_SVC_ID	10	Y	A/N	This is the XAI service associated with this record. This service should have an adapter of **CISStagingUpload**.
XML_STG_FILE_NAME	250	N	A/N	This is the location and name of the file containing the data to be uploaded. This is used for comma delimited files and flat sequential files.
XML_INTFC_NAME	30	N	A/N	The name of the interface used to populate this table. This is simply information and is not used by the system.
XML_STG_STATUS_FLG	2	Y	A/N	Must be set to **P (Pending)**.
NT_XID_CD	30	N	A/N	This field is not in use.
NT_UP_XTYPE_CD	30	N	A/N	This field is not in use.
USER_ID	8	Y	A/N	The ID of the user who created this record.
COMMENTS	254	N	A/N	Use the free format comments, if necessary.
NBR_RECORD_UPLD	10	N	A/N	Leave this blank. This will be populated by the process which creates upload staging records for this control record.

Staging Control Parameters Layout

If your staging control record should read a database table, the XAI service may include selection criteria in its WHERE clause. If that is the case, then your staging control record should populate the selection criteria. The name of this table is **CI_XML_STGCTL_P**. The following table describes each column on this table.

Column Name	Length	Req'd	Data Type	Comments
XML_STG_CTL_ID	10	Y	N	The unique identifier of the staging control record.

XML_STG_CTL_PARM	18	Y	A/N	Indicate the element in the WHERE clause whose value will limit the selection of records.
XML_STG_CTL_PVAL	250	Y	A/N	Use this to indicate the value used to limit selection of records.

Upload Staging Layout

You create an XAI upload staging record directly for each XML request you wish to make. The name of this table is **CI_XML_STGUP**. The following table describes each column on this table.

Column Name	Length	Req'd	Data Type	Comments
XML_STGUP_ID	15	Y	N	This is the unique identifier of the record. This value does NOT have to be a random number, but it does need to be unique.
APP_SVC_ID	20	Y	A/N	This is the foreign key to the application service table, and identifies the application service that is being requested.
COMPLETE_DTTM	26	N	Date/Time	Completion date and time.
CRE_DTTM	26	Y	Date/Time	Creation date and time.
RETRY_COUNT	3	Y	N	Number of retries to process the request.
XML_REQUEST	30,000	Y	A/N	The XML request document.
XML_RESPONSE	30,000	Y	A/N	The XML response document.
XML_STG_CTL_ID	10	Y	A/N	The id of the staging control record linked to this record.
XML_STG_STATUS_FLG	2	Y	A/N	Must be set to **P (Pending)**.

XMLUP-PR - Purge XAI Upload Objects

Completed XAI upload staging objects should be periodically purged from the system by executing the **XMLUP-PR** background process. This background process allows you to purge all **Completed** XAI upload staging objects older than a given number of days.

We want to stress that there is no system constraint as to the number of **Completed** XAI upload staging objects that may exist. You can retain these objects for as long as you desire. However we recommend that you periodically purge **Completed** XAI upload staging objects as they exist only to satisfy auditing and reporting needs.

XAI Dynamic Upload

This page displays the XAI upload record. However, rather than displaying the XML Request as an XML document, it dynamically builds the screen with prompts and input fields to allow for changes without having to understand the XML. This screen is useful for fixing errors. Once the data is fixed, the status of the record can be changed back to **Pending** to once again attempt to upload this record.

NOTE: The Dynamic Nature of this Transaction. This transaction is designed to display the schema of the represented XAI upload staging. T he system reads the XML schema associated with the upload XAI service and builds the tab(s) with the associated prompts and fields. For example, if the upload record is relevant to the Premise Maintenance service, Premise Characteristics and Premise Geo Types tabs are dynamically built.

XAI Dynamic Upload - Main

Navigate to this page using **Menu** > **External Response** > **XAI Dynamic Upload**.

Description of Page

The **XAI Upload Staging ID** is a system assigned identifier of the XAI staging record.

The **Application Service** identifies the internal system service called by the XAI tool to load/update the system data.

NOTE: This is not used by the upload program. Rather, the application service is part of the XML Request. This field is used to help in searching for XAI upload staging records.

The **XAI Staging Control** ID related to this XAI upload staging record is displayed.

The status of the upload is indicated by the **XAI Upload Staging Status**. Values are **Pending**, **In Progress**, **Complete**, and **Error**.

Create Date/Time indicates when the record was posted.

Completion Date/Time indicates when the work was completed.

If there is an error with this record, you will see the error **Message** associated with this record. The message area is suppressed if there are no problems with the record.

Click the magnifying button to view the long explanation. The long explanation provides information about the cause of the error (and how to fix it).

The **Transaction Type** indicates the action that should be performed for the application service when this document is uploaded. The valid values are **Add**, **Change**, **Delete**, **List**, **Read**, **Search** and **Update**.

Set the **Trace** option to **yes** to request level tracing to be executed inside the XAI tool. This will result in information written to a file, which may be useful in debugging. Refer to the XAI tools documentation for more information.

The bottom portion of the screen will contain field prompts and input fields for the data associated with the XML request linked to this upload record. The system dynamically builds this portion of the page by reading the XML request associated with the upload record. A user can change data in the displayed fields. This will result in a change to the XML request associated with the upload record.

NOTE: This page will also generate other tabs dynamically for any collections that exist for the service being displayed. These will vary based on the service. The response tab is the only other tab, which is always present.

XAI Dynamic Upload - Response

Navigate to this page using **Menu** > **External Message** > **XAI Dynamic Upload** and go to the response tab.

Description of Page

The **XAI Upload Staging ID** is a system assigned identifier of the XAI staging record.

The system's response to the upload XML appears in the **XML Response** text box.

XAI Upload Exception

A record is written to the XAI upload exception table for every XAI upload staging record that is in error.

To view the messages associated with the exception records, schedule the **TD-XAIUP** background process. This process generates a To Do entry for every record in the XAI upload exception table.

After correcting the cause of the error, drill into the *XAI Upload Staging* page and change the status from **Error** to **Pending** and the system will attempt to process the record again.

XAI Download Staging

XAI Download Staging - Main

To view individual XAI download staging records associated with a notification download staging record, open **Menu** > **External Message** > **XAI Download Staging**.

Description of Page

XAI Download Staging displays information about the record.

The **Download Staging ID** and **XAI Route Type** are the primary identifiers for this record.

The **XAI Download Status** is displayed. The values are **Pending**, **Complete**, **Canceled** or **Error**. When a record is in **Error**, it is displayed on the *XAI Download Exception* table.

Values from the NDS record associated with this XAI download staging record are displayed including **Service Provider**, **Notification Download Type**, **NT Download Status Flag**, **Retry Count** and the **Context** collection.

XAI Download Staging - Request

To display the XAI Request built by the download staging receiver, open **Menu** > **External Message** > **XAI Download Staging**.

Description of Page

The **XML Request** built by the download staging receiver is displayed.

XAI Download Staging - Response

To display the Response to this request, open **Menu** > **External Message** > **XAI Download Staging**.

Description of Page

The **XML Response** to this message is displayed.

XAI Download Exception

A record is written to the XAI download exception table for every XAI download staging record that is in error.

To view the messages associated with the exception records, schedule the **TD-XAIDN** background process. This process generates a To Do entry for every record in the XAI download exception table.

Maintaining Your XAI Environment

This section describes various tools provided to enable your XAI administrators to more easily maintain your XAI environment.

XAI Submission

This page exists for testing purposes. It allows you to create an XML request document and submit it to the system, to ensure that the XML has been built correctly.

XAI Submission - Main

To submit an XML document for testing, navigate to **Admin** > **XAI** > **XAI Submission** and navigate to the main tab.

Description of Page

This page is used to test XML schemas, which are defined for the XAI tool. Enter an appropriate XML document in the **XML Request** field. Typically, you define the XML schema using the schema editor in the XAI application. Then you would copy and paste the document here, then modify the schema to enter actual data for testing purposes.

When you have entered the document, choose Save to submit this document to the system. Note that this request information is not saved anywhere. It simply calls the system with the appropriate service name and executes the XML request.

Navigate to the Response tab to view the response.

XAI Submission - Response

To view the response to a XML document for testing, navigate to the response tab.

Description of Page

After choosing Save on the main tab to submit a test for an XML request, the response to your request is displayed in the **XML Response** text box.

XAI Dynamic Submission

This page exists for testing purposes. It is similar to the XML Submission page, but it dynamically builds your XML document based on a selected XAI service and data that you enter.

XAI Dynamic Submission - Main

To create and submit an XML document for testing, navigate to **Admin** > **XAI** > **XAI Dynamic Submission** and navigate to the main tab.

Description of Page

Select the **XAI In Service Name**, which identifies the XAI Inbound Service called by the XAI tool to load/update the system data. After selecting, click **Load UI**. This button causes the system to read the XML schema associated with the service and build the screen with the associated prompts and fields, which enables a user to enter data.

> **NOTE: Testing schema.** This page tests submitting the schema referenced on an XAI inbound service. If your service references an XSL transformation script, that information is ignored. This page tests post-XSL transformation.

Select the **Transaction Type** associated with this XML request. The valid values are **Add**, **Change**, **Delete**, **List**, **Read**, **Search** and **Update**. This information is built into the XML request document.

Set the **Trace** option to **yes** to request level tracing to be executed inside the XAI tool. This results in information written to a file, which may be useful in debugging.

The bottom portion of the screen contains field prompts and input fields for the data associated with the XML request linked to this service. The system dynamically builds this portion of the page by reading the XML Request associated with the service. You can enter data in the displayed fields.

> **NOTE:** This page also generates other tabs dynamically for any collections that exist for the service being displayed. These tabs vary based on the service. The response tab is the only other tab that is always present.

Enter values in the appropriate fields. You need to have some knowledge of what information is needed based on the service and transaction type. For example, if your service is accessing the account record and you want to **read** the record, you only need to provide the account id. However, if your transaction type is **add**, you need to fill in all the fields necessary for adding an account. If you have not entered values correctly, you receive an error in the Response.

When finished entering values in the fields, click **Show XML** to see the XML request built based on the schema and the values of the fields entered.

If everything looks OK, click **Submit** to execute the XML request. Note that this request information is not saved anywhere. It simply calls the system with the appropriate service name and executes the XML request.

You are brought to the Response tab, where you may view the response.

XAI Dynamic Submission - Response

To view the response to the XML document submitted for testing, navigate to the response tab.

Description of Page

After choosing Submit on the main tab to submit a test for the XML request built dynamically, the response to your request is displayed in the **XML Response** text box.

Additional XAI Tools

This section introduces some additional tools to help you maintain your XAI environment.

XAI Service Export

The service export page allows you to export the definition of an XAI Inbound Service to a file. This function may be helpful if you need to copy the definition of this service to a separate environment. To export a service, open **Admin** > **XAI** > **XAI Service Export**.

Description of Page

Upon entry into this page, you are provided with the current list of **XAI In** bound **Services** and their **Description** s. Use the **XAI In Service Name** search field to find the XAI service that you would like to export.

Use the **Export?** column to indicate which XAI service(s) you would like to export. Once you have selected your services, choose **Save**.

> **NOTE:** If multiple services are selected, they are exported together into the same output file.

You are presented with the standard File Download dialogue where you can open or save the file.

XAI Service Import

The service import page allows you to import the definition of an XAI Inbound Service from a file into the XAI service table. This function may be helpful if you need to copy in the definition of this service from a separate environment. To import a service, open **Admin** > **XAI** > **XAI Service Import**.

Description of Page

Upon initial entry into this page, you are provided with an input field, where you can enter the file name to import. Click **Browse** to search for the desired file in a directory.

Once the file is identified, click **Read File**, to read in the contents of the file.

> **NOTE:** The format of the file must include tags indicating the column names for XAI Inbound Service table along with the values of the columns. For an example of how the format should be, simply go to the *XAI Service Export* page, export a Service and view the format of the resulting file.

Once the file has been read in, the list of XAI services found defined within the file is displayed in the Import grid, identified by their **XAI In Service Name** and **Description**. In the **Import?** column, indicate which services to import.

If a service with this service name already exists in the table, you must check the **Overwrite Existing** switch in order to indicate that the imported file information should replace the current service. An *XAI Inbound Service* that is provided as part of the system (i.e., with an owner of **Base Product**) may not be overwritten.

Click Save to proceed with the import. If any problems are found, information is displayed in the **Message Text** column.

XAI Command

Use the XAI Command page to send commands to the XAI and MPL server. To execute a command, open **Admin** > **XAI** > **XAI Command**.

Description of Page

The following operator commands may be sent to the XAI server. For each of these commands, you may check **Also Sent to MPL URL**, in which case, the command is also sent to the MPL server. You need to indicate the URL of the MPL server.

Display Registry Use this command to display the current registry information that the XAI instance is running with.

Refresh Code and Description This is related to an attribute in the schema editor where you may indicate that the description of a control table code should be returned along with the code itself. This information is kept in cache memory in the server. As a result, changes made to descriptions have no effect on the runtime server. This command clears the cache of control table codes and descriptions accessed by the server.

Refresh Registry The registry contents are kept in cache memory in the server. As a result, making changes to the registry control tables has no effect on the runtime server. Use this command to refresh the contents of the registry cache with the new values in the registry control tables. The command reloads all registry control table data into the server.

Refresh Schema Schema definitions are stored in cache memory on the XAI server. As a result, modifying a schema definition has no effect on the runtime server. To refresh schema definitions, use the Refresh Schemas command.

Refresh Service Service definitions are stored in cache memory on the XAI server. As a result, modifying an XAI inbound service definition has no effect on the runtime server. To refresh service definitions, use the Refresh Service command. You are prompted to indicate which service to refresh.

Refresh XSL XSL Transformation script definitions are stored in cache memory on the XAI server. As a result, modifying an XSL transformation definition has no effect on the runtime server. To refresh XSL transformation definitions, use the Refresh XSL command.

Trace On Use this command to start the XAI server trace.

Trace Off Use this command to stop the XAI server trace.

XAI Trace Clear Use this command to clear the contents of the trace file.

XAI Trace Swap Use this command to rename the current trace file by appending the date and time to the end. A new trace file is then created with the name as defined in the *Message option* page.

The following operator commands can be sent to the MPL server. You must set the URL of the MPL server first.

MPL Refresh Executer Executer definitions are stored in cache memory. As a result, adding or modifying executer definitions has no effect on the runtime server. Use this command to refresh executer definitions. You are prompted to indicate the executer to refresh.

MPL Refresh Receiver Receiver definitions are stored in cache memory. As a result, adding or modifying receiver definitions has no effect on the runtime server. Use this command to refresh receiver definitions. You are prompted to indicate the receiver to refresh.

MPL Refresh Sender Sender definitions are stored in cache memory. As a result, adding or modifying sender definitions has no effect on the runtime server. Use this command to refresh sender definitions. You are prompted to indicate the sender to refresh.

MPL Start Receiver Use this command to start a particular receiver. You are prompted to indicate the receiver to start.

MPL Stop Use this command to stop all MPL activity. It stops all receivers and waits for all executers and senders to complete.

MPL Stop Receiver Use this command to stop a particular receiver. You are prompted to indicate the receiver to stop.

MPL Trace On Use this command to start the MPL server trace.

MPL Trace Off Use this command to stop the MPL server trace.

When you have chosen the appropriate command and indicated any extra information, click **Send Command** to send the command to the server(s).

If you have sent a command to the XAI Server, then the bottom portion of the screen displays the response in the **XAI Response**. If you have sent a command to the MPL Server, then the bottom portion of the screen displays the response in the **MPL Response**. If you have sent a command to both servers, the bottom portion of the screen displays both responses.

MPL Exception

The MPL Exception table is used by the MPL to keep information about requests that resulted in a system error. These are errors that occurred inside the MPL. For example, if the MPL fails to send a request to XAI (maybe WebLogic is down), this is a system error, which would be logged in the MPL exception table.

There are errors that are defined recoverable. This means that the MPL will retry the action that failed, according to the parameters it received.

Server Trace

The XAI server traces every request and response. The requests/responses are written to a trace file on the server. The trace file may be viewed using the *Trace Viewer*.

Starting the Trace

The log starts automatically based on definitions in the *Message Options* in the traceType and traceFile options. To manually start the trace:

- Navigate to **Admin** > **XAI** > **XAI Command**.
- Select the **Start Trace** command from the command dropdown
- Click **Send Command**

Stopping the Trace

- Navigate to **Admin** > **XAI** > **XAI Command**.
- Select the **Stop Trace** command from the command dropdown

- Click **Send Command**

Trace Viewer

Use the Trace Viewer utility to view the log file. The Trace Viewer is installed when you install the XAI client tools. It can be found in the XAI program group under Start/Programs.

Main Page
When the Trace Viewer starts, select a trace file to view. A trace file may be opened in one of two ways:

- To open a trace file directly from its location on the web application server, use the **File, Open HTTP** menu item and provide the appropriate URL.
- To open a trace file on the local/network file system use the **File, Open** menu item

Description of Page

Once a trace file is opened, it displays a list of all the requests on the left side including the **Service Name**, the **Start Time** and the **End Time**.

To display the XML contained in the request and response entries for a displayed request, select a request entry.

Filtering Options

Since the trace file may contain a very large number of messages, the trace viewer limits the number of messages that can be displayed. It does that by displaying messages traced within the last x number of **Minutes**, **Hours** or **Days**.

Use the **Max Messages** to limit the number of messages displayed.

> **NOTE: Default Note**. By default, the Trace viewer displays the first **200** messages in the trace file.

To view only errors in the trace, check the **Show only Errors** option.

> **NOTE: Refresh Display**. After changing any of the above filtering options, click the refresh button in order to redisplay the request entries based on the new options.

The **First Message Found** field indicates the date and time of the earliest entry in the trace file.

Viewing as Text

To view the trace file as text rather than viewing each entry in its XML format, use the **View, As Text** menu option. The contents of the trace file are displayed in text format in a separate window.

Statistics Page
Use the **View, Statistics** menu item to view the statistic page, which displays performance statistics about the XAI services that were executed in the XAI trace file.

For each type of XAI Service and transaction type, it displays the following information based on the requests traced in the XAI trace file:

- The **Service Name** with the transaction type in parentheses
- The **Number of calls** for this service in the listed trace records
- The **Average** duration **Time** (in seconds)
- The **Max** imum duration **Time** (in seconds)
- The **Min** imum duration **Time** (in seconds)

> **NOTE: Requests Included in Statistics**. Only requests falling in the time selection criteria and listed on the main log viewer are processed for calculating the statistics.

To display a Duration Chart for a particular service, check the Service. A chart such as the one below is displayed.

Integrations

This chapter provide high level information about product integrations supported for all products that use Oracle Utilities Application Framework.

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.

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.

FASTPATH: Refer to *Defining Security and User Options* 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* white paper for more information about typical steps related to the full 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 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.

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.
- 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.

In addition, for any additional processing related to the creation or update of a User, the standard *Business Object plug-ins* may be used for the **F1–IDMUser** business object which the LDAP batch process uses to create or update users.

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.

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.

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

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:

- 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**

Element	Attribute	Description
	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 addre should be used both for the Login ID and the Email Address.
	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 on 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 defin user id as <first initial of first name>+<last name> all uppercase, to a maximum of 8 digits. If an exis 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 Gr 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 the group you are importing. If the LDAP entry you are describing is a User and the string is %dn% 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**

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 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* white paper.

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 user that can facilitate the definition of users and reduce some of the challenges listed above. The concept is as follows:

- Define a template user for each broad category of users in the system. For example, Oracle Utilities Mobile Workforce Management may define the following template users: Dispatcher, Mobile Worker, System Administrator and Contractor. Each user would define the typical configuration for users of that type including the home page, the user groups, the To Do roles, the portal preferences, etc.
- When extending the configuration in the identity manager product, simply 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 interface uses the user BO **F1–IDMUser** to create the user. The BO includes a preprocessing algorithm that looks for the existence of a template user (sent as a characteristic of type **F1-TMUSR**). All the information from the template user will be copied onto the new user record except for the information passed in from the identity manager. The template user is captured on the newly created user via a characteristic for information / audit purposes.
- 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.

Configuring Template 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.

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 Mobile Worker role that have more security privileges than a typical Mobile Worker. 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 one 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 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.

To create a template user, navigate using **Admin** > **Security** > **User** .

- Define a User ID that will become the template user reference in the identity management system.
- Be sure to choose a **User Type** of **Template User**.
- Define all the information that should be copied onto a new user that references this user as a template user. Note that **Bookmarks** are not included in the data that is copied from a template user.

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* white paper for more information.

Data Synchronization

NOTE: The information in this section applies to the integration with Oracle Utilities Meter Data Management and/or Oracle Utilities Network Management System.

Defining Sync Requests

This section highlights functionality provided to help an implementation manage the communication of data to an external system.

The Big Picture of Sync Requests

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.

Capturing the Change

The base product has provided the **Audit** plug-in spot on the MO to allow for processing to be called by the system upon detecting a change to an MO. The framework calls the algorithm defined on this plug-in spot in the event a change to the MO has been detected. The base product comes with a generic change data capture algorithm **F1-GCHG-CDCP** that makes use of this plug-in spot to create the sync request BOs. The **Sync Request BO** MO Option is used to define these sync request BOs. The generic algorithm loops through this list of BOs and instantiates them, if no instances of those BOs yet exist in the initial state. The MO and primary key used for these sync requests will be the MO being modified and its primary key.

Sometimes it is necessary to instantiate a sync request whose MO is different from the MO being modified. As an example, a change to the Person record may need to instantiate an SA sync request. In this case, your implementation will have to create your own Audit algorithm that captures this idiosyncratic logic. For examples on how this is done, please refer to the *Oracle Utilities CCB-MDM Integration Implementation Guide*.

Sync Request Maintenance Object

The sync request maintenance object (MO) is used to communicate data elements to an external system. It holds the data elements that are to be synchronized or extracted out of your system and also holds the MO and primary key constituents that drive the sync request. If your organization wishes to use this MO, you can either use the business object (BO) supplied in the base product or configure your own BO.

This MO provides the following functionality:

- A business object option **External System** is provided for business objects of this type. The value specified on this option is used by the base product to create an entry in the JMS Queue.
- A business object option **Outbound Message Type** is provided for business objects of this type. The value specified on this option is used by the base product to create an entry in the JMS Queue.
- An **Information** algorithm is provided (**F1-SYNC-INFO**).

- The standard **Determine BO** algorithm is provided.
- The standard logs are provided.
- The standard characteristics collection is provided.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference F1-SYNC REQ.

For more information about this MO and to review the business objects defined for this MO, navigate to **Admin** > **System** > **Maintenance Object** and view the MO **F1-SYNC REQ**.

Sync Request Business Object

The sync request business object (BO) contains the rules that govern the processing of a sync request. The algorithms in this BO control what data elements are synchronized to an external system; how this data is to be communicated to the external system; and how the communication of this information is controlled chronologically to ensure that changes are processed in the right order. The base product provides the BO **F1-SyncRequest**, which contains the following life cycle.

- **Pending**. The initial state of the sync request BO. At this point, a pre-processing algorithm would have already taken a snapshot of what the relevant information looked like prior to the change. A deferred monitor algorithm is specified on this state so as to accumulate all changes prior to sending the sync request to the external system. Furthermore, in order to prevent the sync request from transitioning to the next state while another sync request may not have completed its processing yet, the base package provides the monitor algorithm **F1-WAITRELSR** that skips transitioning if it detects another instance of the same BO in a non-final state for the same MO and primary key combination.
- **Determine If Sync Needed**. This transitory state will contain the algorithm that takes the final snapshot of the relevant information so that it may be compared against the initial snapshot to see if the change affected any of the relevant data elements. The base product provides the algorithm **F1-COMPSNAPS** for this purpose. Your implementation may also add your own rules here to discard the sync request if certain criteria are met.
- **Discarded**. If the comparison of the initial and final snapshots yields no changes, or if it fails any other checks your implementation has introduced, the sync request is transitioned to this state. If any processes are dependent on the sync request transitioning to a final state, your implementation may plug in an enter algorithm on this state to kick off the dependent process.
- **Send Request**. This transitory state is used to hold the algorithm that facilitates the sending of the sync request to the external system. The algorithm used here may write a message to a JMS Queue or write a record to the general process MO or perform any other task that is suited to how your implementation communicates the change.
- **Awaiting Acknowledgement**. This state can be used to hold the sync request from further state transitions until an acknowledgement is received from the external system. We strongly recommend designing some form of acknowledgement that the external system has processed the information as this helps control the chronological flow of information. The base package provides 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.
- **Synchronized**. Once the information has been processed and acknowledged by the external system, the sync request is transitioned to this state. If any processes are dependent on the sync request processing successfully, your implementation may want to plug in an enter algorithm on this state to kick off the dependent process.
- **Error**. If a negative acknowledgement is received or if the acknowledgement is not received within the prescribed period of time, the sync request is transitioned to this state. Your implementation may wish to create a to do entry when the sync request transitions to this state. The base product provides the enter algorithm **F1-TDCREATE** for this purpose. The exit algorithm **F1-TODOCOMPL** has also been provided to complete any to do entries when leaving this state.
- **Canceled**. A user may transition the sync request to this state from either the **Awaiting Acknowledgement** state or the **Error** state if he wishes to discontinue processing of the sync request for any reason. Your implementation will have

to configure your own cancel reasons to document the transition. If any processes need to be triggered when the sync request reaches this state, your implementation can plug in an enter algorithm containing such logic.

Designing Your Sync Requests

The starting point for designing sync requests is the analysis of the external system's data requirements. Your implementation will need to analyze the external system's data model and compare it against your system's data model. Where the relevant data reside in your system will need to be identified. If the data reside in more than one MO, a decision must be made to either combine the information in one sync request or to break up the sync request into several ones.

For each sync request identified, the driving MO must be determined. The BO for each sync request can then be created as a sub-class of the base BO **F1-SyncRequest**. For an example of how these BOs are configured, please refer to *Oracle Utilities CCB-MDM Integration Implementation Guide* or *Oracle Utilities CCB-NMS Integration Implementation Guide*.

Sync Requests

The Sync Request portal is used to view information about data synchronizations from Oracle Utilities Customer Care and Billing to Oracle Utilities Meter Data Management, or from Oracle Utilities Customer Care and Billing to Oracle Utilities Network Management System. The menu location of the portal depends on your specific edge product.

Sync Request Query

Use the *query portal* to search for an existing Sync Request. Once a Sync Request record is selected, you are brought to the maintenance portal to view and maintain the selected record.

Sync Request Portal

This portal appears when a sync request has been selected from the Sync Request Query portal.

The topics in this section describe the base-package zones that appear on this portal.

Actions

The actions zone only appears for sync request business objects that define an actions map. For sync requests that are designed to show the actions directly in the display map, this zone is suppressed.

Sync Request

The Sync Request zone shows display-only information about the sync request. Refer to the zone's help text for additional information about this zone's fields.

Sync Request - Log

The sync request log page contains a standard *Log Zone*.

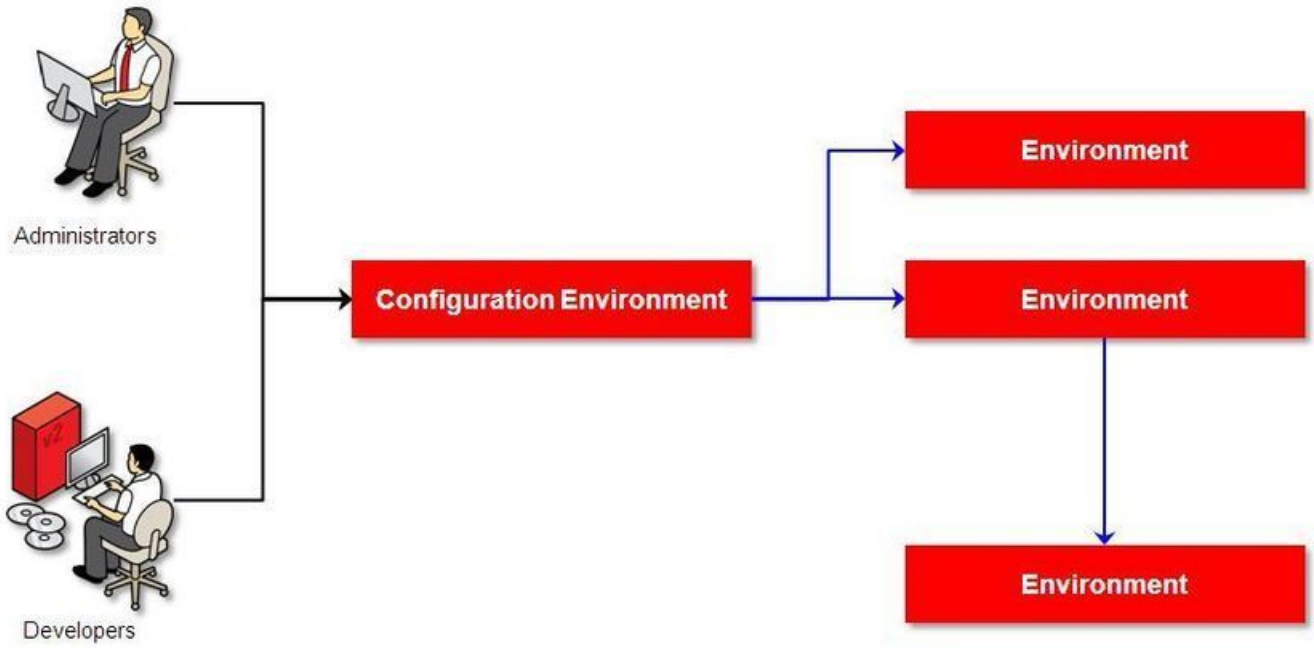
Configuration Migration Assistant (CMA)

This chapter describes the Configuration Migration Assistant (CMA), a facility to enable the export of customer-owned configuration data from one environment to another.

CAUTION: This chapter is intended for users responsible for testing configuration data and performing "what if" analysis in non-production databases.

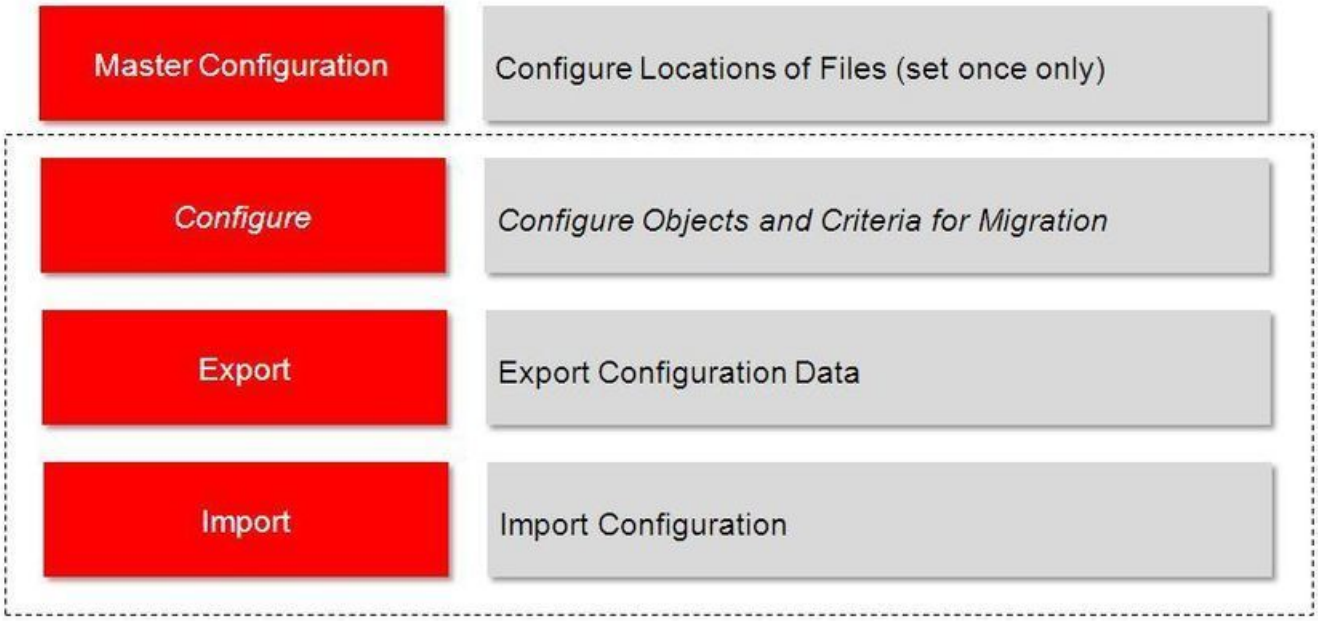
Understanding CMA

The Configuration Migration Assistant (CMA) provides implementers with a flexible, extensible facility for migrating configuration 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 two system preparation tasks described in *Migration Assistant Configuration* must be performed on both source and target systems.

The CMA Process Flow



The high-level CMA process comprises the following tasks and flows. Each is described in more detail later in this section.

- **One-time tasks**, which must be applied on both source and target systems:
  - Specify the source and target paths and a file extension for import and export data files in the **Migration Assistant Configuration** master configuration record.
  - Create a thread pool that turns off the L2 caching. This is required to support the import step where cached data is being added or updated. It's recommended for all steps (including export and compare) to ensure that the algorithms are working with the data in the database rather than the cache. Refer to *Caching Considerations* for more information.
- **Configuration** steps are used to define the data to migrate. This task is performed on the source system and may be defined at any time. 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.
  - 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. Multiple migration plans may exist for a given maintenance object if there are different requirements for migrating records in that MO under different circumstances.
    - The primary instruction in the migration plan could define the physical BO of the record. This signals to CMA that all records for the MO are eligible to be migrated.
    - The primary instruction may define a specific BO, in which case only records that reference that BO in its parental hierarchy are considered.

      NOTE: Refer to *Understanding the BO Filtering Process* for more information.

    - Subsequent instructions may include references to related records. There may be some circumstances where a migration should include subsequent records and some circumstances where they shouldn't based on requirements.

- A **Migration Request** is used to define a set of migration plans to be included together in a single migration attempt. In addition, the migration request may define selection criteria for each migration plan to limit the migration to a subset of data for each MO. Selection may be defined using SQL, an algorithm or explicit primary key values.

  FASTPATH: For more information, refer to *CMA Configuration*.

- The **Export** process includes all the steps needed to select records to be exported from the source environment and create the export file.
  - A **Migration Data Set Export** object is created for a specific migration request.
  - 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.
  - Because there may be a large volume of data in the export, many of the steps in the lifecycle of the migration data set export are executed via the **Migration Data Set Monitor**.

  FASTPATH: 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 *Migration Assumptions, Restrictions and Recommendations* 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. The following is a high level overview of the process.
  - A **Migration Data Set Import** object is created for a given file to import.
  - The next step reads the import file and creates **Migration Transactions** and **Migration Objects** based on the information in the import file. A migration object is created for every maintenance object record to potentially be created or updated. The migration transaction is a grouping record that groups together related migration objects.
  - The next step is for the objects to **Compare** the data being imported against the data for that record in the target environment. If it is found that the migration object is new or represents a change to the existing record in the target environment, appropriate SQLs are generated. If no changes are found, the object is marked “unchanged” and doesn’t progress.
  - Once all the objects are compared, the user may review the objects for acceptance or rejection.
  - When the migration objects are all accepted or rejected, the next step is to apply the objects and update the target environment.

  FASTPATH: For more information, refer to *Importing and Applying a Migration*.

Migration Assumptions, Restrictions and Recommendations

The following sections describe miscellaneous topics that are important to learn with respect to CMA.

Type of Data Migrated

CMA is designed to migrate configuration data only. The tool cannot be used to migrate master or transactional data that contains system-generated primary keys.

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.

No Record Deletion

The CMA process allows users to define records to copy from a source environment to a target environment. In that way, the import process for the migrated records is able to identify objects to add and objects to change. There is 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. If data on the target system must be deleted, users must delete the records in the target accordingly.

Note that CMA does support 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.

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.

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.

CMA Configuration

The following sections describe tasks required for CMA configuration.

Master Configuration - Migration Assistant

Before proceeding with your first migration, system wide configuration must be defined. This is captured in the **Migration Assistant Configuration** master configuration record. This must be defined in both the source environment and the target environment.

Navigate using **Admin** > **Master Configuration.** In the **Master Configuration** list, scroll to **Migration Assistant Configuration** and click the add icon if there is no record yet or the edit icon to modify an existing record.

For more information about specific fields in the master configuration, refer to the in-line 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 following topics describe defining a migration plan as well as other topics for a migration plan.

Defining a Migration Plan

To view or define a migration plan, navigate using **Admin** > **Migration** > **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.

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/businessObjectOption/businessObjectOptionType = 'F1DU'`. This technique allows foreign key references that are mapped inside a CLOB to be referenced.

> **NOTE:** The #parent expressions may access elements that are stored in the CLOB 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
Import	Optional	Algorithms of this type may be used to adjust the data after it is moved to the target system. Refer to *Adjusting Imported Data* for more information. Click *here* to see the algorithm types available for this system event.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *F1_MIGR_PLAN*.

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.

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 CLOB-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. For wholesale migrations, where all data (or a large amount of data) is being migrated, 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 type of migration. For piecemeal migrations, defining instructions ensures that the related objects are included in the migration, if appropriate.

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 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 unordered lists of Migration Plans that are to be migrated together. Algorithms, SQL statements, or specific keys are used to specify the set of objects you want to export. When complete, the request describes the complete data set that is extracted to the migration export file when the request is executed.

To view or define a migration request, navigate using **Admin** > **Migration** > **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.

Define one or more **Migration Plans** for the migration request. Note that the order doesn’t matter. During the export process, CMA looks at all objects that qualify for the export and will group them together based on their relationships.

For each option, define an appropriate **Selection Type**, which is used to filter which records in the migration plan’s object should be selected. The valid values are **Algorithm**, **SQL Statement**, and **Specific Key**.

- For the option **Algorithm**, specify an **Algorithm** for the Key Selection. The algorithm is responsible for returning a list of key values to include in the migration.

  NOTE: The algorithms that are eligible to be plugged in here are those valid for the Migration Request — Select system event. Click *here* to see the algorithm types available for this system event.

- For the option **SQL Statement**, specify an **SQL Statement** for the key selection. may be used to limit the keys to include. To migrate all records in the table, the SQL statement "1=1" may be used. Refer to the inline help for other examples.
- For the option **Specific Key**, enter one or more primary keys to individually to define the records to include. Click the "+" to enter each additional key. Each row represents one key and supports a multi-part primary key.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *F1_MIGR_REQ*.

Wholesale and Piecemeal Migrations

The Configuration Migration Assistant is used for two general types of migrations: wholesale and piecemeal. The following sections 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. Whether one migration request is used or multiple are used depends on the following considerations:

- For each migration request used, a separate migration data set export record (and therefore separate migration data set import record) is needed. The multiple records may cause more user interaction with the data to progress all the records to their final state.
- On the other hand, splitting data into multiple migration requests, grouping information logically together may allow for more reuse.
- In addition, 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 may choose to include only migration plans for your custom MOs (and simply migrate the objects in this table as a separate step in the process) or include other migration plans from the product in your custom migration plan to have a consolidated plan.

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.

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.

Piecemeal Migrations

A piecemeal migration refers to migrating a targeted subset of data from one environment to another. Examples of piecemeal migrations include:

- Migration of a new Business objects with its options and algorithms.
- Migration of a new maintenance portal, its zones, and its application service.
- Migration of all outbound message types.

Administrative users can define a migration request with the specific types of objects that should be copied and use selection criteria to limit the records to copy as desired.

The migration plans included in a 'piecemeal' migration request should be reviewed carefully to verify what subordinate instructions are included. When copying a specific type of record, there may be related records that should be copied as well and other related records that should not be copied. For example, when copying a custom To Do Type, perhaps any algorithms it refers to should be copied (along with their algorithm types) and its message should be copied, but not its navigation option or its drill keys, which would probably refer to base values.

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 targeted (piecemeal) 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, in Oracle Public Sector Revenue Management, a Form Type includes a collection of valid Form Change Reasons and in turn the Form Change Reason refers to its Form Types. If an implementation wants to do a targeted migration of a form type and include all its related information, including form rules and form change reasons, it does not want the migration of a form change reason to in turn copy all its form 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 Configuration 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 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.
- 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 using **Admin** > **Characteristic Type** > **Search** 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:

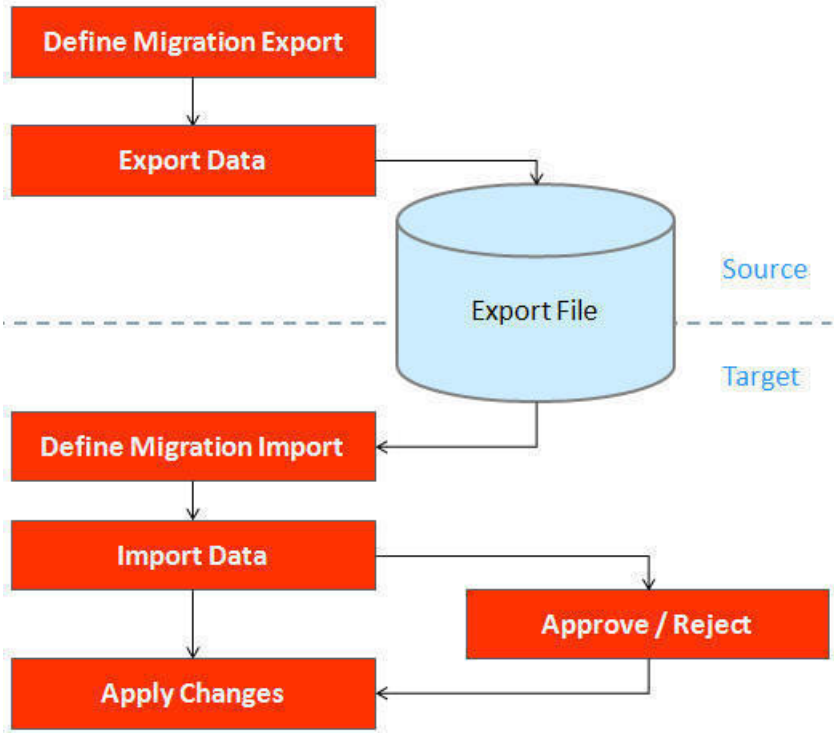
- If you have implemented only one “logical” business object used to define the data in the MO, then a single migration plan that references the this BO (or the maybe the MO’s physical BO) is appropriate.
- If you have implemented more than one “logical” business object, would the data for multiple business 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.

If your implementation has a template migration request to use for piecemeal or wholesale 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.

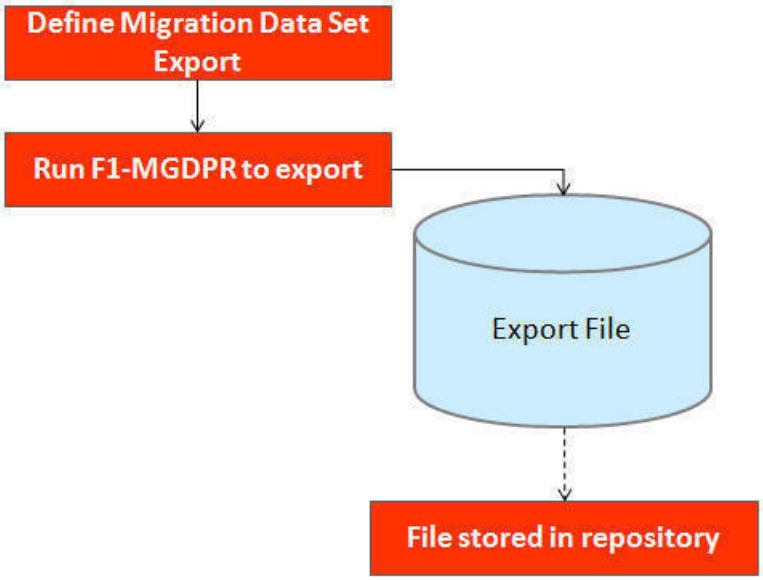
The CMA Execution Process

The following diagram illustrates a high-level view of the Configuration Migration Assistant execution process. The subprocesses illustrated here are described in more detail in the following sections.



Exporting a Migration

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 Monitor** batch job can be submitted generate the export file.



The following topics provide more detail about this process.

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 that includes the migration plans and selection criteria for the objects to include in the migration.

To view an existing migration data set export, navigate using **Admin** > **Migration** > **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 in the *Migration Assistant Configuration* master configuration record.

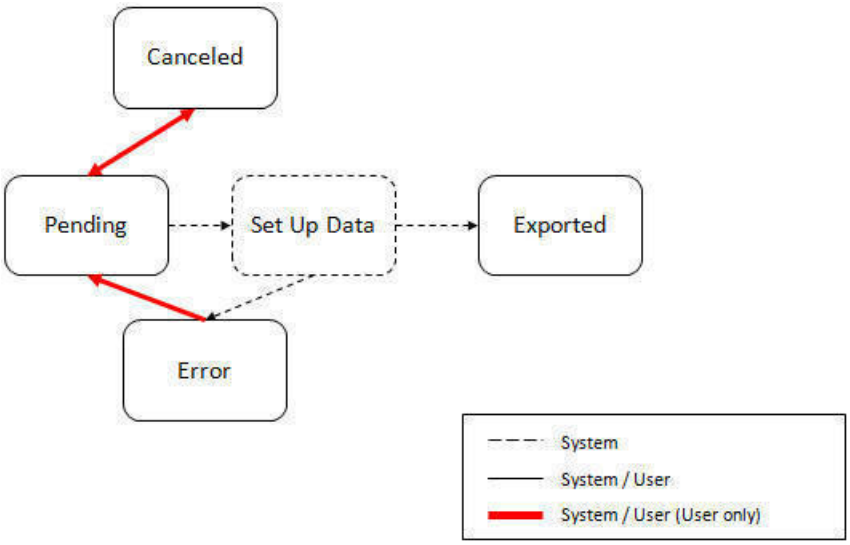
Enter an **Export Description** for the data set.

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.

When the data set is complete, click **Save**.

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.
- 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 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.

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 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. 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.
- **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

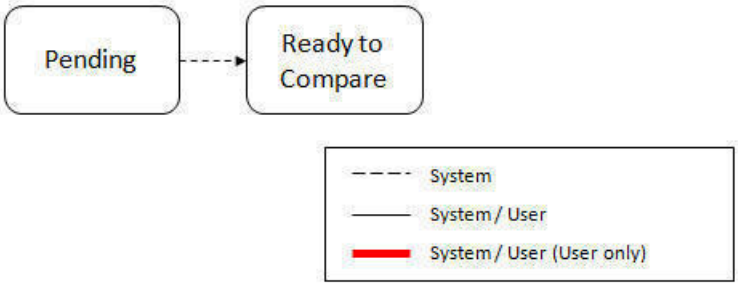
The import process starts with verifying the import directory configured in the *Master Configuration — Migration Assistant* for the target environment and ensuring that the exported file is located in that directory. Then, in the target environment, a **Migration Data Set Import** record should be created. 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 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 (data set) is created, the next step is to read in the file and create Migration Transactions and Migration Objects.

The following is a portion of the Migration Data Set Import lifecycle as it pertains to the import step.



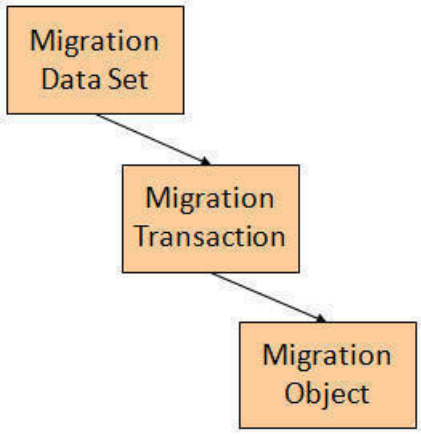
The following points describe the lifecycle.

- 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* 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.
- 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).

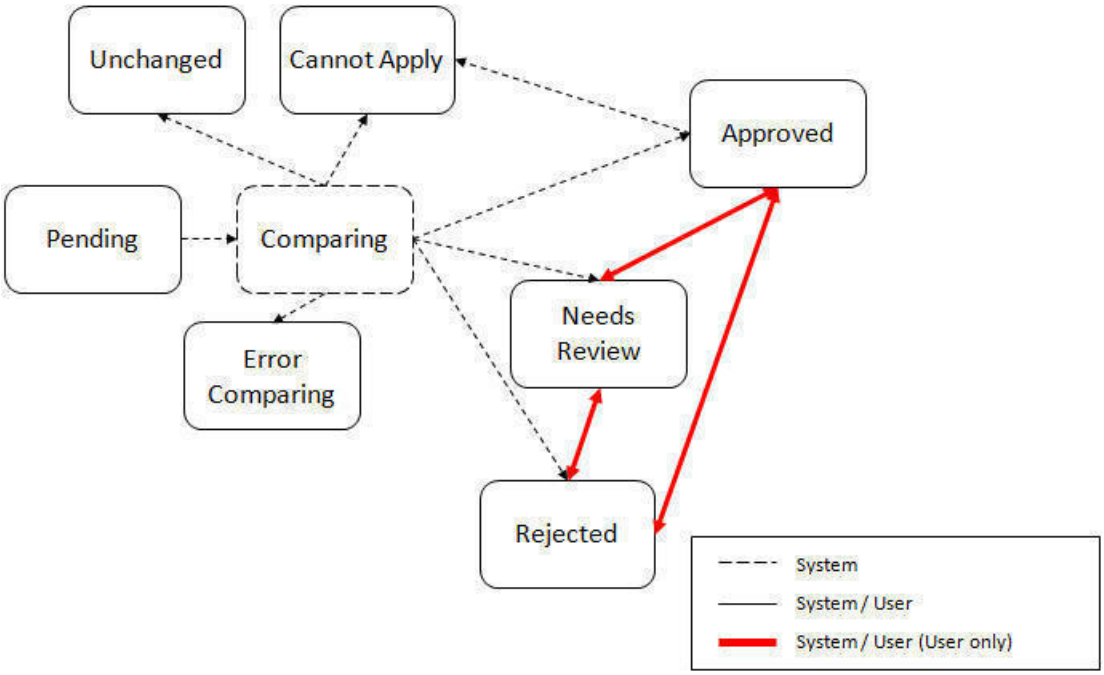
Compare Step

The import step results in the creation of one or more migration objects, one 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. 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.

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.



The following points describe the lifecycle.

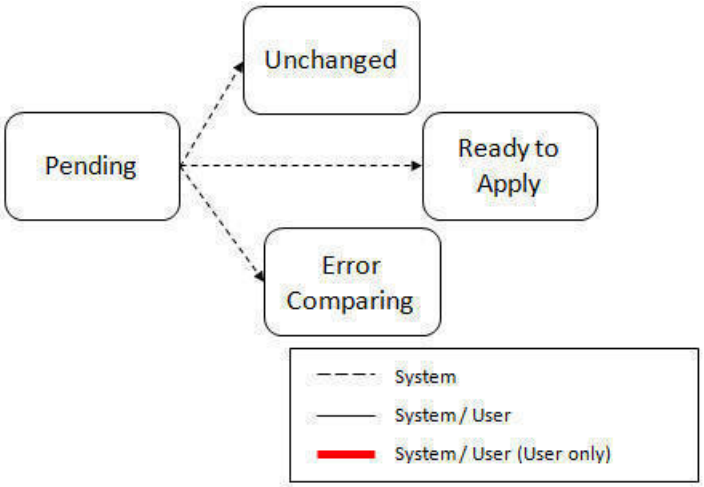
- When **Pending** records are selected by the monitor batch job, it transitions to **Comparing** where the algorithm will determine the appropriate next state.
- If the record in the migration object is found in the target environment and the data is exactly the same, the record transitions to **Unchanged**.
- If the record in the migration object is found in the target environment and the data is different, the algorithm generates the appropriate SQL to be used later in the Apply step to update the record and 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 generates the appropriate SQL to be used later in the Apply step to insert the record and then transitions to **Approved**, **Needs Review** or **Rejected** based on the Default Status For Add 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.

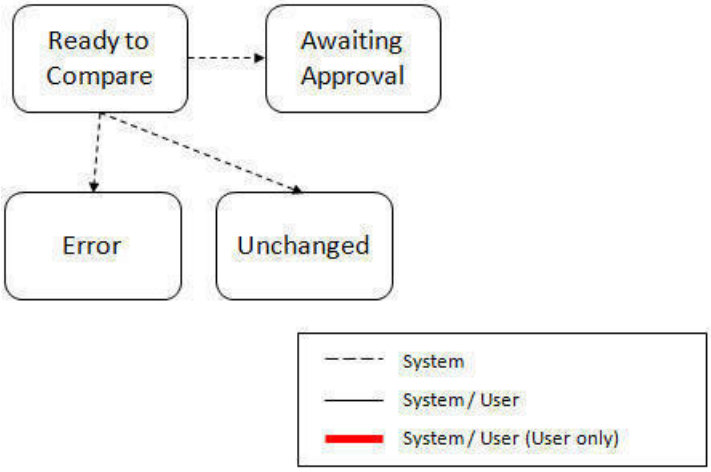
- If any related migration object is in the Error Comparing state, the transaction transitions to **Error Comparing**.
- If all related migration objects are in the Unchanged state, the transaction transitions to **Unchanged**.
- Otherwise, the transaction transitions to **Ready to Apply**. This means 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.

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.

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.

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

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. 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 reference the foreign key is in a CLOB 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.

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. Because the migration objects are not ordered, the multi-threaded batch process may not process records in the desired order. To overcome this potential issue, 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.

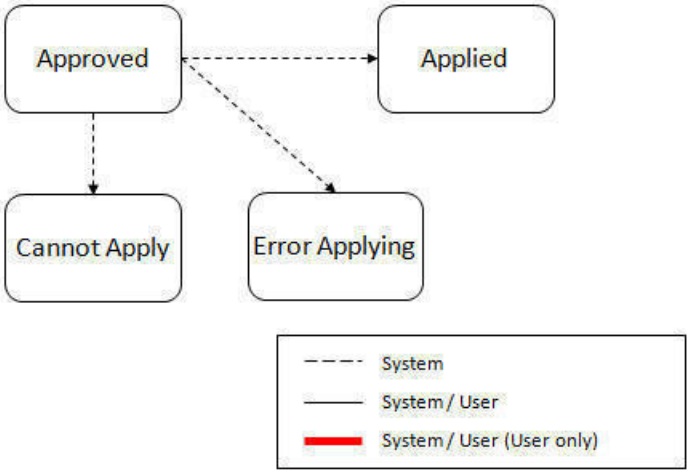
Apply Objects

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. 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, erasing the benefit of the iteration processing.

The following diagram is the portion of the migration object lifecycle that pertains to the Apply step. Note that this diagram is not complete. A subsequent section provides more information about resolving errors.



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.

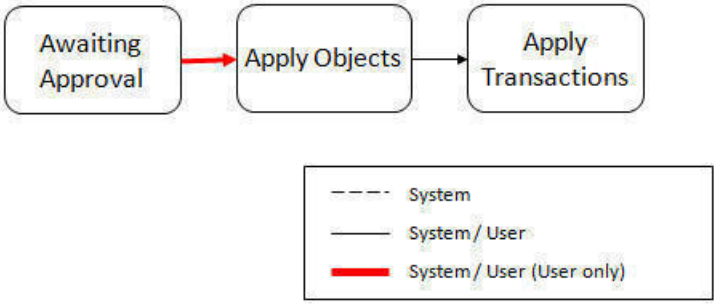
- They are in category 5 described above where the records have a circular reference with another record. For this scenario, the Apply Transactions step described below should successfully apply the records.
- There is some other error that is unrelated to the records in the current migration. In this case, manual intervention is 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.



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** and do not have any records in **Error Applying**. If so, it automatically transitions the record to the **Apply Transactions** state.

If any objects are in **Error Applying**, the monitor algorithm does not automatically transition the record. In that case, a user must decide if the record should transition to **Apply Transactions**. The Resolving Errors section below describes alternative steps that the user may take if there are errors.

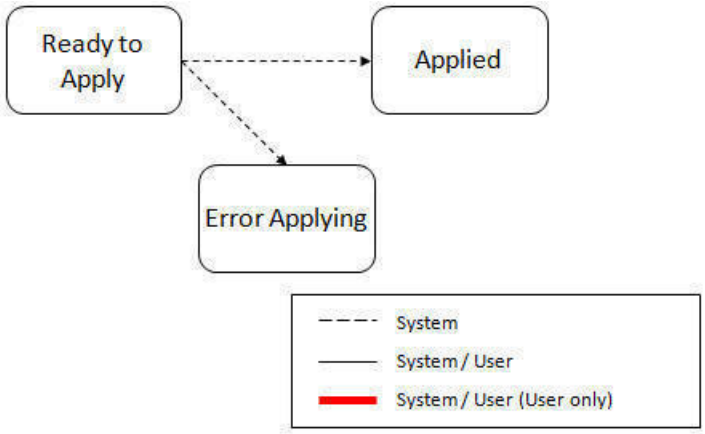
Once the Data Set is in the state of **Apply Transactions**, the **Migration Transaction Monitor — Apply** process (F1–MGTAP) runs. It attempts to apply the transaction's objects. If no migration objects are in error, the migration transaction

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. Note that this diagram is not complete. A subsequent section provides more information about resolving errors.



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 and the system will not automatically transition the data set to the **Apply Transactions**. Rather, a user must make the decision. This allows for the user to review the errors and make a decision:

- If the errors appear to be dependency related, the user can decides 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

- 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**. This is accomplished with a Retry Count. This is different from the Iteration count that is used during the apply steps to handle the iterative selection logic. The following points describe the Retry logic for migration objects.

- When the Migration Data Set Import record first enters the **Apply Objects** state, its Object Retry Count is set to 1.
- When Migration Objects first enter the **Approved** state, their Object Retry Count is set to 1.
- When migration objects transition to **Error Applying**, it remains in this state as long as the object's Retry Count matches the data set's Object Retry Count (or it is successfully applied via the Apply Transactions step).
- If a user decides to **Retry Objects** (using an action button on the Migration Data Set Import page), the data set's Object Retry Count is incremented and the Data set returns to the **Apply Objects** state.
- At this point, the monitor on the **Error Applying** state for the objects detects that the object's Retry Count doesn't match the data set's Object Retry Count and that triggers the transition back to **Approved**. This increments the object's retry count to match the data set's. Now the objects are eligible to be picked up by the object level Apply process.

Analogous logic exists for the migration transactions.

- When the Migration Data Set Import record first enters the **Apply Transactions** state, its Transaction Retry Count is set to 1.
- When Migration Transactions first enter the **Ready to Apply** state, their Transaction Retry Count is set to 1.
- When migration transactions transition to **Error Applying**, it remains in this state as long as the transaction's Retry Count matches the data set's Transaction Retry Count.
- If a user decides to **Retry Transactions** (using an action button on the Migration Data Set Import page), the data set's Transaction Retry Count is incremented and the Data Set returns to the **Apply Transactions** state.
- At this point, the monitor on the **Error Applying** state for the transactions detects that the transaction's Retry Count doesn't match the data set's Transaction Retry Count and that triggers the transition back to **Ready to Apply**. This increments the transaction's retry count to match the data set's. Now the transactions are eligible to be picked up by the transaction level Apply process.

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 **Applied** 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).

Adjusting Data While Importing

Some records may have data that is specific to the environment it is in and won't apply in the target environment. In such cases, an algorithm plugged into the migration plan instruction may be used to adjust the data when importing. This algorithm is executed in the apply step after the record is inserted but before the validation is executed.

Some examples of records that may require import algorithms.

- Batch Control references its next batch sequence number. This number 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.

Import Process Summary

The following table summarizes the steps required to complete the import process from start to finish. It highlights what steps are manual and what steps are performed by a batch monitor process. For the Apply steps, there are two parts where multiple next actions are possible. The possible next actions have the same sequence with a letter following the sequence. For each step, the table highlights the Next Action sequence that would occur.

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”.

Step	Seq	Action	Manual / Batch	Portal — Action	Batch Control	Record Impacted — Resulting Status	Next Action Sequence
Import	**10**	**Create Import record**	Manual	Migration Data Set Import - Add		Migration Data Set Import - Pending	11
Import	**11**	**Import file**	Batch		F1-MGDIM - Migration Data Set Import Monitor	Migration Data Set Import - Ready to Compare Migration Transaction - Pending Migration Object - Pending	20
Compare	**20**	**Migration Object Compare**	Batch		F1-MGOPR - Migration Object Monitor	Migration Object - Approved, Needs Review, Rejected, Unchanged or Error Comparing	21
Compare	**21**	**Migration Transaction Status Update**	Batch		F1-MGTPR - Migration Transaction Monitor	Migration Transaction - Ready to Apply, Unchanged or Error Comparing	22

Step	Seq	Action	Manual / Batch	Portal — Action	Batch Control	Record Impacted — Resulting Status	Next Action Sequence
Compare	**22**	**Migration Data Set Export Status Update**	Batch		F1-MGDIM - Migration Data Set Import Monitor	Migration Data Set Import - Awaiting Approval, Unchanged or Error	30
Approval	**30**	**Review comparison results, approve / reject as needed**	Manual	Migration Data Set Import, drill in to the Transactions / Objects as necessary.		Migration Object - Approved or Rejected (no records should be in Needs Review) Migration Data Set Import - Apply Objects	40
Apply	**40**	**Apply Objects**	Batch		F1-MGOAP - Migration Object Monitor - Apply	Migration Object - Applied or Error Applying	41
Apply	41a	Data Set Transition - auto transition to Apply Transactions. Only applicable if no migration objects are in Error Applying	Batch		F1-MGDIM - Migration Data Set Import Monitor	Migration Data Set Import - Apply Transactions	42
Apply	**41b**	**Data Set Transition - manual transition to Apply Transactions.** Occurs if user reviews errors and determines that they may be resolved in the Apply Transaction step.	Manual	Migration Data Set Import - click Apply Transactions		Migration Data Set Import - Apply Transactions	42
Apply	41c	Data Set Transition - manual transition to Retry Objects. Occurs if user decides to fix an external error and wants to try the batch level Apply again.	Batch	Migration Data Set Import - click Retry Objects		Migration Data Set Import - Apply Objects	44
Apply	**42**	**Apply Transactions**	Batch		F1-MGTAP - Migration Transaction Monitor - Apply	Migration Transaction - Applied or Error Applying Migration Object - Applied or Error Applying	43

Step	Seq	Action	Manual / Batch	Portal — Action	Batch Control	Record Impacted — Resulting Status	Next Action Sequence
Apply	**43a**	**Data Set Transition - auto transition to Applied** Applicable if all transactions are Applied	Batch		F1-MGDIM - Migration Data Set Import Monitor	Migration Data Set Import - Applied.	N/a
Apply	43b	Data Set Transition - manual transition to Retry Objects. Occurs if user decides to fix an external error and wants to try the batch level Apply again at the Object level.	Manual	Migration Data Set Import - click Retry Objects		Migration Data Set Import - Apply Objects	44
Apply	43c	Data Set Transition - manual transition to Retry Transactions. Occurs if user decides to fix an external error and wants to try the batch level Apply again at the Transaction level.	Manual	Migration Data Set Import - click Retry Transactions		Migration Data Set Import - Apply Transactions	45
Apply	44	Move Objects from Error Applying back to Approved. Occurs if user chose to Retry Objects.	Batch		F1-MGOPR - Migration Object Monitor	Migration Object - Approved	40
Apply	45	Move Transactions from Error Applying back to Ready to Apply. Occurs if user chose to Retry Transactions.	Batch		F1-MGTPR - Migration Transaction Monitor	Migration Transaction - Ready to Apply	42

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

Batch Control	Description	Comments
		• Ready to Compare • Apply Objects • Apply Transactions
F1-MGTPR	Migration Transaction Monitor (Deferred)	Processes transaction records in the following states: • Pending • Error Applying
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) • Rejected (check for Data Set cancellation) • Error Applying
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.

Refer to *Running Batch Jobs* for more information about managing the batch jobs.

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.

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.

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.).
- All migration requests can be exported at the same time. On the import side, however, 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 an insert error on the object, and the transaction would be marked with status "Error Applying". If instead you wait until the first file is applied 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.

Caching Considerations

Because CMA updates administrative data that is usually read from a cache, a thread pool with the L2 cache disabled is required during the execution stages of migration. Contact your system administrator and ask for the name of a thread pool with the L2 cache disabled. This thread pool name must be entered in the batch controls used for CMA processing in the **Thread Pool Name** parameter.

Refer to *Running Batch Jobs* for more information about running CMA batch jobs.

The batch section of the *Server Administration Guide* also contains information on preparing and implementing thread pools and turning off the L2 cache.

Also note that after a successful migration, the target region now has new administrative data which needs to be part of the L2 cache. The existing thread pool workers should be restarted by your system administrators. In addition, it is recommended to restart the application server.

Maintaining Import Data

This section describes the portals provided to add, view and maintain migration import data.

Migration Data Set Import

Use the Migration Data Set Import portal to view and maintain migration data set import records. Navigate using **Admin** > **Migration** > **Migration Data Set Import**.

Migration Data Set Import Query

Use the query portal to search for an existing Migration Data Set Import record. Once a record is selected, you are brought to the maintenance portal to view and maintain the selected record.

In addition, the query provides an option to specifically search for data sets that have either objects in error or transactions in error.

Migration Data Set Import Portal
This page appears when viewing the detail of a specific migration data set import record.

The topics in this section describe the tabs that appear on the portal.

Migration Data Set Import - Main
This portal appears when a migration data set import record has been selected from the query portal. The topics below describe the base-package zones that appear on the portal.

Migration Data Set Import

The Migration Data Set Import zone contains display-only information about the selected record.

Please see the zone’s help text for information about this zone’s fields.

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.

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.

Migration Data Set Objects in Error

This zone is only visible if the data set's status is **Apply Objects**, and there are objects in the status **Error Applying**. 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 transition the record to **Error Applying** or manually fix the cause of the error and click **Retry Objects**.

NOTE: Refer to *Apply Step* for more information about resolving errors.

Migration Data Set Transactions in Error

This zone is only visible if the data set's status is **Apply Transactions**, and there are transactions in the status **Error Applying**. It indicates the error for each object. 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.

Migration Data Set Import - Log

Navigate to the Log tab to view the *logs* for the migration data set import record.

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.

The topics in this section describe the tabs that appear on the portal.

Migration Transaction - Main
The topics below describe the base-package zones that appear on the portal.

Migration Transaction

The Migration Transaction zone contains display-only information about the selected record.

Please see the zone's 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.

Migration Transaction - Log

Navigate to the Log tab to view the *logs* for the migration transaction.

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.

The topics in this section describe the tabs that appear on the portal.

Migration Object - Main
The topics below describe the base-package zones that appear on the portal.

Migration Object

The Migration Object zone contains display-only information about the selected record.

Please see the zone's help text for information about this zone's fields.

Migration Object - Log

Navigate to the Log tab to view the *logs* for the migration object.

Running Batch Jobs

There are several batch jobs that are part of the CMA process, especially the import step. 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 process whatever is ready. A user doesn't have to manually submit a batch request. Navigate to **Admin** > **Batch Control** > **Search** 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.
- **Manual submission**. The user managing the CMA import process submits the appropriate batch jobs on demand when a particular step is ready. Navigate using **Menu** > **Batch** > **Batch Job Submission** > **Add**, select the appropriate batch control and fill in the parameters as needed.

Note that for the CMA batch processes, especially the "apply" batch processes, the setting of the **Thread Pool Name** parameter is important. This parameter specifies the thread pool that will be executed by the batch. Since the CMA apply processes update administrative data that is usually read from a cache during batch processing, the thread pool named here must be one with the L2 cache disabled. In addition, after successfully applying the migrated data, the L2 cache of all thread pools must be refreshed. For more information, see *Caching Considerations*.

> **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 simply wait until the supported number of threads are finished.

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 - Main* in the Batch Jobs section.

CMA Reference

This section provides additional reference information.

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.

You can see all currently available objects and their descriptions by performing a search in the **Migration Plan Query** or **Migration Request Query** pages.

The following points highlight some information about the Framework-provided migration plans and migration requests:

- Fields and characteristic types are not migrated with the object unless specifically indicated.
- The **Application Service** used by an object is migrated only if it is CM-owned.
- The **F1-Language** migration plan should **never** be used in a migration request with other objects. Defined constraints will cause CMA to link all objects with a language table—which is almost all of the system admin data—into one large transaction. Attempting to update and commit all the changes for this one large transaction may cause performance issues and/or out of memory errors. For this reason, this MO has its own migration request, **F1-Languages**.
- The migration request **F1-SchemaAdmin** defines migration plans related to data that is commonly used in schema-based objects.
- The **Batch Control** object optionally references a User. If this user does not exist on the target system, CMA cannot apply the requested changes.
- 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 piecemeal 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 piecemeal 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.
- The migration plans provided by CMA migrate scripts, schema-based objects and zones, and, through constraints, some of the associated data associated with them. However, data 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. It's important to note that this could cause validation errors during **Apply**, and may require retrying or migrating the additional data separately. See *Apply Step* for a description of how to reapply the import should an **Applied With Errors** result occur.
- 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). This is used in the **F1-FrameworkAdmin** migration request, which migrates all admin objects. 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 (which has been deprecated). This migration plan is not included in any base migration requests. It may be included in any appropriate custom piecemeal 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 (**Super User** access mode for the Feature Configuration application service (**CILTWSDP**).
- All of the provided Framework-owned migration requests include the SQL statement "1=1" so that all records in the plan are migrated. If an implementation wants to limit a migration to a subset of records, the prepackaged migration request may be duplicated and then customized to modify the key selection criteria.
- Many of the XAI-related maintenance objects include references to environment-specific data, and data should be migrated with extreme care. Migration plans are not provided for MOs that contain mostly environment-specific data. Migration plans are provided for the following XAI-related maintenance objects, but these plans are not included in the **F1-XAI-Admin** migration request: **External System**, **XAI Receiver**, **Message Sender**, and **XAI Route Type**.

Migration Requests for Wholesale Migrations

The following framework provided migration requests may be used in a wholesale migration. 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 **F1-SchemaAdmin**(Framework Schema Admin) migration request. This request contains migration plans for objects needed by schema based objects, such as Field and Lookup. It has few dependencies on its data and many other objects include dependencies to it.
- The **F1-FrameworkAdmin** (Framework Admin) migration request. This includes migration plans for most widely used maintenance objects Your product may have chosen to incorporate migration plans from this migration request directly into one of its owned migration requests.
- The **F1-GeneralSystemOptions** (General System Objects) migration request. This includes migration plans for business related objects that may or may not be applicable to all products. Your product may have chosen to incorporate a subset of the migration plans from this migration request directly into one of its owned migration requests.

For each migration request determined to be needed for a wholesale migration, create a migration data set export record and process it as documented in **Exporting a Migration**.

Executing Piecemeal Migrations

Piecemeal migrations involve copying a targeted set of data. It may be that it includes a subset of maintenance objects (for example all Activity Types or all Asset Types) or it may further limit the records within one or more maintenance objects (for example, all 'electric' rates). Many piecemeal migrations are ad-hoc, depending on the specific requirements at the time.

If your product has provided migration requests for piecemeal migrations out of the box, it would they would be defined to copy the appropriate type of data. However, the selection criteria would most likely not be limited to a type of record. As such, it could be used as is for a "copy all data in these maintenance objects" migration. For example, the framework provides a migration request for Security Configuration. This may be used to copy all the data in the various security tables. Oracle Public Sector Revenue Management provides a migration request to copy form types and its related data.

If your implementation wants to copy only a subset of data for maintenance objects covered by a base provided migration request, do the following:

1. Duplicate the base migration request.
2. Find the migration plan for the object or objects where you want to limit the data. Enter appropriate Key Selection criteria to select the desired data.
3. Use that migration request to request a migration data set export request.

If your piecemeal migration requirement is not satisfied by a base migration request that may be used as a starting point, review the base migration plans for the records that should be copied. Determine if the migration plans have the desired subordinate instructions to copy (or not copy) the related data as desired.

- If existing migration plans satisfy your requirements, create a migration request that includes those plans (and desired key selection as needed). Use that migration request to create a migration data set export request.
- If existing migration plans do not satisfy your requirements, create migration plans as needed. Create a migration request that includes those plans (and desired key selection as needed). Use that migration request to create a migration data set export request.

Configuring 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

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.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *F1_FACT*

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.

FASTPATH: For more information about business objects, refer to *The Big Picture of Business Objects*.

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.

FASTPATH:

Refer to *State Transitions Are Audited* for more information on logging. For more information about the various configuration tools available, refer to *Configuration Tools*. For more information about user interfaces, refer to *Portal and Zone Features*.

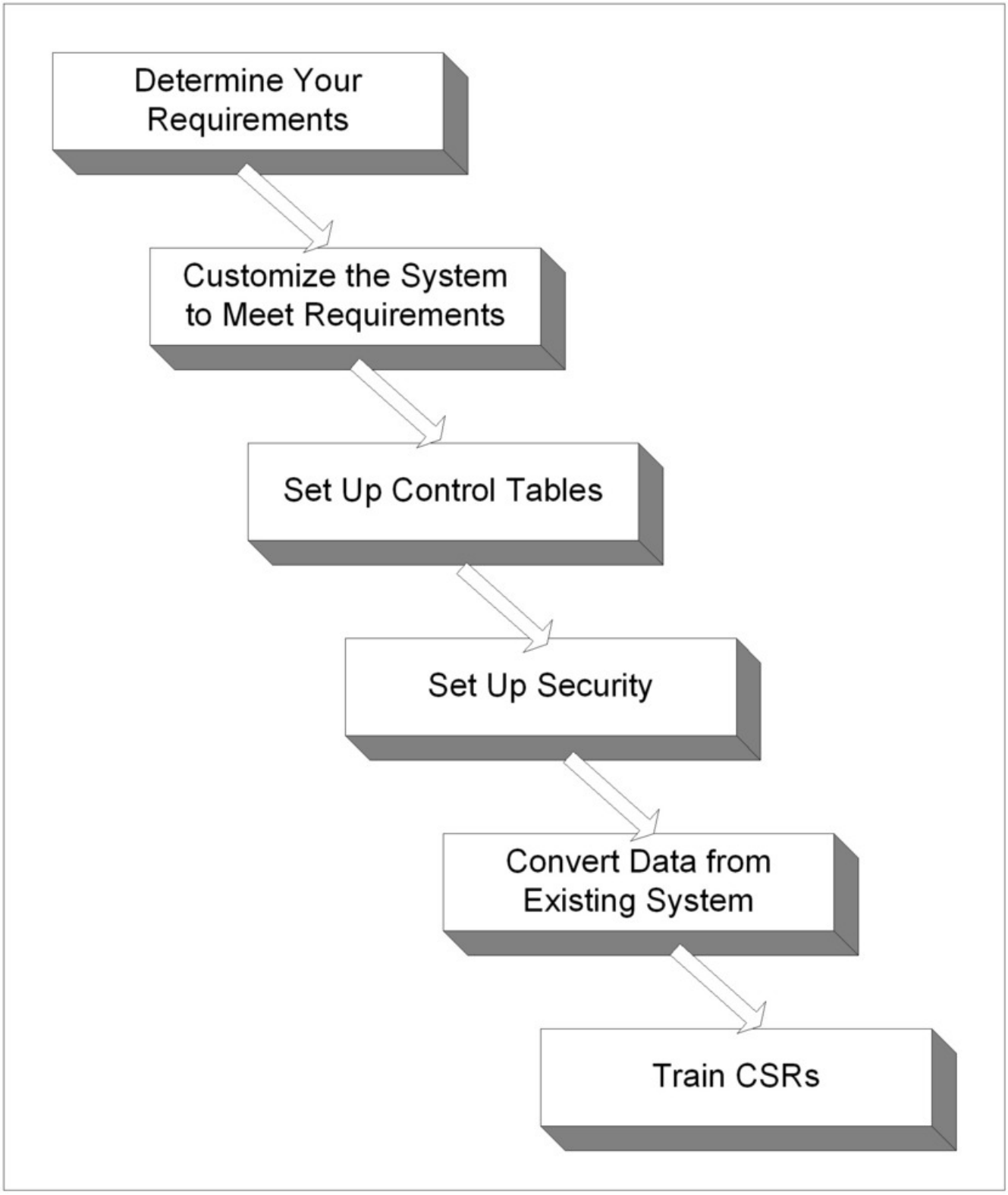
Public Sector Revenue Management Administrative User Guide

Introduction to administrative-related user documentation for Oracle Public Sector Revenue Management.

Preparing To Implement

Getting ready for production takes a good deal of planning. You have probably already begun analyzing your requirements according to your business and organizational needs. You will need to review your current environment and think about what changes could be made now and in the future. And while you might have decided to simply transfer your current processing structure to Oracle Public Sector Revenue Management, you may also have discovered that the product can provide new options.

Because the system is sophisticated and customizable, there are a number of steps involved in rolling out and using your new system.



The topics in this section describe the order in which the control tables should be set up.

Control Table Setup Sequence

To implement the system, you must set up your organization's business rules in "control tables". Setting up these tables is time-consuming because we allow you to tailor many aspects of the system to meet your organization's requirements. We strongly recommend that you take the time to document how you plan to set up all of these tables before you use the following roadmap to enter the control data. Time spent understanding the interrelationships between this data will reap the rewards of a clean system that meets your current and long term needs.

While we describe the transactions and options in more detail in other sections of this manual, use the following chart (and the remaining sections of this chapter) as your roadmap. Here we list the order in which you perform tasks and the pages you'll use to set up your system. The order is important because some information must exist before other information can be defined (i.e., many dependencies exist).

NOTE: Auto setup. The Auto Setup column in the following table contains suggestions to save you time. It also indicates if a control table contains information when the system is installed.

NOTE: You don't have to set up every control table. You need only set up those control tables that govern functions that are applicable to your organization.

NOTE: Algorithm references. In the sections below when it is mentioned that an algorithm is needed, note that the base product may provide base algorithms that can be used as is if they satisfy the implementation's needs. Additionally, the product may provide an algorithm type but no algorithms in cases where the algorithm requires parameters that the implementation may need to configure. Finally, the implementation may determine that a new Algorithm Type and its Algorithm are needed to support the desired business functionality.

Function	*Menu*	*Auto Setup*
Global Context		
Algorithm	Admin, Algorithm. 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*.	
Accounting Related Tables		
Country & State	Admin, Country	
Currency Codes	Admin, Currency Code	**USD** is automatically populated
Accounting Calendar	Admin, Accounting Calendar	
GL Division	Admin, General Ledger Division	
Security Related Tables		
Application Service	Admin, Application Service	All base package transactions are automatically populated
Security Type	Admin, Security Type	
User Group	Admin, User Group Note, you won't be able to set up users at this point	One user group, **ALL-SERVICES,** is automatically set up. It references all other application services and a single user called **SYSUSER**.
Language	Admin, Language	**ENG** is automatically populated
Display Profile	Admin, Display Profile	Two display profiles are automatically set up: **NORTHAM** displays currencies and dates in a classic American format; **EURO** displays information in a classic European format
Data Access Role	Admin, Data Access Role	**CI_DFLT** is automatically populated. It references a single user called **SYSUSER**

Function	*Menu*	*Auto Setup* and a single access group called **CI_ACCGRP**
Access Group	Admin, Access Group	**CI_ACCGRP** is automatically populated. It references the data access role **CI_DFLT**
User	Admin, User	**SYSUSER** is automatically set up.
Return to User Group	You must return to your user groups and define all of their users	
Account Type Related Tables		
Account Type	Admin, Account Type. At this point, you'll only be able to set up your account type codes. You will return to these account types throughout the setup process to populate additional information.	
Financial Transaction Related Tables		
Work Calendar	Admin, Work Calendar	
Division	Admin, Division	
Revenue Class	Admin, Revenue Class	
Algorithm	Admin, Algorithm. You will need to set up the algorithm that constructs a distribution code's corresponding GL account when it is interfaced to the general ledger	
Distribution Code	Admin, Distribution Code	
Bank & Bank Accounts	Admin, Bank	
Algorithm	Admin, Algorithm. You will need to set up the algorithm that constructs a payment segment's financial transaction	
Payment Segment Type	Admin, Payment Segment Type	
Algorithm	Admin, Algorithm. You will need to set up the algorithm that constructs an adjustment's financial transaction	
Payment event distribution related control tables need to be set up if your organization uses the distribution rules method to create payment events. Refer to *Setting Up The System To Use Distribution Rules* for a description of the tables that must be set up to enable this functionality.		
Algorithm	Admin, Algorithm. Several plug-in spots are available to perform additional logic when processing adjustments. For example, if you have the system calculate adjustments, you must set up an adjustment generation algorithm. Refer to *Adjustment Type* for other available plug-in spots that may be used by your implementation.	
Algorithm	Admin, Algorithm. You may want to set up an algorithm that formats the Adjustment information that is displayed throughout the system for a specific Adjustment Type. This algorithm is plugged-in on the *Adjustment Type*.	
Algorithm	Admin, Algorithm. You may want to set up an algorithm that formats the Adjustment information that is displayed throughout the system. This algorithm is plugged-in on the *installation record*.	
Debt Category	Admin, Debt Category	
Debt Category Priority	Admin, Debt Category Priority	
Adjustment Type	Admin, Adjustment Type	
Adjustment Type Profile	Admin, Adjustment Type Profile	
Approval Profile	Admin, Approval Profile. Note, an approval profile references a To Do type and one or more To Do Roles; these must be set up before you can set up the approval profile.	

Function	*Menu*	*Auto Setup*
	After the approval profile(s) are set up, they must be referenced on the adjustment types that they govern.	
Cancel Reason - Payment	Admin, Payment Cancel Reason	
Cancel Reason - Adjustment	Admin, Adjustment Cancel Reason	
Tender Type	Admin, Tender Type	
Tender Source	Admin, Tender Source	
A/P Request Type	Admin, A/P Request Type	
Installation	Admin, Installation Options - Framework and Admin, Installation Options. Many fields on the installation record impact the financial transaction environment. Refer to the description of the *Financial Transaction* tab for more information.	
Algorithm	Admin, Algorithm. You will need to set up an algorithm that distributes payments.	
Algorithm	Admin, Algorithm. You will need to set up an algorithm that handles overpayment situations.	
Algorithm	Admin, Algorithm. You may need to set up an algorithm if you want the system to levy a non-sufficient funds charge if a payment is canceled due to non-sufficient funds.	
Algorithm	Admin, Algorithm. You will need to set up an algorithm that formats the payment information that is displayed throughout the system. This algorithm is plugged-in on the *installation record*.	
Algorithm	Admin, Algorithm. You will need to set up an algorithm that defaults the amount when a payment is manually added. This algorithm also calculates the amount of an automatic payment for a bill for an account with an active auto pay option. This algorithm is plugged-in on the *installation record*.	
Algorithm	Admin, Algorithm. Refer to *Account Type* for other available plug-in spots that may be used by your implementation to perform additional logic when processing payments.	
Return to Account Type	Admin, Account Type. You will need to plug-in the algorithms defined above on your account types.	
Address Environment		
Address Type	Admin, Extendable Lookup, search for the Address Type lookup. Define valid address types for person addresses and tax role addresses.	
Address Inactive Reasons	Admin, Extendable Lookup, search for the Address Inactive Reason lookup. Define valid address inactive reasons to use when changing the status of an address to inactive.	
Algorithm	Admin, Algorithm. You will need an algorithm that finds an address if your implementation receives requests from external sources to define or update a taxpayer's address. This plug-in determines if the address already exists in the centralized address repository. This algorithm is plugged-in on the *installation record*.	
Taxpayer Environment		

Function	*Menu*	*Auto Setup*
Account Management Group	Admin, Account Management Group. Note: You will probably have to set up To Do Type and To Do Roles before you can set up account management groups. Refer to *Assigning A To Do Role* for more information on how account management groups may be used to define an entry's role.	
Account Relationship	Admin, Account Relationship Type	
Alert Type	Admin, Alert Type	
Algorithm	Admin, Algorithm. If you have software capable of reconstructing an image of a letter in a PDF (for the purpose of online display), you will need to create an algorithm that formats the extract records that are sent to your letter image software.	
Letter Template	Admin, Letter Template	
Customer Contact Class	Admin, Customer Contact Class	
Customer Contact Type	Admin, Customer Contact Type	
Algorithm	Admin, Algorithm. You may need to set up the algorithms that determine if person ID's are in a predefined format.	
Identifier Type	Admin, Identifier Type	
Industry Codes	Admin, Industry Code	
Algorithm	Admin, Algorithm. You may need to set up the algorithms that determine if phone numbers are in a predefined format.	
Phone Type	Admin, Phone Type	
Person Relationship Type	Admin, Person Relationship Type.	
Person Type	Admin, Person Type	
Algorithm	Admin, Algorithm. You will need to set up an algorithm that formats the person information that is displayed throughout the system. This algorithm is plugged-in on the *installation record*.	
Algorithm	Admin, Algorithm. You can override the system's standard account information string by setting up an algorithm that produces this string of information. This algorithm is plugged-in on the *installation record*.	
Installation	Admin, Installation Options. Many fields on the installation record impact the Customer Environment. Refer to the description of the *Main*, *Person*, and *Account* tabs for more information.	
Automatic Payment (EFT) Environment		
Algorithm	Admin, Algorithm. You will need to set up an algorithm to create automatic payments. This algorithm is plugged-in on the *installation record*.	
Tender Source	Admin, Tender Source Note: Earlier, you created tender sources for the remittance processor and your cash drawers. At this point, you'll need to add at least one tender source for automatic payments. Why? Because automatic payments get linked to a tender control (which, in turn, gets linked to a tender source) when they are interfaced out of the system.	
Algorithm	Admin, Algorithm. You will need to set up the appropriate automatic payment date	

Function	*Menu*	*Auto Setup*
	calculation algorithm to populate the extract, GL interface and payment dates on automatic payments.	
Auto Pay Route Type	Admin, Auto Pay Route Type	
Tender Type	Admin, Tender Type Note: Earlier, you created tender types for things like cash, checks, etc. At this point, you'll need to add a tender type for each type of automatic payments (e.g., direct debt, credit card, etc.).	
Work Calendar	Admin, Work Calendar. You need only set up additional work calendars if the auto pay sources (i.e., the financial institutions) have different working days than does your organization	
Algorithm	Admin, Algorithm. If you need to validate the taxpayer's bank account or credit card number, you will need to set up the appropriate validation algorithms.	
Auto Pay Source Type	Admin, Auto Pay Source Type	
Algorithm	Admin, Algorithm. You may need to set up an algorithm if your taxpayers can define a maximum withdrawal limit on their autopay options.	
Return to Account Type	Admin, Account Type. You should plug-in the Autopay Over Limit Algorithm in each appropriate Account Type.	
Characteristics		
Algorithm	Admin, Algorithm. If you have ad hoc characteristic types, you may need to set up the algorithms that control how they are validated	
Foreign Key Reference	Admin, FK Reference. If you have foreign key characteristic types, you may need to set up foreign key references to control how the user selects the characteristic values (and how the foreign key values are validated).	All base package FK references are automatically populated
Characteristic Type & Values	Admin, Characteristic Type	
Tax Type and Obligation Configuration		
Revenue Calendar	Admin, Revenue Calendar	
Tax Type	Admin, Tax Type	
Algorithm	Admin, Algorithm. You will need to set up the algorithms that determine: • Special processing that should take place when obligations of a given type are created. • Special processing that should take place when a financial transaction is frozen for obligations of a given type.	
Algorithm	Admin, Algorithm. You may want to set up an algorithm that formats the obligation information that is displayed throughout the system. This algorithm is plugged-in on the *installation record*.	
Algorithm	Admin, Algorithm. You may want to set up an algorithm that formats the obligation information that is displayed throughout the system for a specific obligation type. This algorithm is plugged-in on the *Obligation Type*.	

Function	*Menu*	*Auto Setup*
Tax Role Relationship Type	Admin, Tax Role Relationship Type.	
Obligation Type	Admin, Obligation Type	
Overpayment Configuration		
Algorithm	Admin, Algorithm. You will need to define an extract algorithm that formats the data to be sent to a bank for direct deposit requests. These are plugged in on the bank event type.	
Bank Event Type	Admin, Bank Event Type Note, if your implementation supports receiving rejections from the bank that should cause another attempt to refund, you will need a “retry” overpayment process type.	
Algorithm	Admin, Algorithm. You will need to define overpayment validation and refund validation algorithms. These are plugged in on the overpayment process type.	
Overpayment Process Type	Prior to defining your overpayment process types, refer to *Enabling the System to Use Standard Overpayment Process* for information about data that needs to be defined for a typical overpayment process type. Admin, Overpayment Process Type. If you have defined a “retry” overpayment process type, return to bank event to configure this value.	
Refund Control Type	Admin, Refund Control Type	
Wrap Up		
Algorithm	Admin, Algorithm. You will need to set up the algorithms that determine: • Special alerts on the dashboard (assuming you have special alerts)	
Installation Options	Admin, Installation Options - Framework and Admin, Installation Options. At this point, it's a good idea to double-check everything on the installation record.	
Postal Default	Admin, Postal Code Default	

If you have cash drawers you will also need to set up the following information:

- Create a person / account to which you will link your over / under obligation. Refer *How To Get An Unbalanced Tender Control In Balance (Fixing Over/Under)* for more information.
- Create an obligation to which your over/under payments will be linked. This obligation will reference your over / under obligation type. Refer to *Over / Under Cash Drawer Obligations* for more information.

Cross Reference To The Remaining Chapters

The table in the previous section describes the order in which you should enter your control tables. These tables are described at length in the following chapters.

- Refer to *Defining General Options Addendum* and *Defining General Framework Options* for a discussion of the control tables associated with general functionality (e.g., country codes, state codes, etc.).
- Refer to *Defining Financial Transaction Options* for a discussion of the tables affecting your financial transactions (e.g., adjustment types, payment segment types, etc.).

- Refer to *Defining Taxpayer Options* for a discussion of the control tables affecting persons, accounts, tax roles and obligations.
- Refer to *Configuring Obligation Types* for a discussion of the control tables affecting your obligation types.
- Forms processing tables and form rules need to be set up for processing registration forms, tax forms and form upload staging tables. Refer to *Defining Forms Processing Options* and *Defining Form Rules* for more information.
- Penalty and interest related configuration tables need to be set up for penalty and interest calculations. Refer to *Setting Up Penalty and Interest Options* for a description of tables that must be set up to enable this functionality.
- Refer to *Setting Up Asset Options* for a description of tables that must be set up to enable asset and valuation functionality.
- Refer to *Defining Calculation Engine Options* for a description of tables that must be set up to enable calculation engine functionality.
- Refer to *Configuring Bills* for a description of tables that must be set up to enable billing functionality.
- Overdue processing tables need to be set up for collection activity. Refer to *Overdue Processing - Setup Tasks* for a description of tables that must be set up to enable this functionality.
- Refer to *Setting Up Bankruptcy Options* for a list of objects to be defined for bankruptcy handling.
- Refer to *Setting Up Audit Case Options* for a list of objects to be defined for audit cases.
- Refer to *Setting Up Appeal Options* for a list of objects to be defined for appeals.
- Refer to *Setting Up Review Options* for a list of objects to be defined for reviews.
- Refer to *Setting Up Suppression Options* for a list of objects to be defined for suppression handling.
- Refer to *Defining Background Process* for a discussion of the control tables affecting your background processes.
- Refer to *Defining Algorithms* for a discussion of the control tables affecting the algorithms referenced on many control tables.
- Most zones are delivered with the base-package and do not require any configuration. However, some zones are only available if configured by your implementation. Refer to *Configuring Zones* for more information.
- Refer to *Setting Up To Do Options* for more information on how to configure the system to match your organization's To Do management needs.
- If your organization plans to use process flows for business functionality not supported in the base product, refer to *Setting Up Process Flows* for more information on setting up the system to use process flow.
- Open-item accounting tables need only be set up if your organization practices *Open Item Accounting*. Refer to *Setting Up The System To Enable Open Item Accounting* for a description of the tables that must be set up to enable this functionality.
- If your implementation finds that it needs to set up rates for certain calculations, refer to *Rates* for a discussion of the control tables affecting your rates.

Defining General Options Addendum

This section describes control tables that are used throughout the product.

Defining Installation Options

The topics in this section describe the various installation options that control various aspects of the system that are specific to the Oracle Public Sector Revenue Management product.

FASTPATH:

Refer to *Installation Options - Framework* for options that are common to products on the same framework.

Installation Options - Main

Select **Admin** > **Installation Options** and use the **Main** tab to define system-wide installation options.

Description of Page

Use **Quick Add Tender Type** to define the tender type defaulted on payments added using the *Payment Quick Add* transaction.

Use **Starting Balance Tender Type** to define the tender type of the starting balance recorded on your tender controls (this will almost always be the tender type associated with "cash"). This value is used during tender control balancing as a separate balance is required for each tender type in order to balance a tender control. Refer to *The Lifecycle Of A Tender Control* for more information.

FASTPATH:
For more information, refer to *Setting Up Tender Types*.

Location Geo Type in only visible if the address feature configuration is set to *Legacy*. It is used to indicate whether at least one geographic identifier (e.g., GPS coordinate) is **Required** or **Optional** on a location. Refer to *Defining Geographic Types* for more information.

The **Alternate Representation** flag should be set to **None** unless your organization uses multiple character sets for a person's main name and / or a location's address. Alternate representations are typically only used in countries where multiple character sets are used. For example,

- In Hong Kong, a person's name may be written in both Chinese characters and in English.
- In Japan, a person's name may be written in both Kanji and Katakana.

In both of the above situations, users need to be able to use both representations to find a taxpayer or a location.

If your organization uses alternate representations of person name or address, set this flag to one of the following values:

- Use a value of **Name** if you only use alternate representations for a person's primary names.
- Use a value of **Address** if you only use alternate representations for location addresses. This option is only available if the *address support* feature configuration is set to Legacy.
- Use a value of **Name & Address** if you use alternate representations for both location addresses and person names. This option is only available if the *address support* feature configuration is set to Legacy.

The following points describe the ramifications of this flag in the system:

- If you support alternate representations of a person's primary name,
  - The name grid on *Person - Main* allows you to specify an **Alternate** name for the person.
  - If you use the base package *name formatting algorithm*, a person's name will be shown throughout most of the system in the format AAA (BBB), where AAA is the person's primary name and BBB is the person's alternate name. Note, this format does not apply to names that appear in search results (i.e., the alternate name is not concatenated to the main name in search results; however you can search for information using the alternate name).
  - Most of the system's person name-oriented searches will allow users to use both a person's primary and alternate names to search for information.
- If you support alternate representations of a location's address,
  - A tab is available on the *Location* page that allows a user to define an alternate address for a location.

- If you use the base package *location formatting algorithm*, a location's address will be shown throughout most of the system in the format AAA (BBB), where AAA is the location's primary address and BBB is the location's alternate address.
- Most of the system's location-oriented searches will allow users to use both a location's primary and alternate addresses to search for information.

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 this field's 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. Refer to *Caching Overview***for information** on how to clear the system login cache (this is the cache in which installation options are stored).

Installation Options - Person

Select **Admin** > **Installation Options** and use the **Person** tab to define person-specific installation options.

Description of Page

Use the **Person ID Usage** to indicate whether or not at least one form of identification is **Required** or **Optional** when a new person is added.

Each form of identification has an identifier type. For persons that are humans (as defined by the *person type's* person/business identifier), the *Person* page defaults the identifier type defined in **Identifier Type (Person)**. For persons that are businesses (as defined by the *person type's* person/business identifier), the Person page defaults the identifier type defined in **Identifier Type (Business)**.

Installation Options - Account

Select **Admin** > **Installation Options** and use the **Account** tab to define account-specific installation options.

Description of Page

When a new account is added on the *Account* page, the system requires it to have an account type. If the main taxpayer linked to the account is a human (as defined by the taxpayer's person type), the system defaults the account type defined in **Account Type (Person)**. For persons that are businesses (as defined by the person type), the system defaults the account type defined in **Account Type (Business)**. For more information, refer to *Setting Up Account Types*.

In addition to requiring an account type when a new taxpayer is added, the system also requires a "main taxpayer" (i.e., a reference to a person who is identified as the main taxpayer for the account). Enter the default **Account Relationship Type** code to be used to define the main taxpayer relationship. For more information, refer to *Setting Up Account Relationship Codes*.

Enter the default **Bill Route Type** to be used to define how classic bills should be routed to a taxpayer. For more information, refer to *Setting Up Bill Route Types*.

NOTE: The bill route type field is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module. This information is used only for classic billing functionality.

Installation Options - Billing

Select **Admin** > **Installation Options** and use the **Billing** tab to define classic billing-specific installation options.

NOTE: Optional information. This tab is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module. The information is used only for classic billing functionality.

Description of Page

The **Bill Segment Freeze Option** controls when an obligation's balance and the general ledger are affected by classic bill segments and certain types of adjustments. Refer to *Preventing Obligation Balances And The GL From Being Impacted Until Bill Completion* to understand the significance of this option.

The **Accounting Date Freeze Option** controls how the accounting date defined on financial transactions is populated. Refer to *Forcing The Freeze Date To Be Used As The Accounting Date* to understand the significance of this option.

Define the **Minimum Amount for Final Bill**. If a final bill is less than this amount, the bill is still produced; it's just not printed.

Typically, the system sets a bill's Bill Date equal to the date on which it is completed. If you want to be able to specify a bill's Bill Date when you complete a bill, turn on **User Can Override Bill Date**. You would only want to override the bill date if you are setting up sample bills from historical period whose bill date needs to reflect the respective historical period.

Installation Options - Collections

Select **Admin** > **Installation Options** and use the **Collections** tab to define collections-specific installation options.

Description of Page

Enter what you consider to be an excellent compliance rating in **Beginning Compliance Rating**. Overdue events can cause an account's compliance rating to decrease. When an account's compliance rating falls below a certain level, different overdue processes may ensue.

Use **Compliance Rating Threshold** to define when an account's compliance rating becomes risky. When an account's compliance rating falls beneath the Compliance Rating Threshold, the system will show an alert in the alert zone highlighting such.

Installation Options - Financial Transaction

Select **Admin** > **Installation Options** and use the **Financial Transaction** tab to define financial transaction installation options.

Description of Page

Use **G/L Batch Code** to define the batch process that is used to interface your financial transactions to your general ledger. The process is snapped on FT download records by the GLS background process.

Use **A/P Batch Code** to define the batch process that is used to interface your check requests (initiated with adjustments with an adjustment type that reference an A/P request type) to you accounts payable system.

Use **Fund Accounting** to indicate if *fund accounting* is **Practiced** or **Not Practiced** at your organization. By default, the installation indicates that it is **Not Practiced**.

The **Accounting Date Freeze Option** controls how the accounting date defined on financial transactions is populated. Refer to *Forcing The Freeze Date To Be Used As The Accounting Date* to understand the significance of this option.

NOTE: If your implementation has not *turned off* the **BI — Billing (Classic)** module, the Billing tab will be visible and the accounting date freeze option field will be maintained on that tab.

Installation Options - Algorithms

The following table describes **System Events** that are provided by the product in addition to the ones provided in the framework as described in *Installation Algorithms*.

System Event	*Optional / Required*	*Description*
Account Information	Optional	We use the term "Account information" to describe the basic information that appears throughout the system to describe an account. The data that appears in "account information" may be constructed using an algorithm plugged in here. Refer to *Defining Account Information* for more information on when this algorithm is used. Click *here* to see the algorithm types available for this system event.
Address Information	Optional	This algorithm allows your implementation to define a common format for displaying an address. It receives address constituents and returns a formatted address string. This plug-in spot may be invoked by other algorithms using the business service **C1-FormatAddressInfo**. Click *here* to see the algorithm types available for this system event.
Adjustment Information	Optional	We use the term "Adjustment information" to describe the basic information that appears throughout the system to describe an adjustment. The data that appears in "Adjustment information" may be constructed using an algorithm plugged in here. Refer to *Adjustment Information* for more information on when this algorithm is used. Click *here* to see the algorithm types available for this system event.
Alert	Optional	There are two types of alerts that appear in the *Alert Zone* : 1) hard-coded system alerts and 2) alerts constructed by plug-in algorithms. You cannot change the hard-coded alerts (see the *Alert Zone* for the complete list). However, by plugging in this type of algorithm you can introduce additional alerts. An error displays if more than 60 alerts are generated for an account by plug-in algorithms. Click *here* to see the algorithm types available for this system event.
Automatic Payment Creation	Required if you allow taxpayers to *pay automatically*	This algorithm is executed to create automatic payments whenever the system creates automatic payments. Refer to *How And When Are Automatic Payments Created* for the details. Click *here* to see the algorithm types available for this system event.
Bank Details Determination	Required	This plug-in spot is used for processing bank details for an Account, Tax Role or Obligation. It can be called in any of three modes: • Read - Retrieves the effective bank details.

		• Remove - Resets or end-dates existing bank details that are deemed no longer valid. • Get Master - Finds the related Account ID / Tax Role ID / Obligation ID using supplied bank details. Click *here* to see the algorithm types available for this system event.
Case Information	Optional	We use the term "Case information" to describe the basic information that appears throughout the system to describe a case. The data that appears in "case information" is constructed using this algorithm. Plug an algorithm into this spot to override the system default "Case information". Note: This algorithm may be further overridden by a "Case information" plug-in on the Case Type. Refer to *Case Type* for how algorithms of this type are used. Click *here* to see the algorithm types available for this system event.
Collection Agency Referral Information	Optional	We use the term "Collection Agency Referral information" to describe the basic information that appears throughout the system to describe a collection agency referral. Plug an algorithm into this spot to override the system default "collection agency referral information". Click *here* to see the algorithm types available for this system event.
Compliance Rating "Created By" Information	Required	The data that appears in the compliance rating "created by" information is constructed using this algorithm. Refer to *Account - Collections* for more information about the compliance rating. Click *here* to see the algorithm types available for this system event.
Compliance Rating History Information	Optional	We use the term Compliance Rating History information to describe the basic information that appears throughout the system to describe a *compliance rating history* entry. Plug an algorithm into this spot to override the system default "compliance rating history information". Click *here* to see the algorithm types available for this system event.
Determine Distribution Rule	Required if your implementation uses the distribution rule method to interface payments.	This plug in spot is use to populate the account, distribution rule and value on payment event upload staging records as the first stage of processing. Refer to *Payment Event Upload Processing Overview* for more information on when this algorithm is used. Click *here* to see the algorithm types available for this system event.
Financial Transaction Info	Optional	We use the term "financial transaction information" to describe the basic information that appears throughout the system to describe a financial transaction. The data that appears in "financial transaction info" is constructed using this algorithm. Click *here* to see the algorithm types available for this system event.

Find Address	Optional	This plug-in spot is used to find an address in the centralized address repository based on input address constituents. It receives constituents and an algorithm plugged into this spot is responsible for looking at the Address table to find a unique match and return the ID. Refer to *Centralized Address* for more information . Click *here* to see the algorithm types available for this system event.
Obligation Information	Optional	We use the term "obligation information" to describe the basic information that appears throughout the system to describe an obligation. The data that appears in "obligation information" may be constructed using an algorithm plugged in here. Refer to *Defining Obligation Information* for more information on when this algorithm is used. Click *here* to see the algorithm types available for this system event.
Online Letter Image	Optional	This algorithm constructs a PDF that contains the image of a letter. This algorithm is executed when the Display Letter button is pressed on *Customer Contact - Main*. Refer to *Technical Implementation of Online Letter Image* for more information. Click *here* to see the algorithm types available for this system event.
Payment Amount Calculation	Required	This algorithm is executed to calculate the amount of an automatic payment for an account with an active auto pay option. Refer to *How And When Are Automatic Payments Created* for more information on automatic payments. This algorithm is also executed to default the amount of a manually added payment. Refer to *How To Add A New Payment Event* for more information on adding a payment manually. Click *here* to see the algorithm types available for this system event.
Payment Information	Required	We use the term "payment information" to describe the basic information that appears throughout the system to describe a payment. The data that appears in "payment information" is constructed using this algorithm. Click *here* to see the algorithm types available for this system event.
Person Information	Required	We use the term "person information" to describe the basic information that appears throughout the system to describe a person. The data that appears in "person information" may be constructed using an algorithm plugged in here. Refer to *Person Information* for more information on when this algorithm is used. Click *here* to see the algorithm types available for this system event.
Person Name Validation	Optional	This plug-in spot is only applicable if an implementation has not implemented person name validation via person business objects. The format of names entered on *Person - Main* is validated using this algorithm.

		Click *here* to see the algorithm types available for this system event.

The following table highlights algorithms related to *legacy addresses* or *classic billing*.

System Event	Optional / Required	Description
Bill Information	Required	This plug-in spot is only applicable to implementations supporting the *classic billing* functionality. We use the term "Bill information" to describe the basic information that appears throughout the system to describe a bill. The data that appears in "bill information" may be constructed using an algorithm plugged in here. Click *here* to see the algorithm types available for this system event.
Determine Open Item Bill Amounts	Required if you use overdue functionality to *collect on bills*	This plug-in spot is only applicable to implementations supporting the *classic billing* functionality and open item accounting. This algorithm is responsible for determining the unpaid amount of an open-item bill. It can also be used to return the unpaid amount for a specific Obligation on a bill. Click *here* to see the algorithm types available for this system event.
Location Information	Optional	This plug-in spot is only applicable to implementations supporting the *legacy* address functionality. We use the term "location info" to describe the basic information that appears throughout the system to describe a location. The data that appears in "location info" may be constructed using an algorithm plugged in here. Refer to *Defining Location Information* for more information on when this algorithm is used. Click *here* to see the algorithm types available for this system event.
Online Bill Display	Optional	This plug-in spot is only applicable to implementations supporting the *classic billing* functionality. This algorithm constructs a PDF that contains the image of a bill. This algorithm is executed when the Display Bill button is clicked on the *Classic Bill* page. Refer to *Technical Implementation of Online Bill Image* for more information. Click *here* to see the algorithm types available for this system event.
Override Proration Factors	Optional	This plug-in spot is applicable to rates but is not expected to be a common requirement. It is most likely to be applicable to implementations supporting the *classic billing* functionality. Algorithms for this spot are only used if your organization has unusual rate proration requirements that necessitate the overriding of the base package proration logic. For example, you may have certain rate components whose charges should never be prorated. Refer to *Overriding Proration Factors* for more information. Click *here* to see the algorithm types available for this system event.

Override Seasonal Proration	Optional	This plug-in spot is applicable to rates but is not expected to be a common requirement. It is most likely to be applicable to implementations supporting the *classic billing* functionality. Algorithms for this spot are only used if your organization has unusual method of determining the seasons for your rate components. Refer to the description of the seasonal attributes for a *rate component* for more information. Click *here* to see the algorithm types available for this system event.

Defining Taxpayer Languages

As described under *Defining Languages*, you define the language in which each user sees the system. In addition to defining each user's language, the system allows you to define each person's preferred language. For example, one person can receive correspondence in English whereas another person could receive their correspondence in Chinese.

Each person's language is defined by the *language code* on the *person record*. The language code is passed on to all taxpayer-facing interfaces, such as correspondence.

NOTE: To support correspondence, you must also provide translations of the correspondence text. This must be handled by your printing software vendor.

Defining Accounting Calendars

The accounting calendar determines the accounting period to which a financial transaction will be booked. The following points describe how the system determines a financial transaction's account period:

- Every financial transaction references an accounting date and its obligation
- Every obligation references an obligation type
- Every obligation type references a GL division
- Every GL division references an accounting calendar
- The accounting calendar contains the cross reference between the accounting date specified on the financial transaction and related accounting period in your general ledger

CAUTION: This information must be the same as the information in your financial database.

To add or review an accounting calendar, choose **Admin** > **Accounting Calendar**.

Description of Page

Enter a unique **Calendar ID** and **Description** for the calendar.

Enter the **Number Of Periods** for the calendar. Don't count the adjustment period, if you use one, or any special "system" periods.

Specify the **Fiscal Year**, each **Accounting Period** in that year, a **Period Description**, the **Begin Date** and the **End Date**.

When you enter begin and end dates, you can define monthly calendar periods or any fiscal period that matches your accounting calendar (weekly, bimonthly) as long as the begin and end dates of successive periods do not overlap.

For each fiscal period, enter the **Open From Date** and **Open To Date**. These dates define when that particular business dates are open for posting financial transactions to that fiscal period. For example, you might create a financial transaction

on Sept 1 for taxes reported on August 31. To post this financial transaction in the August period, you must keep it open through Sept 1.

As time passes, you will need to return to this transaction to manually enter ensuing years. You can enter several years at a time or incorporate the task into end-of-year system maintenance.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_CAL_GL*

Defining General Ledger Divisions

There are two types of divisions referenced in the system: a division and a GL division.

- General Ledger divisions typically comprise individual entities (e.g., companies) in your general ledger. You must set up a GL division for each such entity. The GL division's sole purpose in the system is to define the accounting period associated with financial transactions linked to obligations associated with the GL division (obligations are associated with GL divisions via their obligation type). The system cares about accounting periods in order to prevent a user from booking moneys to closed periods. It also uses accounting periods when it produces the flat file that contains the consolidated journal entry that is interfaced to your general ledger (refer to *The GL Interface* for more information).

  NOTE: When determining how many GL Divisions you need, be sure to consider your general ledger and how your chart-of-accounts is structured. You will typically have one GL division for each "company" in your general ledger.

- A division is typically associated with a jurisdiction. The definition of a jurisdiction is a geographic-oriented entity with unique business rules. You must set up a division for each jurisdiction in which you conduct business.

  FASTPATH: Refer to *Setting Up Divisions* for information about divisions.

To define a general ledger division, select choose **Admin** > **General Ledger Division**.

Description of Page

Enter a unique **GL Division** for the general ledger division.

Enter a **Description** of this general ledger division.

Define the accounting **Calendar ID** that controls how to convert an FT's accounting date into an accounting period. Refer to *Defining Accounting Calendars* for more information.

You may define a **Currency Code** for the GL division. Note that the system does not use this currency code.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_GL_DIVISION*.

Defining Banks & Bank Accounts

The topics in this section describe how to maintain your implementation's bank accounts.

Bank - Main

To add or review Banks choose **Admin** > **Bank**.

Description of Page

Enter a unique **Bank Code** and **Description** for the bank.

The **Bank Accounts** collection displays the bank accounts currently linked to this bank code. Use the drill down button to view more details or to modify the bank account details. Alternatively, you may navigate to the Bank Account tab and scroll to the desired bank account.

Bank - Bank Account

To add or review Bank Accounts for a Bank, choose **Admin, Bank** and then navigate to the **Bank Account** tab.

Description of Page

Use the **Bank Accounts** tab to define the attributes of each bank account. For each account, enter the following information:

- Enter a **Bank Account Key** to identify an Account at a Bank. You may have more than one account at a given bank, and you may have accounts at more than one bank. This code will allow the system to easily identify a specific account.
- Enter a **Description** to appear on prompt lists, inquiries, and reports.
- Enter the **Account Number**, **Check Digit** and if needed, the **Branch ID** of the bank where the account is held.
- Enter the **Currency Code** for the currency in which the account is denominated.
- Use **DFI ID** to define the Depository Financial Institution ID that is interfaced to the automatic payment-processing agent as part of the automatic payment interface.
- Enter the **Distribution Code** to be used for cash GL distributions when a payment is frozen or canceled.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_BANK_ACCOUNT*.

To Do Lists Addendum

This section is an addendum to the general *To Do Lists* chapter. This addendum describes the To Do functionality that is specific to Oracle Public Sector Revenue Management.

Assigning A To Do Role

As described in *To Do Entries Reference A Role*, each To Do entry requires a role. To Do entries created in Oracle Public Sector Revenue Management may attempt to assign a role based on an account management group or division if it is applicable to the type of data related to the To Do entry.

As described in *The Big Picture of To Do Lists*, users are informed that something requires their attention by entries that appear in a To Do List. For example, consider what happens when a form suspends:

- Form processing moves the form to suspended and stores an exception record.
- This in turn, triggers the creation of a To Do entry.
- The To Do entry is assigned a role. A role is one or more users who can look at / work on the entry.
- When users view a To Do List, they only see entries addressed to roles to which they belong.

You can optionally use account management groups (AMG) to define the respective role to be assigned to the To Do entries that are associated with an account and To Do type. For example, you can create an AMG called **Credit Risks** and assign this to accounts with suspect credit. Then, whenever an account-oriented To Do entry is created for such an account,

it will be assigned a role based on the **Credit Risks** AMG. Refer to *Setting Up Account Management Groups* for more information.

By assigning an AMG to an account, you are telling the system to address this account's To Do list entries to the roles defined on the AMG (note, each To Do type can have a different role defined for it on an AMG).

You can optionally use division to define the respective role to be assigned to the To Do entries that are associated with an account and To Do type. Refer to *Setting Up Divisions* for more information.

A **To Do Pre-Creation** installation options plug-in is provided to determine the appropriate To Do Role for an account based on AMG and division setup. If plugged in, the logic to determine To Do role for an account is performed whenever a To Do entry is created. Refer to *C1-TDCR-DFRL* for further details on how this plug-in works.

FASTPATH: Refer to *To Do Entries Reference A Role* for the details of how an initial role is assigned to the To Do entries.

System To Do Types

NOTE: List of available To Do types. The To Do types available with the product may be viewed in the *application viewer'sTo Do type* viewer. In addition if your implementation adds To Do types, you may *regenerate* the application viewer to see your additions reflected there.

Configuring Zones

Most zones in the product do not require configuration by your implementation team. There are however a limited number of zones that require configuration before they can be used because their behavior is dynamic. The topics in this section provide some information about zones that require configuration.

FASTPATH: Refer to *The Big Picture of Portals and Zones* for a description of portal and zone functionality.

Configuring Timeline Zones

A timeline zone contains one or more "lines" where each line shows when significant events have occurred. For example, you can set up a timeline zone that has two lines: one that shows when payments have been received from a taxpayer, and another that shows when forms have been posted for the taxpayer.

FASTPATH: For a complete description of the numerous features available on a timeline zone, refer to *Timeline Zone*.

The following points describe how to set up a timeline zone:

- Determine which portal you wish the zone to appear on. For example, you may configure the zone to appear on *360 Degree View - Account*, *360 Degree View - Tax Role* or for implementations still using Control Central, the *Control Central Account* tab.
- Set up an *algorithm* for each line in the zone. These algorithms will reference an algorithm type that is plugged into the **Zone - Timeline Line** plug-in spot. Note that the base product supplies pre-configured algorithms for many of the timeline zone algorithm types that may be used if the configuration is acceptable. Click *here* to see the algorithm types available for this plug-in spot along with any pre-configured algorithms supplied with the product. Please note the following about the parameter values defined on these algorithms:
  - Most timeline algorithms are designed to display information about the account in context. However, three are several that are designed to display information for an account or for a specific tax role in context (for use on the 360 Degree View - Tax Role tab). If the algorithm includes a Restrict by Entity flag, indicate the appropriate value to control the data that should be shown.

- Each timeline algorithm allows you to define the appropriate foreign key reference that controls the "info string" that appears as well as the navigation option. The object's info string appears in the zone's info area. When a user clicks on an "info string", they are transferred to an appropriate page (typically the one used to maintain the object).
- You can set up a timeline algorithm to show *BPA scripts* when a user clicks on an event on a timeline. For example, if you click on a payment event, BPA script descriptions can appear in the info area. When a user clicks on one of these descriptions, the script will execute and guide them through a respective business process (e.g., transfer a payment). You define the scripts in each timeline algorithm's parameters.

  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.

  The script can use this page data model field to navigate to the pertinent pages. For example, if you were setting up a script to transfer a payment, the first line of the script would reference a navigation option to transfer the user to the payment page where they can initiate the transfer. This navigation option will contain context fields that matched the names of the fields in the page data model (this is how field values are passed to pages).
- You can control every color and icon shown on a timeline by specifying the appropriate color codes on the zone's parameters.

- Set up one or more *zones* that reference these algorithms. The zones should reference the **F1-TIMELINE** zone type.
- Configure the zone's visibility parameter to define an appropriate visibility script so that the zone only displays when the relevant data is in context:
  - For account oriented zones, configure the following: ss='F1-ShldShwZn' input=[id=ACCT_ID] output=shouldShowZone
  - For tax role oriented zones, configure the following: ss='F1-ShldShwZn' input=[id=TAX_ROLE_ID] output=shouldShowZone
- Update your users' *portal preferences* and *security rights* so they can see the zone in the desired location on the portal(s).

You can set up many timeline zones. For example,

- You might want different zones to appear on a portal depending on the type of user. For example, you might want one timeline for collection clerks, and a different one for customer service representatives.
- For aesthetic reasons, you might want multiple simple timeline zones to appear on a given portal rather than one complex timeline zone. Each separate zone includes its own date range controls.

Miscellaneous Topics

The following sections describe miscellaneous system wide topics.

Advanced Search Options

The product offers an option to perform fuzzy searching in the *360 Degree Search* by Person Name and in the Determine Taxpayer Existence form rule's apply rule algorithm (*C1-FR-CHTXEX*). The option is only available if your implementation has appropriately configured your database for fuzzy searching.

Refer to the DBA guide in the installation 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.

If your implementation has configured its database to enable fuzzy searching, you must also set up a *Feature Configuration* to indicate that feature is supported. 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 **Fuzzy Searching Enabled** and define a value of **Y**.

Control Table Status

Some of the product's control tables or configuration tables include a status.

In most cases, the status is simply Active / Inactive. The purpose of the status is for an implementation to be able to mark a record as no longer in use (Inactive) and prevent end users from using that control record when attempting to create a master or transaction record governed by the record.

- The status is only used on "type" records that a user may have to choose from when creating a new master or transaction record. The add dialogues that prompt for the "type" will only show types that are Active. For example, when adding a new Appeal record, Appeal Types that are inactive are not included in the dropdown list.
- Typically the product does not include server validation to prevent a master / transaction record from being added if the "type" record is inactive. This is only an issue when a record is not created by an online user, but rather when a record is created via an algorithm and the "type" is provided as configuration somewhere. For example, if a form rule creates an overpayment process as part of posting a form, the overpayment validation does not check that the overpayment process type is active. The expectation is that if an implementation has decided to make a record inactive, the onus is on the administrative users to checks other configuration that may reference that "type" to change the value. In this case, the admin users should update the form rule to an appropriate overpayment process type.
- A status will not typically be found on a configuration object that is implemented via configuration on other objects. For example, when defining an Asset Type, the valid Asset External ID types must be defined on the Asset Type. Asset External ID Type does not have a status because if an implementation determines that a given Asset External ID Type should no longer be used, it will simply not configure any Asset Types to refer to that external id type.
- Not all "type" objects have a status. This is a pattern that was established with the introduction of business object driven maintenance objects and user interface. Some older objects that were introduced earlier do not follow this pattern.
- Some "type" objects use a BO lifecycle to implement the Active / Inactive states. This was a pattern followed when the business object driven maintenance objects was first introduced. In subsequent releases the current standard of a simple Active / Inactive lookup based status was introduced.

There are some cases where an administrative object may have a more sophisticated lifecycle, for example, the form type status. This occurs when the administrative object itself has some business rules that are driven by a lifecycle, for example when child records need to be finalized and cross-validated before the "type" object may be used for master / transaction records.

Defining Converted COBOL Program Options

The topics in this section describe the transaction that allows you to define the metadata for converted COBOL programs within the current environment's database.

CAUTION: Updating converted COBOL Programs 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.

Converted COBOL Program - Main

NOTE: Not available for all products. This page is only available for products that support COBOL.

Use this transaction to define COBOL program user exits for your system. Navigate to this page using **Admin** > **Converted COBOL Program**.

Description of Page

The following describes fields that are relevant to defining the user exit code that a COBOL Program should use:

Program Component ID represents the internal ID that is given to the COBOL program component.

Prog Com Name is the physical name of the COBOL program component.

Short Comments provides a short description of the COBOL program component.

Template is the template used to generate the COBOL program component.

Specify **User Exit Program** if you have written user exit code for this COBOL program component.

Defining Financial Transaction Options

This topics in this section explain the financial design of the system and describe how to set up the tables that control the financial impact of these transactions.

The Financial Big Picture

This section provides an overview of the relationship between an account and the various financial transactions that influence how much a taxpayer owes.

NOTE:
In the following sections, the term ‘bill’ is a reference to bills created using calculation rule based functionality. Topics related to rate-based bill functionality can be found under the heading of ‘Classic Bills’.

Assessments Overview

An assessment is a tax liability financial transaction associated with an obligation and represents the legal presentation of a tax liability to a taxpayer. There are different types of assessments, based on how and why the liability was created, and the assessment type can apply differentiated processing rules, such as different penalty and interest calculation rules or different collections rules.

Most revenue or filing periods only have one assessment created that captures any applicable penalty, interest, or fees. However, it is possible for additional assessments to be created within a revenue period.

Return and bill based tax types differ in how assessments get created and processed. The following sections discuss these concepts.

Return Based Taxes

Return based taxes are either expected or event based. Return based taxes represent taxpayers that have an expected obligation to file a Return for a filing period. Return based taxes can also be based on events such as taxpayers filing an excise tax. Income tax, withholding tax, and sales tax are examples of return based taxes.

For expected return-based tax types, the obligation is associated with a filing period as it tracks whether a filing obligation has been met for that period, and groups the assessments and financial transactions related to it. For most tax types, a filing period may be associated with a single type of obligation. For example, an active monthly Sales Tax filer has a single obligation for each month of the year. However, some tax types may require multiple filing obligations (of different types) over the same period of time. For example, a Withholding Tax type may have monthly Withholding Tax Returns as one obligation type, plus an annual Reconciliation Return and an Annual Taxpayer Withholding Detail statement as other obligation types.

Most return-based tax liability is created through the original self-assessment reported by a taxpayer on their tax return. There are two common models for self-assessment:

- Full Self-Assessment. This is common in the US. In full self-assessment, a taxpayer reports their income details on their tax return, calculates their tax per the tax return instructions, and files (and pays or expects a refund) by the due date of the filing period. If the tax return has errors or is changed during processing, the taxpayer receives an adjustment notice, but never receives an assessment notice.
- Partial Self-Assessment. This is common in taxes modeled after the British tax system. Like full self-assessment, the taxpayer reports their income tax details on a tax return. However, the tax return does not include instructions for calculating tax. When the tax return is processed, a Notice of Assessment is generated and sent to the taxpayer. The Notice of Assessment is a legal document informing the taxpayer of their tax obligation, and the due date for paying it.

The assessment established by the taxpayer's initial tax return is called the original assessment. If the taxpayer is later audited, and their income is increased (such that they now owe more tax), the additional tax established by the audit is part of an audit assessment. The incremental tax from the audit will be subject to different business rules, such as different rates and rules for calculating penalty and interest, and different collections notices or processes. It is also possible for a change to a tax return to result in a decrease in tax (and therefore a refund).

Bill Based Taxes

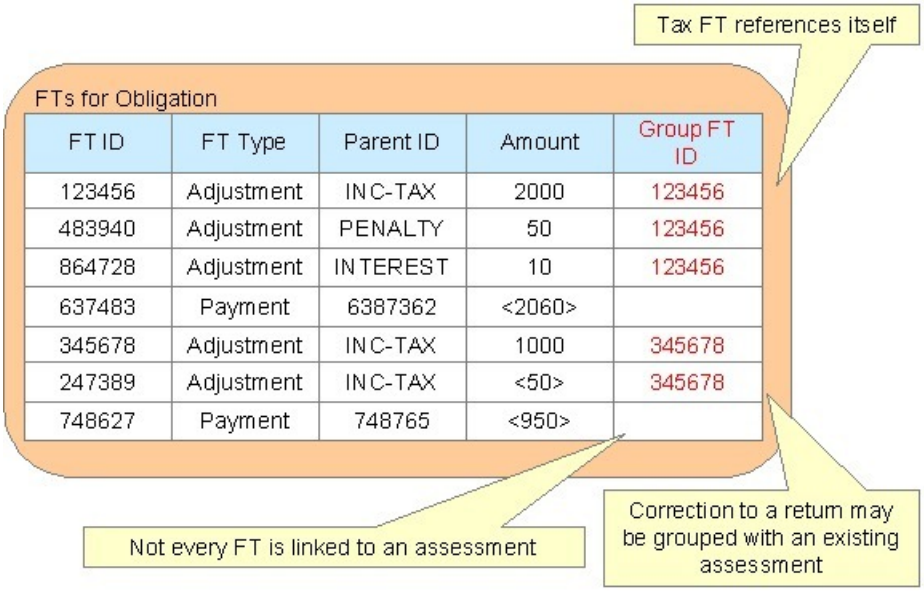
Bill based taxes are billed on a predefined schedule. Property tax, periodic licensing fees, and vehicle taxes are examples of bill-based taxes.

For bill-based taxes, the system has all of the necessary information to initiate assessments. The system creates assessments on a schedule. One or more assessments may exist for each billing period, depending on whether the bill is payable in installments and the applicable business rules for applying penalty and interest. If a taxpayer disputes a bill, the bill is cancelled and rebilled without creating incremental assessments.

Group Financial Transactions

As financial transactions are created for an obligation, often they are related to a specific liability such as an assessment, which is also a financial transaction (associated with an adjustment or a bill segment). For example, a payment may be made for a specific assessment. Penalties, interest and fees are often levied toward a specific assessment. Associating these subsequent financial transactions with the appropriate assessment FT ensures accurate penalty and interest calculations and accurate views of the balance of each assessment associated with an obligation.

The system provides a means for your implementation to group financial transactions (via the Group FT ID). When creating a financial transaction that should be associated with a given assessment, set the group FT id to the FT Id of the assessment. The following example shows the usage of the Group FT Id field.



FT ID	FT Type	Parent ID	Amount	Group FT ID
123456	Adjustment	INC-TAX	2000	123456
483940	Adjustment	PENALTY	50	123456
864728	Adjustment	INTEREST	10	123456
637483	Payment	6387362	<2060>	
345678	Adjustment	INC-TAX	1000	345678
247389	Adjustment	INC-TAX	<50>	345678
748627	Payment	748765	<950>	

The original assessment FT (sometimes referred to as the "header FT") references its own FT id in the Group FT field. This allows system functionality to easily identify the assessment financial transaction.

Bills, Payments & Adjustments

The system maintains debt on each individual obligation for an account. An account's debt is the sum of its obligations' debt. The following points are high level descriptions of the various financial transaction supported

Adjustment Details

Adjustments are used for many different financial effects on a obligation, including tax assessments, penalties, interest, and fees. The following points highlight important concepts related to adjustments

- Over time, an obligation may have many adjustments.
- An adjustment has a related financial transaction. The financial transaction contains the financial effects of the adjustment on the obligation's debt and on the general ledger.
- Canceling an adjustment cancels the financial transaction. If the adjustment is eventually canceled, another financial transaction will be linked to the adjustment to reverse its financial effect.

Payment Details

Over time, many payments may be applied to an account's debt. The following points highlight important concepts related to payments:

- A payment amount is ultimately directed towards an obligation via a payment segment.
- If an account has multiple obligations that are in debt, the various payment segments created for the obligations may be grouped into a single Payment for the account.
- A payment segment has a related financial transaction. A financial transaction contains the financial effects of the segment on the obligation's balances and on the general ledger.
- Canceling a payment cancels the financial transaction. If the payment is eventually cancelled, another financial transaction will be linked to the related payment segment(s) to reverse their financial effect.

Bill Details

For bill based taxes, many bills are produced for an account over time. The following points highlight important concepts related to bills:

- Bills are produced for an account for its bill-based obligations. Over time, many bills may be produced for an account.
- A bill is created to levy charges for a single bill-based tax role and obligation.
- Bills contain value details. Bill value details contain information about the values on which a bill's charges are based, such as asset valuation details.
- Bills contain calculation details. A bill calculation line contains information showing how the line was calculated and how it should be printed on the taxpayer's bill.
- Bills contain bill segments. A bill segment has a related financial transaction. A financial transaction contains the financial effects of the bill segment on the obligation's balance and on the general ledger.
- Canceling a bill cancels its financial transactions. When a bill is cancelled, other financial transactions will be linked to the bill for each bill segment to reverse the original financial transaction.

Effective Date

Financial transactions are assigned an effective date. This is the date that the debit or credit amount affects the obligation's balance and is important for penalty and interest calculations. The following are some examples of how the effective date is set:

- An assessment's effective date is typically the due date of the assessment. This is the date at which this amount impacts the obligation's balance with respect to penalty and interest calculations. If the taxpayer files a form earlier than the due date of the form, the form's due date is still used for the assessment's effective date because if the taxpayer does not pay, penalty and interest should only start from the due date, not the date the form was posted. The same is true for forms that are filed after the due date. The penalty and interest should calculate from the due date, therefore the assessment's effective date should be set to the due date.
- Penalty and interest transactions are assigned an appropriate effective date based on period of time that the penalty or interest charge covers. For charges that accrue after the period passes (such as interest charges), the effective date should be set to the end date of the covered period. For charges that accrue ahead of the period (such as charges that are "per month or any part thereof"), the effective date should be set to the start date of the covered period.
- A payment's effective date is typically the date the payment was considered received.

FASTPATH: For more information about effective dates and payment dates, see *Payment Date and Effective Date for Payment Events*.

The system requires an effective date by default. However, it is possible to use a feature configuration setting to allow effective date to be optional for new debit adjustments. In this case the FT's "new charge" switch must be checked. This functionality assumes that a separate process is able to determine the proper effective date based on other information and can update the financial transaction at that time to populate the effective date properly. For example, if there is a miscellaneous charge that should only be considered effective after the taxpayer is informed of the charge, the adjustment can be created as a "new charge" with no effective date. The process that produces the correspondence to the taxpayer to inform them of the charge is responsible for updating the FT to set the effective date (and reset the "new charge" switch).

CAUTION: The base product's penalty and interest calculation logic will ignore any financial transactions that do not reference an effective date. It means that the amount will not factor into any calculation basis amount.

FASTPATH: Refer to *Configuring Effective Date as Optional* for configuration steps.

Penalty and Interest

Calculating penalty and interest (P&I) for delinquent assessments is an important element of a tax authority's business.

FASTPATH:
Refer to *The Big Picture of Penalty and Interest* for details about this functionality.

Current Amount versus Payoff Amount

A financial transaction contains two amount attributes: payoff amount and current amount. These attributes allow you to keep track separately of amounts related to how much the taxpayer owes.

- Current amount contains how much the taxpayer is asked to pay. In other words, this is the amount that affects the taxpayer's balance. It is what the taxpayer owes with respect to collections and is the amount that penalty and interest is calculated on.
- Payoff amount contains how much the taxpayer actually owes. This is the amount posted to the general ledger.

For most financial transactions, these values are the same. There are a small number of cases where this amount may be different. One example is a charitable contribution. If a taxpayer makes a charitable contribution when paying their tax liability, the payment or adjustment associated with the contribution credit should affect the payoff amount and the general ledger (because this amount is actually cash in hand). However, it should not affect the current amount because the contribution is not paying off any debt incurred and should not cause the taxpayer's balance to go into credit.

The topics in this section provide more information about these two fields.

What Controls What Gets Booked To Current And Payoff Amount?

As described in *Payment Details*, every payment segment has a sibling financial transaction. The financial transaction defines the payment segment's affect on current and payoff amounts due. The system populates these two fields as per the Financial Transaction Algorithm defined on the payment segment's payment segment type.

FASTPATH:
For more information, refer to *Payment - Current Balance versus Payoff Balance* and *Setting Up Payment Segment Types*.

As described in *Adjustment Details*, every adjustment has a sibling financial transaction. The financial transaction defines the adjustment's affect on current and payoff amounts due. The system populates these two fields as per the Financial Transaction Algorithm defined on the adjustment's adjustment type.

FASTPATH:
For more information, refer to *Adjustments - Current Balance versus Payoff Balance* and *Setting Up Adjustment Types*.

The following information applies only to Classic Bills. As described in *Classic Bill Details*, every bill segment has a sibling financial transaction. The financial transaction defines the bill segment's affect on current and payoff amounts due. The system populates these two fields as per the Financial Transaction Algorithm defined on the bill segment's bill segment type.

FASTPATH:
For more information, refer to *Billing - Current Balance versus Payoff Balance* and *Defining Bill Segment Types*.

GL Accounting Information

Be aware that if payoff amount is non-zero, the financial transaction has general ledger detail lines.

The effect on your GL is controlled by the financial transaction algorithm defined on your bill segment and payment segment types.

FASTPATH:
Refer to *The GL Interface* for how GL account information is interfaced to the general ledger.

Preventing Obligation Balances And The GL From Being Impacted Until Bill Completion

NOTE:
This topic relates to Classic Billing. The concepts described below apply only if your implementation uses classic billing. The business rules relating to financial transactions for rules based bills are governed by the algorithms configured on the bill type.

It's important to understand that when any type of financial transaction is **frozen**, the related obligation's balance is affected. For example:

- When a payment is **frozen**, the taxpayer's balance is reduced.
- When an adjustment is **frozen**, the taxpayer's balance is impacted.
- When a bill segment is **frozen**, the taxpayer's balance is increased (typically).

For payments, there is no issue. However, for bill based tax types, you may not want the taxpayer's balance to be impacted until the bill is completed. Consider the following:

- If a taxpayer has multiple obligations that should be presented on the same bill, it's possible for one of the obligations to have a bill segment that's in **error** and the other obligation's bill segment to be **frozen**.
- The **frozen** bill segment will impact the taxpayer's balance and the general ledger. This is because a financial transaction is marked for *interface* to the general ledger when it is frozen. This can be problematic if you have a long period between FT freeze and bill completion (you could impact the general ledger but not impact the taxpayer's balance).

If this is unacceptable, you can setup the system to not allow certain types of FT's to be frozen until the bill is completed. This means that neither the taxpayer's balance nor the general ledger will be impacted until bill completion time. To do this:

- Choose the **Freeze At Bill Completion** option on *Installation Options - Billing*.
- Determine if any of your *adjustment types* are ones that would be included on a bill-based tax bill. Select **Freeze At Bill Completion** for those that should not impact the taxpayer's balance or the general ledger until the next bill is completed. Select **Freeze At Will** for those that should impact the taxpayer's balance and the GL when they are frozen.

Please be aware of the following in respect of the **Freeze At Bill Completion** options:

- If you turn on **Freeze At Bill Completion** on *Installation Options - Billing*:
  - Users will not be allowed to freeze bill segments online.
  - Any background process created for batch billing should not freeze bill segments until all segments on a bill are error free.
  - Bill segments will exist in the **freezable** state until the bill is **completed**.
- If you turn on **Freeze At Bill Completion** for an adjustment type:

- Users will not be allowed to freeze adjustments of this type online.
- Background processes that create adjustments will not freeze this type of adjustment. Rather, the adjustments will be frozen when the next bill is completed.
- Adjustments of this type will therefore exist in the **freezable** state until the next bill is **completed**.

NOTE:
Alerts highlight freezable FT's. Please be aware that messages appear in the *Financial Information Zone* to highlight the existence of freezable financial transactions.

Please be aware of the following in respect of the **Freeze At Will** options:

- If you turn on **Freeze At Will** on *Installation Options - Billing*:
  - Users will be allowed to freeze bill segments online.
  - Any background process created for batch billing should freeze bill segments when the individual segment is error-free.
  - Bill segments will exist in the **frozen** state regardless of whether the bill is completed.
  - The **frozen** bill segment's FT will be interfaced to the GL when the interface next runs.
  - All adjustment types must also be set to **Freeze At Will** (otherwise they wouldn't get frozen).
- If you turn on **Freeze At Will** for an adjustment type:
  - Users will be allowed to freeze adjustments of this type online.
  - Background processes that create adjustments will freeze this type of adjustment.
  - Adjustments of this type will exist in the **frozen** state prior to bill completion.
  - The **frozen** adjustment's FT will be interfaced to the GL when the interface next runs.

Forcing The Freeze Date To Be Used As The Accounting Date

Every financial transaction references an accounting date. The accounting date controls the accounting period to which the financial transaction is booked as described below:

- Every financial transaction references an accounting date and an obligation
- Every obligation references an obligation type
- Every obligation type references a GL division
- Every GL division references an *accounting calendar*
- The accounting calendar contains the cross reference between the accounting date specified on the financial transaction and the related accounting period in your general ledger

The accounting date is populated on financial transactions when they are initially generated. The following points describe the source of the accounting date:

- The user who creates or cancels a bill segment online defines the accounting date as part of the generation / cancel dialog (note, the current date defaults).
- The user who creates or cancels an adjustment online defines the accounting date as part of the generation / cancel dialog (note, the current date defaults).
- Payments are unusual in that their financial transaction is only created when they are frozen (rather than when the payment is first distributed amongst the account's obligations). At payment freeze time, the accounting date is set to the current date.

For payments, there is no issue because the accounting date is only populated on the financial transaction when a payment is frozen. However, for bill segments and adjustments, your business practice may dictate that the freeze date should be used as the accounting date rather than the original accounting date. Alternatively, your business practice may dictate that the accounting date that's originally stamped on bill segments / adjustments should be used (unless this associated period is closed at freeze time). It's really a question of the interpretation of the local accounting rules. After you've decided on your approach, populate the **Accounting Date Freeze Option** on *Installation Options - Billing* with one of the following values:

- Choose **Always change** if the accounting date on your financial transactions should be populated with the freeze date (i.e., the current date when the financial transaction is frozen).
- Choose **Change if period is closed** if the accounting date defined when the financial transaction is generated should be used (unless the associated accounting period is closed).

Please be aware of the following in respect of your choice:

- If you choose **Always change**:
  - When a user freezes a bill segment online, they will be prompted to supply an accounting date. The current date will default, but the user can override this value.
  - When a user freezes an adjustment online, they will be prompted to supply an accounting date. The current date will default, but the user can override this value.
  - Any batch billing process should use the current business date as the accounting date on bill segments that it freezes.
  - Also note, if you have chosen the **Freeze At Bill CompletionBill Segment Freeze Option** on the *installation record*, bill segments and certain types of adjustments are frozen when a bill is completed. This means that the accounting date on the related financial transactions will be set to the completion date (because the completion date is the freeze date with this setting). Refer to *Preventing Obligation Balances And The GL From Being Impacted Until Completion* for more information.
- If you choose **Change if period is closed**:
  - When a user freezes a bill segment online, they will only be prompted to supply an accounting date if the related accounting period is closed (because the accounting period closes after the bill segment is generated but before it's frozen). The current date will default, but the user can override this date.
  - When a user freezes an adjustment online, they will only be prompted to supply an accounting date if the related accounting period is closed (because the accounting period closes after the adjustment is generated but before it's frozen). The current date will default, but the user can override this date.

Obligation Type Controls Everything

The previous section illustrated three important concepts:

The true financial impact of the three financial events - bills, payments, adjustments - is at the obligation level, not at the account level. This means that bills and payments are meaningless on their own. It's the obligations' bill segments, payment segments and adjustments that affect how much a taxpayer owes.

- Every bill segment, payment segment, and adjustment has a related financial transaction. These financial transactions contain the double-sided journal entries that will be interfaced to your general ledger. They also contain the information defining how the taxpayer's debt is affected by the financial event (i.e., current amount and payoff amount).
- A single bill can contain many bill segments, each of which may have a different frequency.

You control the financial effects of the various financial events using a single field on the obligation. This field is called the **Obligation Type**. In this section, we describe many of the tables that must be set up before you can create an obligation type.

NOTE:

An obligation type controls numerous aspects of an obligation's behavior in addition to its financial behavior. The non-financial aspects are discussed in later chapters. It's only after you have set up all of the control tables in this manual that you'll be able to finally define your obligation types. Refer to *Setting Up Obligation Types* for more information.

CAUTION:
Take the time to define how you will record the various financial events in your general ledger before you attempt to set up these control tables. If you have simple accounting needs, this setup process will be straightforward. However, if you sell many services and use sophisticated accounting, this setup process will require careful analysis.

The Source Of GL Accounts On Financial Transactions

The following is a summary of the source of GL accounts on financial transactions:

- If a bill segment has a financial effect, the distribution code to debit comes from the distribution code on the obligation type; the distribution codes to credit come from the calculation lines used to calculate the bill segment. Calculation rules define the distribution codes to be used when creating bill calculation lines.
- Payment segments always have a financial effect; the distribution code to debit comes from the bank account on the tender source of the tender control of the tender, the distribution code to credit comes from the obligation type.
- For adjustments that have a financial effect, refer to *Adjustment Type Defines the GL Account* for more information.

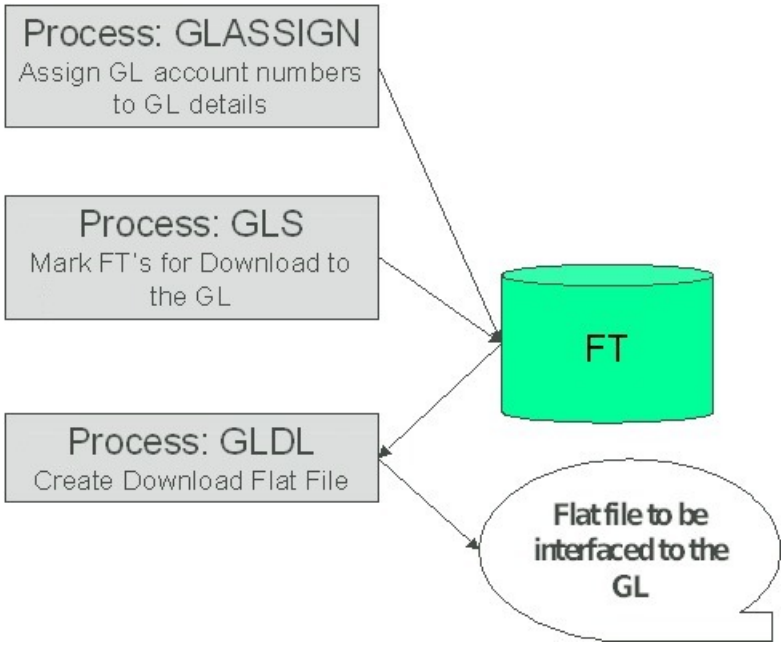
NOTE:
The information in this topic refers to bills created using calculation rule based functionality. For details of the source of FTs for rate-based bills, refer to topics under the heading of ‘Classic Bills’.

The following table lists some examples of financial events, their standard accounting, and the source of distribution codes used to derive the GL accounts sent to your general ledger.

Financial event	*GL Accounting*	*Source Of Distribution Code*
Create a bill segment.	Debit: A/R	Obligation Type
	Credit: Revenue	Calculation Line / Rule
Create a payment segment for a normal obligation	Debit: Cash	Bank Account on the Tender Source of the Tender Control for the Payment Segment's Tender.
	Credit: A/R	Obligation Type
Canceling a payment	Debit: A/R	Obligation Type
	Credit: Cash	Bank Account specified by the user on the cancel tender page. Note that this defaults to the original tender's bank account.
Create an adjustment to levy a charge	Debit: A/R	Obligation Type
	Credit: Revenue	Adjustment Type
Create an adjustment with disbursement details	Debit: A/R	Obligation Type
	Credit: Revenue (multiple)	Adjustment calculation line details

The GL Interface

The following diagram illustrates the GL Interface.



GLASSIGN - Assign GL Account Numbers To GL Details

The **GLASSIGN** process assigns GL account numbers to the GL details associated with financial transactions. GL account numbers are assigned as follows:

- Every GL detail references a distribution code.
- Every distribution code references a GL assignment algorithm. The base package algorithm simply uses the default GL account associated with the distribution code. However, you can construct your own algorithm(s) to assemble your GL account numbers in your desired fashion. Refer to *Setting Up Distribution Codes* for more information about the GL format algorithm.
- The **GLASSIGN** process simply calls each GL's details distribution code's GL assignment algorithm and updates the GL detail with the result (i.e., the GL account number). This GL account number is then used by the **GLDL** process when it creates the consolidated journal entry that's interfaced to the GL.

NOTE:
If incorrect GL account numbers get assigned to GL details... If you do not plug in the correct algorithm or your algorithm is wrong, you can correct the GL account numbers that are assigned to the GL details. How? Write a simple program that resets the GL account numbers on the erroneous GL details. Then run **GLASSIGN**. **GLASSIGN** will re-execute the distribution code GL assignment algorithm and refresh the account number accordingly.

GLS - Prepare FTs for Download

The **GLS** process creates FT download staging records for all FTs that are ready to be posted to the GL (the FT download staging records are stored on the FT/Process table). Each FT download staging record is marked with a batch process ID and run number.

- The batch process ID is the process responsible for creating the flat file that contains the consolidated journal entry that is interfaced to your general ledger. The batch process ID is defined on *Installation Options - Financial*. The system comes with a single GL download program (*GLDL - Create General Ledger Download Flat File*). The GL account numbers are provided by the GL account algorithms that are specified on the distribution codes. Refer to *Setting Up Distribution Codes* for more information about the GL account algorithm.

- The run number is the batch process ID's current run number.

This process also changes the status of the FT to **distributed**. You may not change the FT's GL details after this time.

GLDL - Create General Ledger Download Flat File

The **GLDL** process creates the flat file that contains the consolidated journal entry that is interfaced to your general ledger. One header and multiple detail records are created as described below. At the conclusion of the batch process, a validation is performed to compare debits against credits. If they are not equal, the process terminates with an error.

Header Record Layout

Field Name	*Format*	*Source/Value/Description*
REC_TYPE	A1	1 (1 is used for header records)
BATCH_CD	A8	The code for the batch process that created the file. (This value will always be 'GLDL'.)
BATCH_NBR	N10	The batch process will be run many times. This field indicates which of those runs produced a particular output file. This may be thought of as an instance identifier for the batch process.
BATCH_RERUN_NBR	N10	Any given instance of the GLDL batch process may be re-run at any time. If this instance has been re-run, this field will be populated with a number indicating how often.
EXTRACT_DTTM	A26	The date and time of the run that created a particular output file.
DETAIL_REC_CNT	N12	The number of details records
DETAIL_REC_TOTAL_DR	N13.2	This is the sum of FINANCIAL_AMOUNTs from all detail records that were greater than zero (debits).
DETAIL_REC_TOTAL_CR	N13.2	This is the sum of FINANCIAL_AMOUNTs from all detail records that were less than zero (credits).

Detail Record Layout for GLDL

NOTE:
A record is created for each unique occurrence of REC_TYPE, GL_DIVISION, CURRENCY_CD, GL_ACCOUNT and ACCT_PERIOD. If a given GL account has debit and credit FINANCIAL_AMOUNTs, two records will be created - one shows the debit amount, the other shows the credit amount.

Field Name	*Format*	*Source/Value/Description*
REC_TYPE	A1	2 (2 is used for detail records)
GL_DIVISION	A5	This is the GL division from the CI_FT record. It determines a) which Accounting Calendar will be used to calculate the Accounting Period (below) and b) the currency of the FT.
CURRENCY_CD	A3	The currency in which the Amount is denominated.
GL_ACCOUNT	A48	Contains the GL account number as supplied by the *distribution code's GL account algorithm*.
ACCT_PERIOD	A6	An accounting period in the format YYYYPP where YYYY is the fiscal year and PP is the

Field Name	Format	Source/Value/Description
		accounting period. This is derived from the GL detail's FT's accounting date and GL division.
FINANCIAL_AMOUNT	N13.2	This is the debit or credit amount. Debits are represented by positive numbers; credits are represented by negative numbers. If a given GL account has debit and credit entries, two records will be created - one shows the debit amount, the other shows the credit amount.
STAT_CODE	A8	This is the GL distribution code's statistic code (if any)
STAT_AMOUNT	N13.2	This is the statistical amount from the GL detail lines

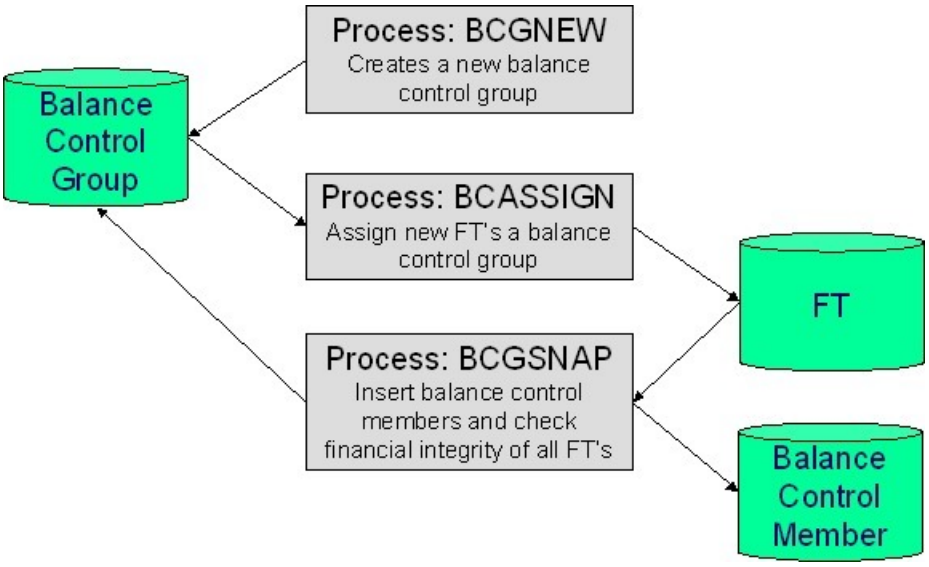
NOTE:
The GLASSIGN process updates an FT's GL details with the appropriate GL account number.

The Big Picture of Balance Control

The balance control processes are used to check the financial integrity of your system. The contents of this section describe how these processes work.

The Balance Control Background Processes

The following diagram illustrates the balance control background processes:



BCGNEW - Create A New Balance Control Group

This process creates a **Pending** balance control group if one doesn't already exist. You may wonder why an entire process is dedicated to such a trivial task. The reason is because the next process, BCASSIGN, is a multi-threaded (i.e., parallel) process and we only need one **Pending** balance control group regardless of the number of threads used to assign balance control ID's to financial transactions.

BCASSIGN - Assign New Financial Transactions A Balance Control Group

This multi-threaded (i.e., parallel) process assigns the **Pending** balance control group to new FTs whose freeze date/time is before the create date/time of the balance control record.

BCGSNAP - Insert BC Members And Check Financial Integrity Of All FTs

This process performs the following two functions:

- It summarizes new financial transactions under the current Pending balance control group as follows:
  - It creates a balance control member for every combination of **division**, **obligation type** and **FT Type** referenced on the financial transactions belonging to the balance control group.
  - It updates each balance control member with the following information:
    - The number of financial transactions (FTs)
    - The sum of the total amounts on the FTs in this balance control group.
    - The sum of the current amounts on the FTs in this balance control group.
    - The sum of the total amounts from all FTs (in this and all other balance control groups).
    - The sum of the current amounts from all FTs (in this and all other balance control groups).
  - It sets the status of the balance control group to **Complete**.
- It checks the integrity of the financial transactions in each historical Balance Control Group. It does this by summarizing EVERY financial transaction throughout time and determining if the sums are in sync with the values maintained on the balance control members. If integrity problems are detected, a detailed error message is displayed on the run control associated with the process.

If you opt to run the balance control processes on a nightly basis, you will find that the verification processing will take longer every night (because there are more financial transactions over time). In order to deal with this issue, the **BCGSNAP** process has a parameter that allows you to control which of the above functions is implemented (it's call VERIFY-ONLY-SW). In order to speed nightly processing, run this process with the switch set to "G" (this causes new financial transactions to be summarized under a new balance control). Then, once a week (or month), run this process with the switch set to "Y" (this checks the financial integrity of all financial transactions in the system).

If you run the balance control processes less frequently, you can set the VERIFY-ONLY-SW to "N" (this causes both of the above functions to execute).

Consider A Backup At This Point

We recommend you backup your database AFTER you run the above processes. Why? So that if a financial integrity problem is spotted in the future, you can compare the current database against the backup to see what changed.

Balance Control Information Is Available Online

Your internal auditors may be interested in the total number and amount of financial transactions that have been posted since a given point in time. You can use the *Balance Control* page to see this information.

General Financial Setup

The following sections describe maintenance transactions related to common financial objects.

Setting Up Divisions

There are two types of divisions referenced on an obligation type: a division and a GL division.

- General Ledger divisions typically comprise individual entities (e.g., companies) in your general ledger. You must set up a GL division for each such entity. The GL division's sole purpose in the system is to define the accounting period associated with financial transactions linked to obligations associated with the GL division (obligations are associated with GL divisions via their obligation type). The system cares about accounting periods in order to prevent a user from booking moneys to closed periods. It also uses accounting periods when it produces the flat file that contains the consolidated journal entry that is interfaced to your general ledger (refer to *The GL Interface* for more information).
- A division is used to separate business rules and can often be associated with a jurisdiction. The definition of a jurisdiction is a geographic-oriented entity with unique business rules. Another example of where you may use separate divisions is when your tax authority is responsible for other types of debt in the system, such as state university debts or child support debts. You must set up a division for each segmentation in your authority where business rules may differ.

Division is also referenced on obligation, account and location.

- The division on obligation is actually part of the obligation's obligation type. Because obligation type controls many business rules, all business rules that are on the obligation type can be thought of as being defined for a given jurisdiction and obligation type combination. Refer to *Configuring Obligation Types* for more information.
- The division on account when combined with the account's account type defines the jurisdiction that governs certain financial business rules (e.g., compliance review date). Refer to *Setting Up Account Types* for more information about these rules. The division on account can also play a part in the addressee of To Do entries associated with the account. To assign To Do entries to a role based on the division, simply link the To Do type to the division. Refer to *To Do Entries Reference A Role* for more information.
- The product was originally built with address functionality that is referred to now as "legacy" address functionality. If your implementation uses this functionality, the division on location defines the jurisdiction in which the location is located. This jurisdiction controls the types of obligations that can be associated with the location. Refer to *Defining Address Options* for more information about addresses.

NOTE:
Both division and GL division are stored on the financial transactions associated with an obligation. However, only GL division plays a part in *The GL Interface*. Refer to *Setting Up GL Divisions* for information about GL Divisions.

The topics in this section describe the pages used to maintain a division.

Division - Main

To define a division, select choose **Admin** > **Division**.

Description of Page

Enter an easily recognizable **Division** and **Description** for the division.

Enter the **Work Calendar** that defines the days on which this division operates. This calendar is used to ensure system-calculated dates (e.g., bill due date, credit and collection event dates, etc.) fall on a workday.

Use the **To Do Roles** scroll area if an account's division influences the role assigned to the To Do entries associated with the account. In the collection, define the **To Do Role** to be assigned to entries of a given **To Do Type** that are associated with accounts that reference the **Division**. Refer to *Assigning A To Do Role* for more information.

NOTE:

Only To Do entries that are account-oriented take advantage of the roles defined for a division.

Where Used

Follow this link to view the tables that reference *CI_CIS_DIVISION* in the data dictionary schema viewer.

Division - Characteristics

You can define characteristics for a division. You may need these for reporting purposes or in your algorithms. Refer to *Characteristic Types* for more information.

Open **Admin** > **Division** and navigate to the **Characteristics** tab to maintain a division's characteristics.

Description of Page

Select a **Characteristic Type** and **Characteristic Value** to be associated with this division. Indicate the Effective Date of the characteristic type and value.

NOTE:
You can only choose characteristic types defined as permissible on a division record. Refer to *Setting Up Characteristic Types & Their Values* for more information.

Setting Up Revenue Classes

Every obligation references an obligation type. Amongst other things, the obligation type defines an obligation's revenue class. The revenue class is used when the obligation's rate books revenue to different GL distribution codes based on the obligation's revenue class.

FASTPATH:
See *Rate Component - GL Distribution* for more information about how revenue class is used to determine the GL revenue accounts referenced on a bill.

To set up revenue classes, choose **Admin** > **Revenue Class**.

Description of Page

Enter an easily recognizable **Revenue Class ID** and **Description** for every revenue class.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_REV_CL*.

Setting Up Debt Categories

Debt Categories are used to categorize financial transactions that are debits. Debt categories may also be assigned to credit financial transactions if the credit is associated with a given type of debit. Refer to *Debt Categories and their Priorities* for more information.

To set up a debt category, open **Admin** > **Debt Category**.

The topics in this section describe the base-package zones that appear on the Debt Category portal.

Debt Category List

The Debt Category *List zone* lists every debt category. The following functions are available:

- Click the *broadcast* icon to open other zones that contain more information about the adjacent debt category.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each debt category.

Click the **Add** link in the zone's title bar to add a new debt category.

Debt Category

The Debt Category zone contains display-only information about a debt category. This zone appears when a debt category has been broadcast from the Debt Category List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_DEBT_CAT*.

Setting Up Debt Category Priorities

Debt category priorities allow you to define a priority order of allocating credit financial transactions to debit financial transactions during credit allocation. Refer to *Debt Categories and their Priorities* for more information.

To set up a debt category, open **Admin** > **Debt Category Priority**.

The topics in this section describe the base-package zones that appear on the Debt Category Priority portal.

Debt Category Priority List

The Debt Category Priority *List zone* lists every debt category priority. The following functions are available:

- Click the *broadcast* icon to open other zones that contain more information about the adjacent debt category priority.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each debt category priority.

Click the **Add** link in the zone's title bar to add a new debt category priority.

Debt Category Priority

The Debt Category Priority zone contains display-only information about a debt category priority. This zone appears when a debt category priority has been broadcast from the Debt Category Priority List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_DEBT_CAT_PRIO*.

Setting Up Distribution Codes

Distribution codes simplify the process of generating accounting entries by defining valid combinations of chart of account field values.

> **FASTPATH:**
> Refer to *The Source Of GL Accounts On Financial Transactions* for more information about the accounting entries associated will bills, payments and adjustments.

To set up distribution codes, open **Admin** > **Distribution Code**.

Description of Page

Enter a unique **Distribution Code** and **Description** for the distribution code.

If this distribution code is a holding account used for payables cash accounting, check the **Use For Cash Accounting** switch, and enter the actual payable **Cash Accounting Code**. The system will transfer the holding amount to this distribution code when the cash event occurs. For more information, refer to *Payables Cash Accounting*.

Define the **GL Account Algorithm** used by the system when it interfaces financial transactions that reference this distribution code to your general ledger (refer to *GLDL - Create General Ledger Download* for more information about the download process). The logic embedded in this algorithm constructs the actual GL account number. If you haven't done so already, you must set up this algorithm in the system. To do this:

- Create a new algorithm (refer to *Setting Up Algorithms*).
- On this algorithm, reference an Algorithm Type that constructs your general ledger account number. Click *here* to see the algorithm types available for this plug-in spot.

The **Write Off Controls** provides the ability to define configuration to write off debt associated with the distribution code by transferring the written off debt to a separate obligation. You would only do this if you wanted to the written off debt to remain visible in the account's balance and you don't want it to remain in the original obligation's balance.

- Define the **Division** and **Obligation Type** of the obligation to which bad debt associated with this distribution code should be transferred at write-off time. Note: only obligation types with a special role of **Write Off** may be selected.
- When the system transfers debt to the write-off obligation defined above, the distribution code defined on this **Division / Obligation Type** will be debited unless you turn on the **Override Switch**. When this switch is turned on, the system overrides the distribution code of the transfer to side of the adjustment with the distribution code associated with the debt being written off. You'd typically turn this switch on for liability distribution codes because you want to debit the original liability account when the debt is written off. Note: if this switch is on the system also overrides the characteristic type / value with the respective value associated with the debt that is being written off.

NOTE:
The write off algorithms provided in the base product (as part of overdue processing) do not transfer the debt to a separate **write off** obligation.

Use the **GL Account Details** scroll to define how the system constructs the GL account associated with the distribution code when it interfaces the financial transaction to your general ledger. For each distribution code, enter the following information:

- Enter the **Effective Date** of the following information.
- Define whether, on the **Effective Date**, the following information is **Active** or **Inactive**. The system will only use effective-dated information that is **Active**.
- Enter the **GL Account** that the general ledger uses to process financial transactions tagged with this distribution code.
- By default, the installation is configured to practice *fund accounting*. With this option activated, you can define the **Fund** associated with this distribution code. If your installation options indicate that fund accounting is **not practiced**, the field is not visible.
- Use the grid to define characteristic values for the **Distribution Code**. To modify a characteristic, simply move to a field and change its value. The following fields display:
- **Characteristic Type**. Indicate the type of characteristic.
- **Characteristic Value**. Indicate the value of the characteristic.

NOTE:

You can only choose characteristic types defined as permissible on the distribution code record. Refer to *Setting Up Characteristic Types & Their Values* for more information.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_GL_DIVISION*.

Configuring Effective Date as Optional

As described in *Effective Dates*, if your implementation would like the FT effective date to be optional on debit adjustments, you must set up a *Feature Configuration* option. Find the Feature Configuration record for the **Financial Transaction Options** feature type. (It may need to be defined if it does not exist).

Choose the **Option Types** with the description **Effective Date Optional for Debit Adjustments** and enter a value of **Y**.

Managing Adjustment Setup

An obligation's debt may be changed with an adjustment. Every adjustment must reference an adjustment type. The adjustment type contains a great deal of information that is defaulted onto the adjustment, including whether the adjustment amount is calculated. It also controls many business processes associated with the adjustment. The topics in this section describe how to design and set up adjustment types.

Adjustment Types Define Business Rules

An adjustment type contains the business rules that govern how its adjustments are managed by the system. The topics in this section describe how adjustment type controls the behavior of an adjustment.

Defines the Business Object

The adjustment user interface relies on a business object to define appropriate UI maps for display and maintenance. In addition, the business object may be used to define additional business rules. The adjustment's business object is defined on the adjustment type.

NOTE:
The adjustment maintenance object does not have a flexible lifecycle so the adjustment's business object may not be used to define a lifecycle or lifecycle rules.

The base product supplies several business objects based on broad categories of adjustments. For each broad category, the system provides two versions of the business object.

- One version defines the standard elements expected for business objects of that type and does not define any characteristics in the schema. These business objects may be used as is or may be extended for implementations that choose to "flatten" characteristic values.
- The second version defines a generic characteristic collection. The UI maps supplied with these business objects provide a generic user interface for defining characteristics where the user must choose the characteristic type and then the appropriate value.

FASTPATH: Refer to *Controls Adjustment Characteristics* for additional information about the configuration required for adjustment characteristics.

To view the details of the business objects provided by the base product, navigate using **Admin** > **Business Object** and select the business objects for the **ADJUSTMENT** maintenance object.

If the base business objects do not provide all the desired functionality for capturing and displaying your adjustment information, you may extend the base business objects as desired or create new ones that are appropriate for your business.

Defaults the Adjustment Amount

The adjustment type may default the adjustment amount in one of the following ways:

- The adjustment type may specify a default amount. This would be used for those adjustment types that have a standard charge for all taxpayers that receive this adjustment.
- The adjustment type may specify a default adjustment amount algorithm. This would be used for those adjustment types that have a charge that varies based on other factors. For example, a non-sufficient funds charge may be based on a taxpayer's credit rating.

When an amount is defaulted onto a new adjustment it may be overridden by a user.

Generated Adjustments

You can use an algorithm to calculate an adjustment amount or to build details related to the adjustment amount. The following are some examples of where this may be used:

- Taking a base adjustment amount and applying a rate to add additional charges.
- Taking the adjustment amount and capturing or producing additional supporting details in the calculation details collection. For example, if a P&I adjustment should be "disbursed" into detailed buckets as per the disbursement of the related assessment adjustment, a generate algorithm may be used to produce the appropriate P&I calculation details. Refer to the base product algorithm type **C1-PIDISTRII** for an example.
- Receiving calculation details from a calling program and storing them with the adjustment.
- Receiving calculation details from a calling program and using them to generate general ledger details for the adjustment's financial transaction.

All generated adjustment types must be set up as follows:

- Set the adjustment type's Adjustment Amount Type to **Calculated Amount**
- Plug in an appropriate Generate algorithm on the adjustment type as per the business rules
- Configure an appropriate FT creation algorithm on the adjustment type. A typical reason for using generated adjustments is that additional details are required for the general ledger. The base product FT creation algorithms all include an option to use the calculation details as a source for the GL.

Adjustment Calculation Details

Generated adjustments are used to produce details related to the adjustment amount. These details may be provided by a calling program or may be determined using the appropriate business logic.

In general, the adjustment calculation lines are used to capture the details. But there are unusual points related to this logic:

- Algorithms that populate the calculation line details must also populate calculation "header" details, including the number of lines and the total amount. However, calculation "header" details are never instantiated in the database. The information populated in the calculation header is used by the adjustment logic to process the calculation lines. Refer to any base product Generate algorithm for an example of populating the calculation "header".
- Calculation lines include a switch called "create bill line." (Adjustment calculation lines are reusing bill calculation line functionality). In the adjustment logic, adjustment calculation lines are only instantiated if this switch is set to true. The reason that an algorithm may produce a calculation line that should not be stored is that this information is available in memory for subsequent processes, namely the FT creation algorithm, which produces the GL details.

There are times when the calling program has the detailed information to be stored in the adjustment calculation lines and in the FT GL details. The services provided in the product to add and freeze an adjustment do not include the full adjustment calculation details collection or the FT GL details collection as input. Rather, there is a special field called "custom common area" which may be used to pass information into the adjustment routines. The base product provides a Generate algorithm that accepts calculation details passed in the custom common area and returns calculation lines. Refer to the base product algorithm type **C1-ADJ-GN-CL** for more information.

Applying a Rate

One use of the adjustment generation plug-in is to call rate application. The base product supplies an algorithm type **ADJG-RT** that enables you to call a rate application, passing in the base adjustment amount and receiving calculated details from the rate.

The adjustment type's generate adjustment algorithm controls which rate is applied to the base amount. A user supplied calculation date controls which version of the rate is used. The user may supply the base amount or it may be defaulted from the adjustment type and possibly overridden by the user prior to calculating the adjustment amount.

Controls Which Balance(s) Are Affected

The adjustment type's financial transaction (FT) algorithm controls how payoff balance and current balance are affected by the adjustment amount.

Controls Adjustment Characteristics

The types of characteristics that are valid for an adjustment are configured on the adjustment type. In addition it is possible to indicate which types of characteristics are required and whether any values should be defaulted.

Note that the underlying adjustment validation rules are using the adjustment type's adjustment characteristic configuration to validate adjustment characteristics. As a result, careful consideration must be paid to this characteristic configuration with respect to defining business objects for the adjustment:

- If the adjustment business object referenced by the adjustment type does not define any schema elements that map to the characteristic collection, then required adjustment characteristic types should not be defined on the adjustment type. Otherwise the users will encounter validation errors.
- If the adjustment business object referenced by the adjustment type defines "flattened" schema elements that map to the characteristic collection, then the same characteristic type must also be defined on the adjustment type as valid.
- If the business object defines a generic characteristic collection in its schema (as per the base business objects that include the characteristics), the valid characteristic types are taken from this configuration.

Defines the GL Account Affected by the Adjustment

Most adjustments affect the general ledger (GL) in some way. The following points describe the source of these GL accounts.

- For many adjustments there is a single accounting entry generated:
- One side of the accounting entry is taken from the distribution code on the obligation type of the obligation affected by the adjustment. For example, if you are adjusting the payoff balance on a normal obligation, the A/R account is constructed from the distribution code on the obligation's obligation type.
- The other side of the accounting entry is taken from the distribution code on the adjustment's adjustment type.
- For transfer adjustments (i.e., adjustments used to transfer moneys between two obligations), there are two accounting entries generated - one for the "from" side and one for the "to" side. Each adjustment carries its own set of balanced GL accounting details.

- For each adjustment, one side of the entry is taken from the distribution code on the obligation type of the obligation affected by the adjustment
- The other sides of both accounting entries have the same GL account. This account should be the intermediate clearing GL account that is to be used for the transfer. The source of this clearing GL account is the distribution code on the adjustment type used to transfer the funds.
- For generated adjustments, the accounting entry may include several GL details:
- One side of the entry is taken from the distribution code on the obligation type of the obligation affected by the adjustment.
- The other side of the entry depends on configuration on the adjustment financial transaction algorithm. If it is configured to use the Calculation Lines as the source, the distribution codes are taken from the calculation lines. If it is configured to use the adjustment type as the distribution code source, the other side of the accounting entry is taken from the distribution code on the adjustment type.

NOTE:
Not all adjustments affect the GL. As a general rule of thumb, only those adjustments that affect an obligation's payoff balance affect the GL.

Controls the Interface to A/P and Income Statement Reporting

If the adjustment type is associated with a payment of money to a taxpayer (e.g. a refund) that is managed by the accounts payable system, the adjustment type indicates such with a reference to an A/P request type.

When an adjustment that references an A/P request type is **frozen**, an A/P download request record is created. This record is the interface request to ask the A/P system to issue a check. This interface record is marked with a batch process ID and run number.

- The batch process ID is the process responsible for creating the flat file that contains check request that is interfaced to your account's payable system. The batch process ID is defined on *Installation Options - Financial*. The base package is supplied with a skeletal background process (referred to by the process ID of **APDL**) that must be populated with logic to format the records in the format compatible with your accounts payable system.
- The run number is the batch process ID's current run number.

FASTPATH: Refer to *Accounts Payable Check Request* for more information.

If the resultant check needs to be reported for income tax purposes under a specific income statement category, the category is also specified on the adjustment type. The income statement category is in turn interfaced to the A/P system. (The system does not manage income statement reporting).

Controls Information Printed On the Bill

If the adjustment is one that appears on a taxpayer's bill, the verbiage is specified on the adjustment type (and may NOT be overridden on the adjustment).

Controls if the Adjustment Requires Approval

FASTPATH:
Refer to *The Big Picture of Adjustment Approvals* for more information.

May Control the Adjustment Information

The adjustment information displayed throughout the system is controlled by a plug-in.

The system first looks to see if the adjustment type references an adjustment business object and if the business object defines an information plug-in. If a BO is not provided or if that BO does not define an information algorithm, the system looks for an information algorithm plugged into the adjustment maintenance object.

If no plug-ins are found on the BO or the MO, the system looks for a plug-in algorithm on the *Adjustment Type*.

If such an algorithm is not plugged-in on the Adjustment Type, the system looks for a corresponding algorithm on the *installation record*.

If you prefer different formatting logic, your implementation should provide a plug-in at one of the above plug-in spots, as appropriate for your business rules.

Setting Up Adjustment Types

The topics in this section describe how to set up adjustment types.

NOTE:
When a new adjustment type is added. When you introduce a new adjustment type, you must update one or more adjustment profiles with the new adjustment type. This is because adjustment profiles define the adjustment types that may be levied on obligations (adjustment profiles are defined on obligation types). If you don't put the adjustment type on an adjustment profile, the adjustment type can't be used on any adjustment.

Adjustment Type - Main

To set up adjustment types, open **Admin** > **Adjustment Type**.

Description of Page

Enter a unique **Adjustment Type** and **Description** for the adjustment type.

If an *adjustment type extension* exists for the adjustment type, a link to the extension record is displayed next to the Adjustment Type ID.

The **Adjustment Amount Type** indicates whether or not the adjustment amount or details to support the adjustment amount is generated or not. Select **Calculated Amount** when you want to use a generate algorithm to generate the adjustment amount or generate calculation line details to support the adjustment amount, otherwise select **Non-Calculated Amount**. Refer to *Generated Adjustments* for more information about generated adjustments.

Enter the **Distribution Code** that references the GL account associated with the adjustment. For example, if this adjustment type is used to levy a charge for a bad check, the distribution code would reference the revenue account to which you associate such revenue. Note, the offsetting distribution code is kept on the obligation type.

NOTE:
Distribution Code for Generated Adjustments. Depending on the algorithm used for the *generated adjustment*, the distribution code may come from the adjustment type or the calculation lines of the adjustment. If the adjustment's FT creation algorithm gets the distribution code from the calculation lines, you do not need to specify a distribution code on the adjustment type.

FASTPATH:

For more information about the source of the distribution codes on financial transactions, see *The Source Of GL Accounts On Financial Transactions*.

Use **Adjustment Type Category** to assign a broad category to the adjustment type. Valid values are **Assessment**, **Credit**, **Manual Adjustment**, **Manual P&I**, **Penalty & Interest**, **Waiver**, **Write Off**.

FASTPATH: Used by P&I. The values of **Assessment**, **Penalty & Interest** and **Waiver** play an important role in the base product P&I Calculation algorithm. Refer to *Apply P&I Rules for Each Time Period* for more details.

NOTE: Multi-Adjustment Transactions The values of **Manual Adjustment** and **Manual P&I** control whether the adjustments of this type may be created on the Manual Adjustment and Manual P&I transactions respectively.

NOTE: The values for this field are customizable using the Lookup table. This field name is ADJ_TYPE_CAT_FLG.

Define the **Debt Category** to assign to the financial transaction for debit adjustments (adjustments with amounts greater than or equal to 0) created for this adjustment type.

NOTE: Required for base algorithms. The base P&I calculation algorithm and the base *Determine Detailed Balance* algorithm require that every debit adjustment reference a debt category.

If this adjustment type is for a certain type of credit adjustment and it has special rules for how credits are applied in the base Determine Detailed Balance algorithm, define the appropriate **Debt Category Priority**. Refer to *Debt Categories and their Priorities* for more information.

Enter the **Currency Code** for adjustments of this type.

Turn on **Sync. Current Amount** if adjustments of this type exist to force an obligation's current balance to equal its payoff balance. These types of adjustments are issued before an obligation's funds are transferred to a write-off obligation. If this switch is on, choose an **Adjustment Fin Algorithm** that does not impact payoff balance or the GL, but does affect the obligation's current balance (refer to *ADJT-CA* for an example of such an algorithm).

Enter a **Default Amount** if an amount should be *defaulted* onto adjustments of this type.

FASTPATH: For more information about current and payoff amounts, refer to *Current Amount versus Payoff Amount*.

If the A/P Adjustment should be recorded in respect of the taxpayer's income statement amounts, indicate the **Income Statement**. The values of this field are **Interest** and **Miscellaneous**. This type of adjustment would also have an **A/P Request Type Code** selected, as income statement reporting is handled in A/P.

Turn on **Print By Default** if information about adjustments of this type should print on the account's next bill.

Choose an **A/P Request Type** if this adjustment is interfaced to accounts payable (i.e., it's used to send a refund check to a taxpayer). Refer to *A/P Check Request* for more information.

The **Adjustment Freeze Option** defines when adjustments can be frozen and therefore when an obligation's balance and the general ledger are affected by an adjustment. Refer to *Preventing Obligation Balances And The GL From Being Impacted Until Bill Completion* to understand the significance of this option. Also note, if the *installation option's* Bill Segment Freeze Option is **Freeze At Will**, this field is defaulted to **Freeze At Will** and cannot be changed.

CAUTION: Adjustment types for adjustments created during bill completion (e.g., by a bill completion algorithm) must have their adjustment freeze option set to *Freeze At Will*. Otherwise (i.e., if the option is *Freeze At Bill Completion*) they will not be frozen until a subsequent bill is completed.

NOTE: The adjustment freeze option field is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module. This information is used only for classic billing functionality.

Set **Allow Manual Creation** to **Allowed** if you want to allow users to manually create adjustments of this type from the adjustment page, otherwise set it to **Not Allowed**.

Set **Allow Manual Cancellation** to **Allowed** if you want to allow users to manually cancel adjustments of this type from the adjustment page, otherwise set it to **Not Allowed**.

If adjustments of this type require approval, define an **Approval Profile**. For more information, refer to *The Big Picture of Adjustment Approvals*.

Enter the verbiage to appear on the printed bill in **Description on Bill**.

Use an **Adjustment Business Object** to define a *BO* that may govern the display and maintenance UI maps for adjustments of this type as well as additional rules related to adjustments of this type.

Use the characteristics collection to define a **Characteristic Type** and **Characteristic Value** common to all adjustments of this type. These can be used for reporting purposes or in your algorithms.

Adjustment Type - Adjustment Characteristics

To define characteristics that can be defined for adjustments of a given type, open **Admin** > **Adjustment Type** and navigate to the **Adjustment Characteristics** tab.

Description of Page

Use the **Adjustment Characteristics** collection to define characteristics that can be defined for adjustments of a given type. Turn on the **Required** switch if the **Characteristic Type** must be defined on adjustments of a given type. Enter a **Characteristic Value** to use as the default for a given **Characteristic Type** when the **Default** switch is turned on. Use **Sequence** to control the order in which characteristics are defaulted.

Adjustment Type - Algorithms

Description of Page

The grid contains **Algorithms** that control important adjustment functions. If you haven't already done so, you must *set up the appropriate algorithms* in your 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.

The following table describes each **System Event**.

System Event	*Optional / Required*	*Description*
Adjustment Cancellation	Optional	When an adjustment is canceled an algorithm of this type may be called to do additional work. Refer to *The Lifecycle Of An Adjustment* for more information about canceling an adjustment. Click *here* to see the algorithm types available for this system event.
Adjustment Freeze	Optional	When an adjustment is frozen an algorithm of this type may be called to do additional work.

		Refer to *The Lifecycle Of An Adjustment* for more information about freezing an adjustment. Click *here* to see the algorithm types available for this system event.
Adjustment Information	Optional	We use the term "Adjustment information" to describe the basic information that appears throughout the system to describe an adjustment. The data that appears in "Adjustment information" may be constructed using an algorithm plugged in here. Refer to *Adjustment Information* for more information on when this algorithm is used. Click *here* to see the algorithm types available for this system event.
Adj. Financial Transaction	Required	Algorithms of this type are used to construct the actual financial transaction associated with the adjustment. The financial transaction controls the adjustment's affect on the obligation's payoff and current balances. It also constructs the information that is eventually interfaced to your general ledger. Click *here* to see the algorithm types available for this system event.
Default Adjustment Amount	Optional	Algorithms of this type are used to default the adjustment amount. Refer to *Default the Adjustment Amount* for more information. Click *here* to see the algorithm types available for this system event.
Determine Obligation	Optional	Algorithms of this type are used to find an obligation for which the adjustment can be posted. This plug-in is used particularly during adjustment upload when a staging record does not identify the obligation ID. Refer to *Interfacing Adjustments From External Sources* for more information. Click *here* to see the algorithm types available for this system event.
Resolve Suspense	Optional	Algorithms of this type are used to automatically resolve adjustments that are in suspense. Refer to *Suspense Adjustments* for more information Click *here* to see the algorithm types available for this system event.
Generate Adjustment	Optional	Algorithms of this type are used to generate the adjustment amount or generate details to support the adjustment amount if an adjustment type indicates that the adjustment amount is calculated. Refer to *Generated Adjustment* for more information. Click *here* to see the algorithm types available for this system event.
Validate Adjustment	Optional	Algorithms of this type are used to validate information for the adjustment after it is generated. Click *here* to see the algorithm types available for this system event.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ADJ_TYPE*.

Setting Up Adjustment Type Profiles

Adjustment type profiles categorize your adjustment types into logical groups. When you link a profile to an obligation type, you limit the type of adjustments to be linked to the obligation type's obligations. The creation of adjustment profiles and their linkage to obligation types prevents inappropriate adjustments from being linked to your obligations. More than one adjustment type profile may be linked to an obligation type.

For example, you can create an adjustment type profile called **Miscellaneous Fees** and link to it the miscellaneous fee adjustment types. Then, you would link this profile to those obligation types that are allowed to levy such fees.

NOTE:
Bottom line. An adjustment can only be linked to an obligation if its adjustment type is part of an adjustment type profile that is valid for the obligation's obligation type. If an adjustment type is not linked to a profile, it could never be levied.

To set up adjustment type profiles, open **Admin** > **Adjustment Type Profile**.

Description of Page

Enter a unique **Adjustment Type Profile** and **Description** for the adjustment type profile.

Indicate the **Adjustment Types** that are part of the profile.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ADJ_TYP_PROF*.

Setting Up Adjustment Type Extensions

Adjustment Type Extensions let you maintain additional information related to an adjustment type. The information you maintain is controlled by the business objects that your implementation defines based on your business needs.

The base product supplies an adjustment type extension business object that supports mapping between assessment distribution codes and P&I distribution codes. Refer to the business object **C1-PIDisbursement** for more information.

To set up an Adjustment Type Extension, open **Admin** > **Adjustment Type Extension**.

The topics in this section describe the base-package zones that appear on the Adjustment Type Extension portal.

Adjustment Type Extension List

The Adjustment Type Extension *List zone* lists every Adjustment Type Extension. The following functions are available:

Click the *broadcast* icon to open other zones that contain more information about the adjacent Adjustment Type Extension.

The standard actions of **Edit, Delete** and **Duplicate** are available for each Adjustment Type Extension.

Click the **Add** link in the zone's title bar to add a new Adjustment Type Extension.

Adjustment Type Extension

The Adjustment Type Extension zone contains display-only information about an Adjustment Type Extension. This zone appears when an Adjustment Type Extension has been broadcast from the Adjustment Type Extension List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ADJ_TYPE_EXT*.

Setting Up Adjustment Creation Reasons

Adjustment creation reasons are defined using an extendable lookup. To view or create adjustment creation reasons:

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Adjustment Creation Reason** extended lookup business object.
- The list of existing adjustment creation reasons are displayed in a standard *List zone*.
- Choose an existing adjustment creation reason to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new adjustment creation reason.

Setting Up Adjustment Cancellation Reasons

Open **Admin** > **Adjustment Cancel Reason** to define your adjustment cancellation reason codes.

Description of Page

Enter an easily recognizable **Cancel Reason** and **Description** for each adjustment cancellation reason.

A/P Check Request

Adjustments whose adjustment type is marked with an A/P check request code are interfaced to your A/P system. Your A/P system then issues the checks.

> **FASTPATH:** Refer to *Controls The Interface To A/P and Income Statement Reporting* for more information about the accounts payable interface.

You must set up at least one A/P check request code if you want A/P to issue checks.

To set up A/P check request types, open **Admin** > **A/P Request Type**.

Description of Page

Enter an easily recognizable **A/P Request Type** for the accounts payable request type.

Use **Due Days** to define when the check is cut. The cut date is equal to the adjustment date plus due days.

Select a **Payment Method**. The current system option is **System Check**

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_APREQ_TYPE*.

The Big Picture Of Adjustment Approval

Some implementations require adjustments to be approved by one or more managers before they impact an obligation's balance and the general ledger. For example, an adjustment used to refund a credit balance may require managerial approval before the refund is sent to the taxpayer. The topics in this section describe how to set up the system to support the approval of adjustments.

Approval Is Controlled By Approval Profiles

An approval profile contains the rules that define if and how an adjustment is approved. If an adjustment type does not reference an approval profile, the related adjustments do not require third-party approval before they impact an obligation's debt. If an adjustment type references an approval profile, the approval profile's approval hierarchy defines if the adjustment requires approval and who the authorized approvers are. For example, an approval profile can be configured with the following approval hierarchy:

- Adjustments < $0 require approval by the "credit approvers role"
- Adjustments >= $0 and <= $10 do not require approval
- Adjustments > $10 and <= $100 require the approval of a user that belongs to the "level 1 approvers role"
- Adjustments > $100 requires the approval of a user that belongs to the "level 2 approvers role"

The approval profile includes a setting to indicate if the adjustment requires **Single** approval or **Multiple** levels of approval. If there is an adjustment for $200 and the approval profile is configured for **Single** approval, only one approval is needed by the "level 2 approvers role". If instead the approval profile for this adjustment type indicate **Multiple** levels of approval: first a user that belongs to the "level 1 approvers role" must approve the adjustment; afterwards, the adjustment must be approved by a user that belongs to the "level 2 approvers role".

NOTE:
Transfer adjustments. The term "transfer adjustment" refers to two adjustments that are used to transfer moneys between two obligations. The adjustment with the positive amount is considered to be the debit adjustment; the other adjustment is considered the credit adjustment. When a transfer adjustment requires approval, only one of the adjustments needs to be approved. You control whether the debit side or the credit side of a transfer adjustment is used to control the approval process when you set up the approval profile.

NOTE:
Separation of Duties. The base product logic includes validation that prevents a user from approving an adjustment if that user was the one that created the record or if that user already approved a previous approval "level" (for approvals that define **Multiple** levels).

Approval Profiles Can Be Linked To Multiple Adjustment Types

Approval hierarchies are frequently the same for many adjustment types. The system allows an approval profile to be linked to multiple adjustment types to simplify the definition and maintenance of the rules over time.

Adjustments Created In Batch Are Not Approved

The system assumes that no approval is necessary for adjustments created by batch processes even those whose adjustment type references an approval profile.

Approval Inserts A Step Into An Adjustment's Lifecycle

The Lifecycle Of An Adjustment explains how an adjustment is transitioned from the **Freezable** state to the **Frozen** state when it should impact the general ledger and the obligation's balance. If an adjustment's adjustment type references an approval profile, the user cannot freeze the adjustment directly. Rather, the user must submit the adjustment for approval when it's ready and only when the last applicable approver approves the adjustment will it become **Frozen**.

NOTE:

Freeze during bill completion. You can configure the system to only freeze certain types of adjustments when the next bill is completed for the adjustment's account. When the last approver approves such adjustments, they remain in the **Freezable** state. When the next bill is completed for the account, these adjustment become **Frozen**. Such adjustments that have not been approved at the time of bill completion will remain in the **Freezable** state. Refer to *Preventing Obligation Balances And The GL From Being Impacted Until Bill Completion* for more information.

Approval Requests Manage And Audit The Approval Process

Users submit an adjustment for approval using a dedicated button on the *Adjustment* page. When an adjustment is submitted for approval, the system creates an "approval request". The approval request determines if the adjustment requires approval and, if so, the list of approvers. If the adjustment does not require approval, the approval request is updated to indicate such and the adjustment is **Frozen** immediately (if freezing is allowed prior to bill completion). If the adjustment requires approval, the approval request's state becomes **Approval In Progress** and the approver(s) are notified.

NOTE:
Approval submission logic is customizable. The previous paragraph describes how the base-package works when an adjustment is submitted for approval. This logic resides in an algorithm that's plugged in on the **C1-AdjustmentApprovalProfile** business object in the **Determine Approval Requirements** system event. Your implementation can change this logic by developing a new algorithm and plugging it into this business object. If your logic is meant to supersede the base-package algorithm, remember to inactivate the base-package algorithm by adding an appropriate inactivation option to this business object.

To Do Entries Are Created To Notify Approvers

When an approval request detects an adjustment requires approval, it notifies the first approver by creating a To Do entry. The To Do entry is created using the To Do type and To Do role defined on the approval profile. All users who belong to the approving To Do role can see the entry. When a user drills down on an adjustment approval To Do entry, the *Adjustment - Main* page is opened. This page includes information about the adjustment and the approval history of the adjustment. This portal is also where the user approves or rejects the adjustment.

When a user in the To Do role approves an adjustment, the To Do entry is **Completed** and the approval request's audit log is updated. If there are no higher levels of approval required, the adjustment is **Frozen** (if freezing is allowed prior to bill completion) and the approval request is moved to the **Approved** state. If there are higher levels of approval required, a new To Do entry is created to the next To Do role in the approval hierarchy.

NOTE:
To Do entries can create email. A To Do entry can be configured to create an email message for every user in the To Do role to inform the user(s) of new adjustments requiring their attention. Refer to *To Do Entries May Be Routed Out Of The System* for the details.

Monitoring and Escalating Approval Requests

The base-package is supplied with an algorithm that your implementation can use to monitor approval requests that have been waiting too long for approval. This algorithm can complete the current To Do entry and create a new one for a different role when the time out threshold defined on the algorithm's parameters is exceeded. If you've configured the system to send email for approval, this algorithm can also send x reminder emails (where x is defined on the algorithm's parameters) before the approval request is escalated to the new To Do role. Refer to *C1-APR-TMOUT* for more information about this algorithm. If you plan to enable this functionality, plug-in your configured algorithm on the **Approval In Progress** state on the **C1-AdjustmentApprovalRequest** business object.

Rejecting Deletes The Adjustment

When an adjustment is being approved, anyone with access to the adjustment can reject it by using the *Adjustments - Approval* portal. Users other than the current approver are allowed to reject an adjustment to allow an "in process" an adjustment to be withdrawn.

When an adjustment is rejected, the following takes place:

- The user is prompted for a reject reason.
- The approval request's audit log is updated with the reject reason and the approval request is moved to the **Rejected** state.
- The adjustment is deleted.

Designing Your Approval Profiles

The following points describe a recommended design process:

- Create logical groups of adjustment types where each group has the same monetary hierarchy and approvers. An approval profile will be required for each of these groups.
- The number of To Do types (if any) that need to be created is dependent on how the adjustment approval To Do entries should be organized on To Do lists. For example, if all approval request To Do entries can appear in the same To Do list, you can use the base-package adjustment approval To Do type. However, if your organization prefers each approval profile's To Do entries to appear in a distinct To Do list, a separate To Do type will be needed for each list. Note that the base-package is supplied with a To Do type called *C1-ADAPP* that should be used as the basis for any new approval request To Do type.
- The number of To Do roles is dependent on who approves your adjustments. At a minimum, you will require a separate To Do role for each level in your approval profiles. Remember that every user in a To Do role will see its entries (and receive email if you've configured the system to do such).
- Refer to *Monitoring and Escalating Approval Requests* for how to configure the system to escalate approval requests that have been waiting too long.
- If your implementation requires email notification when an adjustment requires approval, the following setup is required:
  - Set up an outbound message type, external system, and XAI sender. Refer to *To Do Entries May Be Routed Out Of The System* for the details.
  - Every To Do type referenced on your approval profiles should be configured as follows:
    - Define the *F1-TDEER* batch process as the To Do type's routing process
    - Set up an algorithm that references the *C1-ADJAREQEM* algorithm type and plug it in the External Routing system event.

Exploring Adjustment Approval Data Relationships

Use the following links to open the application viewer where you can explore the physical tables and data relationships behind the approval functionality:

- Click *C1-APPR PROF* to view the approval profile maintenance object's tables.
- Click *C1-APPR REQ* to view the approval request maintenance object's tables.

Implementing Other Approval Paradigms

The above sections describe how the base-package adjustment approval process works. Because adjustment approval has been implemented using the **C1-AdjustmentApprovalProfile** and the **C1-AdjustmentApprovalRequest** business objects, your implementation can add additional business rules and change the approval user interface as required. Alternatively, if your implementation has a radically different approval process, you can create different business objects with their own business rules.

Setting Up Approval Profiles

Approval profiles contain the rules that control how adjustments are approved. To set up an approval profile, open **Admin** > **Approval Profile**.

FASTPATH:
Refer to *The Big Picture Of Adjustment Approval* for a detailed description of how approval profiles govern the adjustment approval process.

The topics in this section describe the base-package zones that appear on the Approval Profile portal.

Approval Profile List

The Approval Profile *List zone* lists every approval profile. The following functions are available:

- Click the *broadcast* icon to open other zones that contain more information about the adjacent approval profile.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each approval profile.

Click the **Add** link in the zone's title bar to add a new approval profile.

Actions

This is a standard actions zone. The **Edit, Delete** and **Duplicate** actions are available.

Approval Profile

The Approval Profile zone contains display-only information about an approval profile. This zone appears when an approval profile has been broadcast from the Approval Profile List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Approval Profile's Adjustment Types

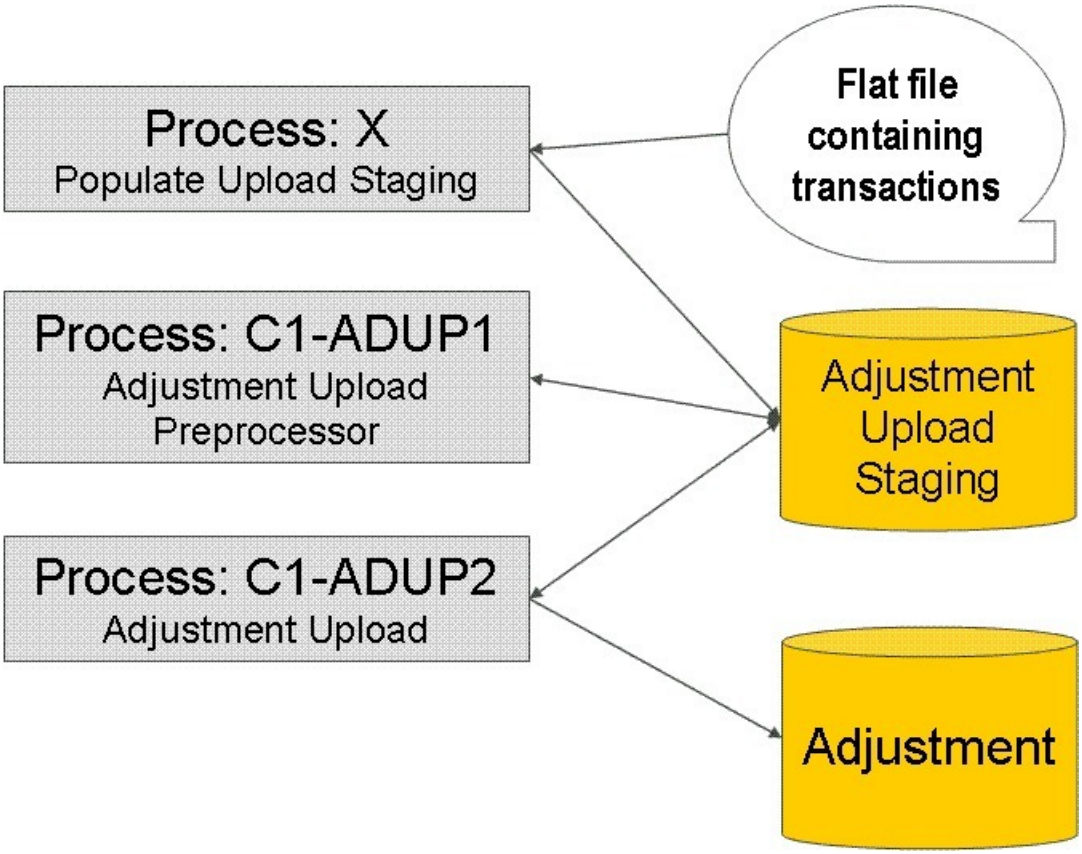
The Approval Profile's Adjustment Types zone lists every *adjustment type* that is governed by this approval profile. This zone appears when there is at least one adjustment type governed by the approval profile displayed in the Approval Profile zone.

Interfacing Adjustments From External Sources

The topics in this section describe how adjustments are uploaded from an external source.

Interfacing Adjustments

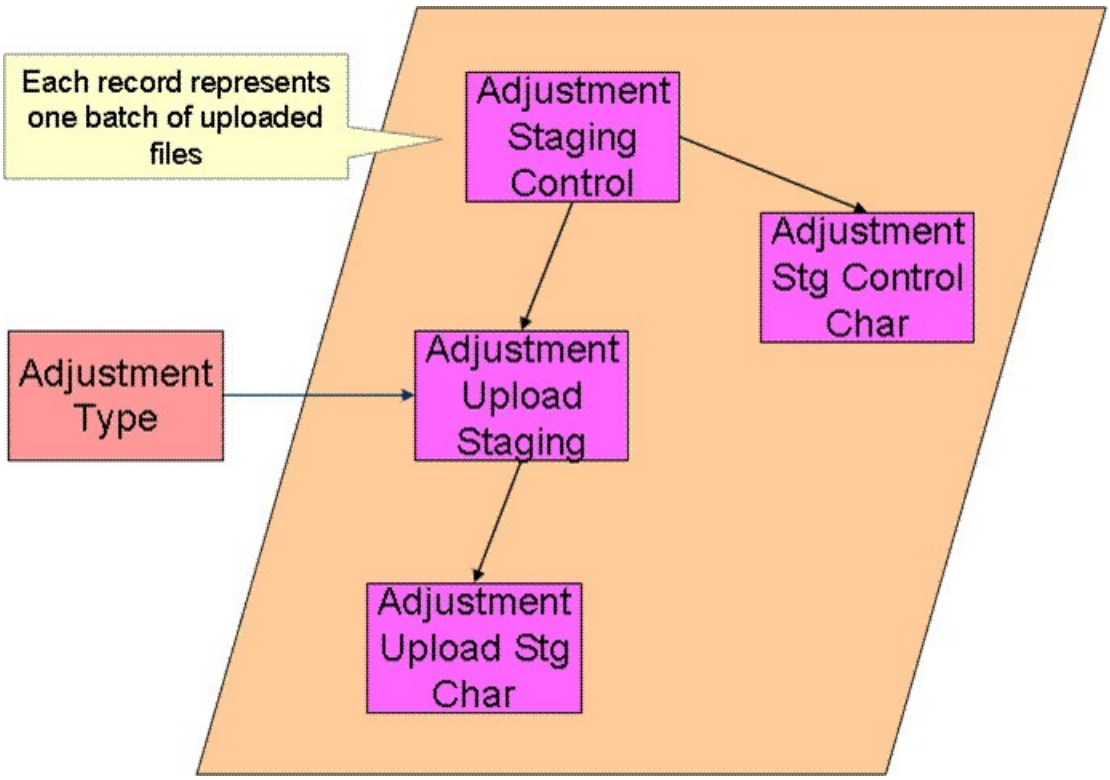
The following diagram illustrates the processes involved in the uploading of adjustments into the system.



The topics in this section describe how these processes work.

Process X - Populate Adjustment Upload Records

Process X refers to the mechanism used by your organization to populate the various staging tables (shown in the shaded section of the following ERD).



The topics in this section describe each of these tables.

Adjustment Staging Control

You must create an adjustment staging control record for each batch of adjustments to be uploaded into the system. The name of this table is CI_ADJ_STG_CTL. The following describes each column on this table.

Column Name	*Length*	*Req'd*	*Data Type*	*Comments*
ADJ_STG_CTL_ID	12	Y	N	This is the unique identifier of the adjustment staging control record. This key is a sequential number so you can use a database function to assign the value when populating the table.
CRE_DTTM	15	Y	DateTime	This is the date / time on which the adjustment staging control record was created. This must be populated with the current date / time.
ADJ_STG_CTL_ STATUS_FLG	4	Y	A/N	This must be set to **P** for **Pending**.
ADJ_STG_UP_REC_ CNT	10	Y	N	This is the total number of adjustment upload staging records that are linked to this adjustment staging control.
TOT_ADJ_AMT	13.2	Y	N	This column must equal the sum of adjustment amounts on the adjustment upload

				staging records that are linked to this adjustment staging control.
CURRENCY_CD	3	Y	A/N	This must be a valid currency code in the system. Refer to *Defining Currency Codes* for more information.
MESSAGE_CATEGORY	5	N	N	Leave this blank. The adjustment upload preprocessor populates this when an error occurs during upload.
MESSAGE_NBR	5	N	N	Leave this blank. The adjustment upload preprocessor populates this when an error occurs during upload.

Adjustment Staging Control Characteristic

You must create an adjustment staging control characteristic record for each characteristic that you would like to link to the adjustment staging control. The name of this table is CI_ADJ_STG_CTL_CHAR. The following describes each column on this table.

Column Name	*Length*	*Req'd*	*Data Type*	*Comments*
ADJ_STG_CTL_ID	12	Y	N	This must correspond with the prime key of the related CI_ADJ_STG_CTL record.
CHAR_TYPE_CD	8	Y	A/N	This must correspond with a characteristic type that is defined as valid for **adjustment staging control**. Refer to *Setting Up Characteristic Types & Their Values* for more information.
SEQ_NUM	3	Y	N	This should be set to **10** unless you have multiple values for a given adjustment staging control and characteristic type.
CHAR_VAL	16	N	A/N	Populate this field if your *characteristic type* is **predefined**.
ADHOC_CHAR_VAL	254	N	A/N	Populate this field if your *characteristic type* is **ad-hoc** or **file location**.
CHAR_VAL_FK1 - CHAR_VAL_FK5	50 each	N	A/N	Populate these fields if your *characteristic type* is **foreign key reference**. Up to five columns of 50 bytes each are provided to accommodate compound keys.

Adjustment Upload Staging

You must create an adjustment upload staging record for each adjustment you want to upload. The name of this table is CI_ADJ_STG_UP. The following describes each column on this table.

Column Name	*Length*	*Req'd*	*Data Type*	*Comments*
ADJ_STG_UP_ID	12	Y	N	This is the unique identifier of the adjustment upload staging record. This key is a sequential number so you can use a database function to assign the value when populating the table.
ADJ_STG_CTL_ID	12	Y	N	The ID of the adjustment staging control that is linked to this adjustment upload staging record.
ADJ_TYPE_CD	8	Y	A/N	This must correspond to the prime key of one of your adjustment types. Refer to *Setting up Adjustment Types* for more information.
ADJ_STG_UP_STATUS_FLG	4	Y	A/N	This must be set to **P** for **Pending**.
CREATE_DT	10	Y	Date	The date when the adjustment occurred.
ADJ_AMT	13.2	Y	N	The amount of the adjustment.
ADJ_SUSPENSE_FLG	4	Y	N	This must be set to **NSUS** for **Not In Suspense**.
SA_ID	10	N	A/N	This must correspond to a valid obligation in the system. If you leave this blank and opt to let the system find the obligation during adjustment upload preprocessing, a **Determine Obligation** algorithm must be plugged in on the associated adjustment type. This plug-in is meant to derive the obligation ID based on supplied miscellaneous information - e.g. information supplied via adjustment characteristic upload staging.
ADJ_ID	10	N	A/N	Leave this blank. The adjustment upload process populates this.
SUSPENSE_ADJ_ID	10	N	A/N	Leave this blank. The adjustment upload process populates this.
MESSAGE_CATEGORY	5	N	N	Leave this blank. The adjustment upload background processes populate this when an error occurs during upload.
MESSAGE_NBR	5	N	N	Leave this blank. The adjustment upload background processes populate this when an

	error occurs during upload.

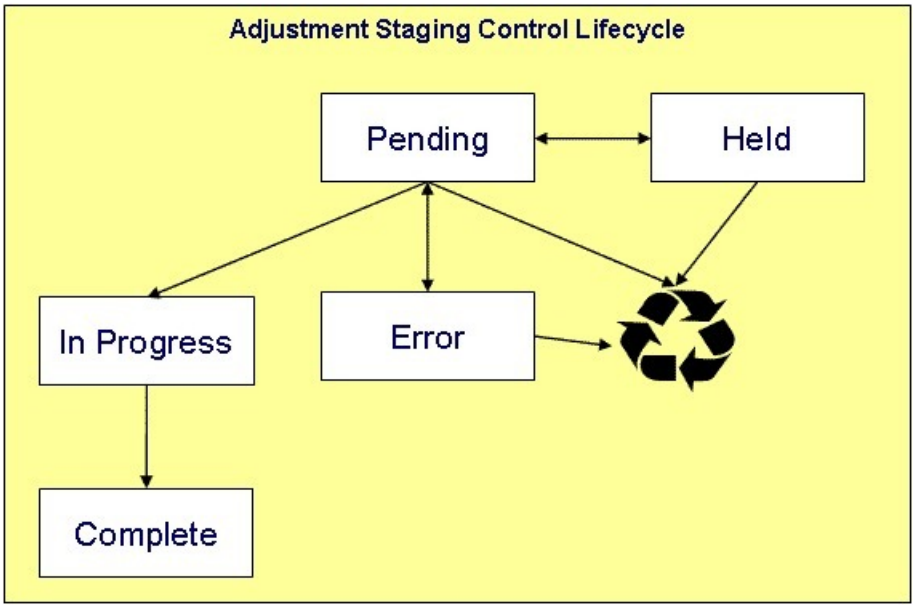
Adjustment Characteristic Upload Staging

You must create an adjustment characteristic upload staging record for each characteristic that you would like to link to the adjustment upload staging and copied to the resulting adjustment. The name of this table is CI_ADJ_STG_UP_CHAR. The following describes each column on this table.

Column Name	*Length*	*Req'd*	*Data Type*	*Comments*
ADJ_STG_UP_ID	12	Y	N	This must correspond with the prime key of the related CI_ADJ_STG_UP record.
CHAR_TYPE_CD	8	Y	A/N	This must correspond with a characteristic type that is defined as valid for **Adjustment**. And must be defined as valid for the adjustment type. Refer to *Adjustment Type Controls Adjustment Characteristics* for more information.
SEQ_NUM	3	Y	N	This should be set to **10** unless you have multiple values for a given adjustment upload staging and characteristic type.
CHAR_VAL	16	N	A/N	Populate this field if your *characteristic type* is **predefined**.
ADHOC_CHAR_VAL	254	N	A/N	Populate this field if your *characteristic type* is **ad-hoc** or **file location**.
CHAR_VAL_FK1 - CHAR_VAL_FK5	50 each	N	A/N	Populate these fields if your *characteristic type* is **foreign key reference**. Up to five columns of 50 bytes each are provided to accommodate compound keys.

The Lifecycle of an Adjustment Staging Control Record

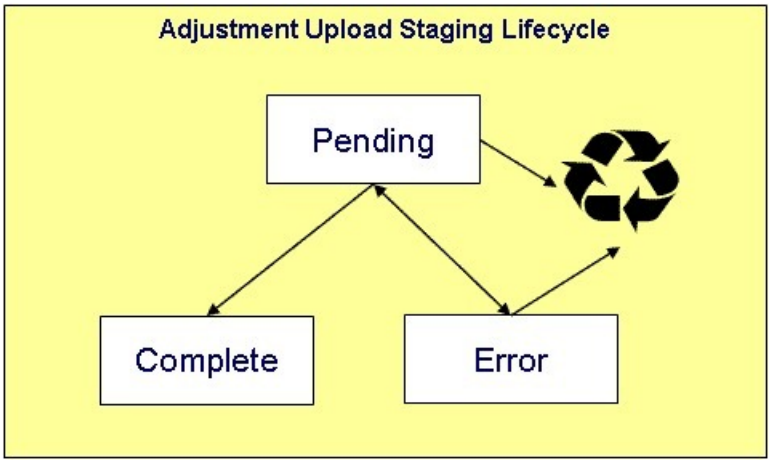
The following diagram shows the possible lifecycle of an adjustment staging control record.



- **Pending.** An adjustment staging control record is created in this state. The **C1-ADUP1** process selects **pending** adjustment staging control records for validation.
- **In Progress.** The **C1-ADUP1** process sets a **pending** record to **in progress** when the totals on the adjustment staging control are successfully validated against the totals from the associated adjustment upload staging records.
- **Complete**. The **C1-ADUP2** process sets the adjustment staging control's status to **complete** when all adjustment upload staging records linked to the adjustment staging control are **complete**.
- **Error.** The **C1-ADUP1** process sets a **pending** record to **error** if the adjustment staging control fails validation. The status may be set back to **pending** after the error is fixed.
- **Held.** The **held** status is available for situations where you want to prevent or delay the upload of a batch of adjustment staging records. The status may be set back to **pending** when the batch of records is ready for upload.
- **Pending, error** and **held** records may be deleted.

The Lifecycle of an Adjustment Upload Staging Record

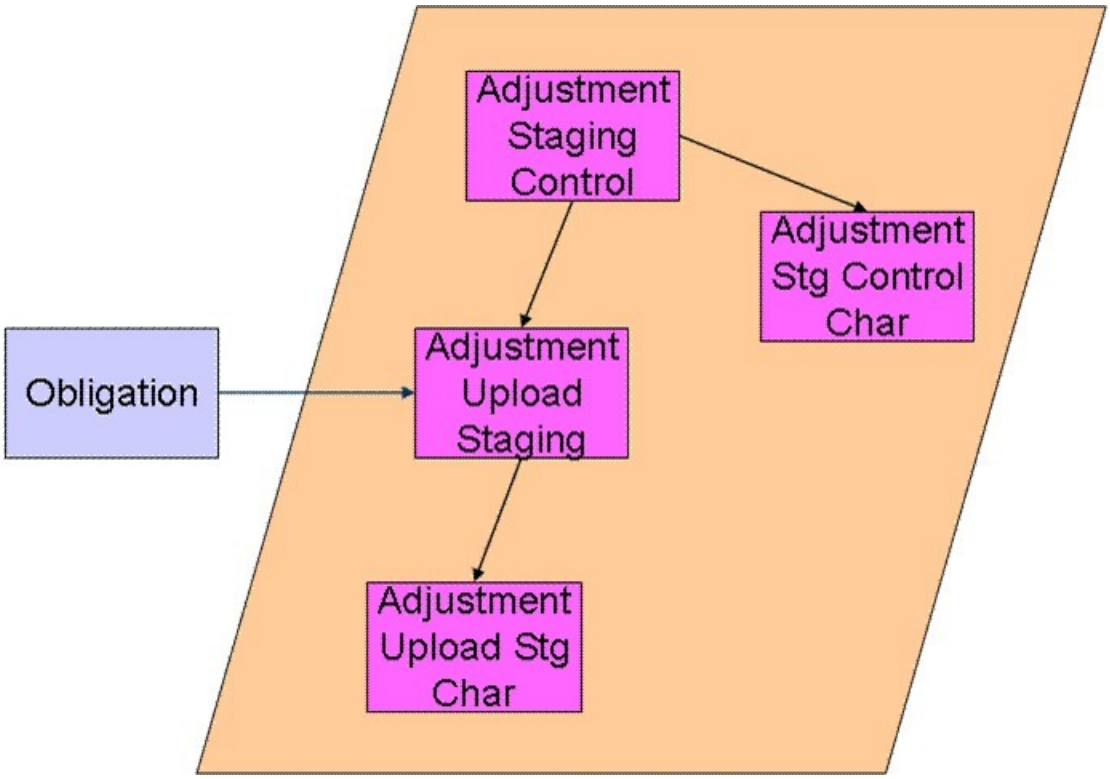
The following diagram shows the possible lifecycle of an adjustment upload staging record.



- **Pending.** Adjustment upload records are created in this state. The **C1-ADUP2** process selects **pending** adjustment upload records and creates adjustments for each of them.
- **Complete.** The **C1-ADUP2** process sets a **pending** record to **complete** if an adjustment is successfully created.
- **Error.** Either **C1-ADUP1** or **C1-ADUP2** process sets **pending** record to **error** when it encounters an error during the upload process. The status may be set back to **pending** after the error is fixed.
- **Pending** and **error** records may be deleted.

Process C1-ADUP1 - Preprocess Adjustment Uploads

The batch process identified by batch process ID **C1-ADUP1** refers to the background process that validates adjustment staging control records and populates obligation IDs on adjustment upload staging records that do not specify an obligation ID.



Phase 1 - Validate Adjustment Staging Controls

The following points describe, at a high level, the first phase of the adjustment upload pre-process:

For each **Pending** adjustment staging control,

- Check that the record count on the adjustment staging control record equals the number of adjustment upload staging records that are linked to the adjustment staging control.
- Check that the total adjustment amount on the adjustment staging control record equals the sum of the adjustment amounts from the adjustment upload staging records that are linked to the adjustment staging control.
- If the adjustment staging control passes validation, set its status to **In Progress**. Otherwise, set the status to **Error**. Create a To Do entry using the inputs To Do type and To Do role (if supplied) for adjustment staging control errors. (Complete any outstanding To Do entries for the adjustment staging control before creating a new To Do entry.)

- If no errors occur, perform To Do cleanup by completing any outstanding To Do entries that were previously created for the adjustment staging control.

NOTE: You can fix errors by going to the To Do entry and drilling into the adjustment staging control page. Don't forget to change the adjustment staging control's status back to **Pending** after fixing the error.

Phase 2 - Populate Obligation ID

The following points describe, at a high level, the second phase of the adjustment upload pre-process:

For each **Pending** adjustment upload staging that is linked to an **In Progress** adjustment staging control and does not have the obligation ID,

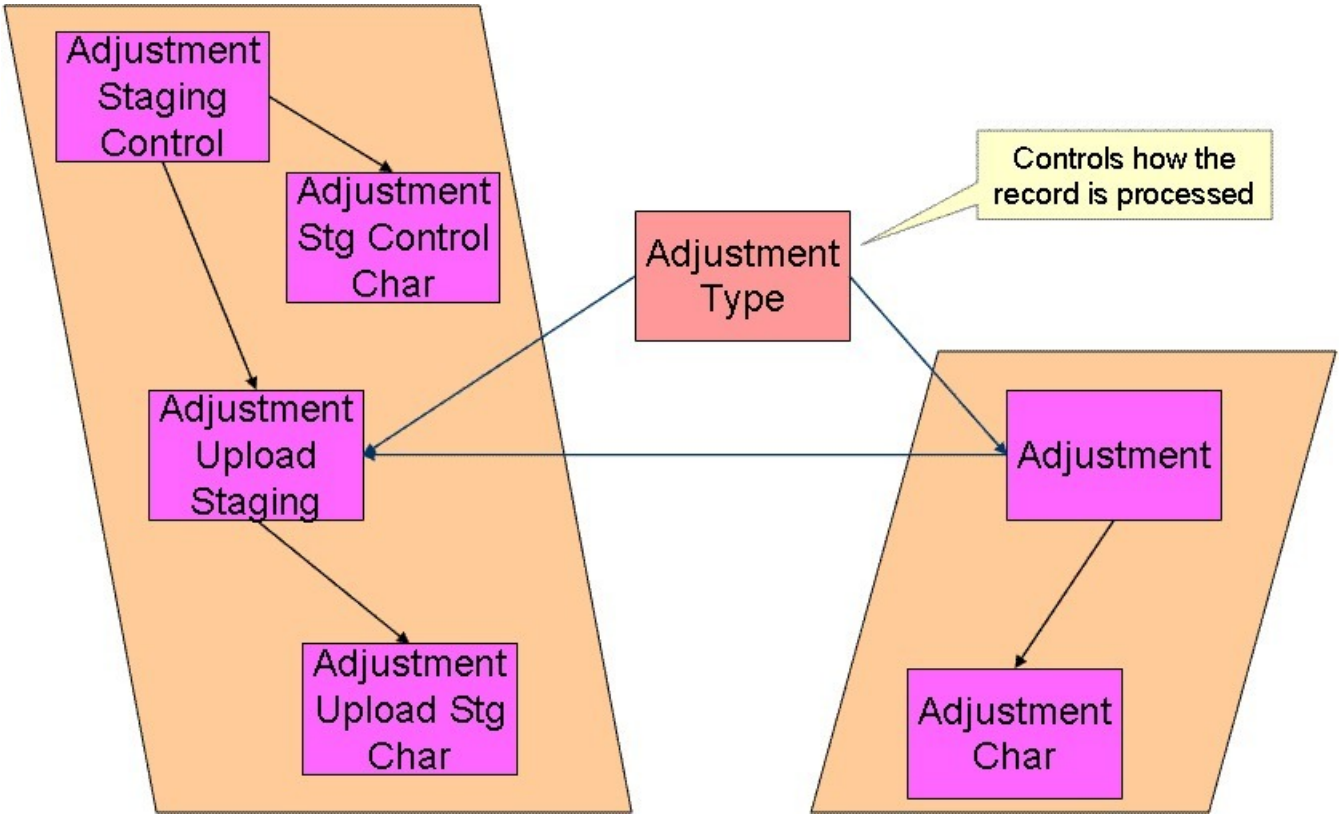
- Execute the **Determine Obligation** algorithm that is plugged in on the *adjustment type*.
- If the algorithm returns a valid obligation ID, stamp that obligation ID onto the adjustment upload staging. If the algorithm also returns an indication that the adjustment is to be put into suspense, set the suspense flag on the adjustment upload staging to **In Suspense**. Refer to *Suspense Adjustments* for more information on how suspense adjustments are handled.
- If the algorithm returns an error, set the adjustment upload staging record's status to **Error**. Create a To Do entry using the inputs To Do type and To Do role (if supplied) for adjustment upload staging errors. (Complete any outstanding To Do entries for the adjustment upload staging before creating a new To Do entry.)
- If no errors occur, perform To Do cleanup by completing any outstanding To Do entries that were previously created for the adjustment upload staging.

NOTE: You can fix errors by going to the To Do entry and drilling into the adjustment upload staging page. Don't forget to change the adjustment upload staging's status back to **Pending** after fixing the error.

Process C1-ADUP2 - Upload Adjustments

The batch process identified by batch process ID **C1-ADUP2** refers to the background process that creates adjustments for all adjustment upload staging records that are stamped with an obligation ID.

The following diagram and section describe, at a high level, the processing done in the **C1-ADUP2** background process.



- For each **Pending** adjustment upload staging that has an obligation ID,
- Add a frozen adjustment using the amount, creation date and adjustment type on the staging record. Populate the adjustment characteristics with the values in the adjustment characteristic upload staging records.

NOTE:
If the type of adjustment being uploaded is one that is calculated, the algorithm that's plugged in on the adjustment type will calculate the adjustment amount and generate associated calculation lines (if applicable). See *Calculated Adjustments* for more information.

- If adjustment creation is successful, update the adjustment ID on the staging record and set the staging record's status to **Complete**.
- If adjustment creation results in an error, set the staging record's status to **Error**. Create a To Do entry using the To Do type on which this batch process (**C1-ADUP2**) is defined as creation process. (Complete any outstanding To Do entries for the adjustment upload staging before creating a new To Do entry.)
- If no errors occur, perform To Do cleanup by completing any outstanding To Do entries that were previously created for the adjustment upload staging.

Suspense Adjustments

What Are Suspense Adjustments?

When the adjustment upload preprocessor is unable to identify a valid obligation ID, it can post the adjustment to a suspense obligation. This is similar to how a payment is posted to a suspense account when a valid account ID could not be identified during payment upload.

Putting adjustments in suspense is optional. Therefore, this logic sits in a plug-in spot. If suspense adjustments are applicable to you, you must plug in your suspense logic in a **Determine Obligation** algorithm on *Adjustment Type*.

How Are Suspense Adjustments Resolved?

A background process can be run periodically to automatically resolve suspense adjustments. Since rules for resolving suspense may vary, this logic sits in a plug-in spot. You must plug in your resolve logic in a **Resolve Suspense** algorithm on *Adjustment Type*.

Process C1-ADURS - Resolve Suspense Adjustments

The batch process identified by batch process ID **C1-ADURS** refers to the background process that resolves suspense adjustments.

For each adjustment upload staging that is **In Suspense**, execute the **Resolve Suspense** algorithm that is plugged in on the *adjustment type*.

Managing Bill Setup

Billing is one method used to establish assessments for bill-based tax types. Examples of these tax types include real property and vehicle taxes. The billing process is used when the revenue authority has the information required to calculate and assess charges for a taxpayer, in contrast to tax types where the taxpayer must file a tax return.

The topics in this section provide background information about a variety of billing topics.

The Big Picture of Bills

A bill is an object provided to support the calculation of charges to establish assessments. In particular, bills are designed for levying assessments based on the value of an asset. A bill references a single tax role, obligation and revenue period. An obligation may have more than one bill for the same period but the product does not expect two bills of the same type within the period.

A bill captures three key sets of information:

- Value details are the values that form the basis of the bill calculation. Value details will most commonly be derived from asset valuations.
- Calculation lines capture the results of the computation steps used to calculate the bill. In addition, they capture the information required to create bill segments.
- Bill segments record bill details from which the financial transactions can be created, including due dates and amounts.

The topics in this section highlight billing functionality.

How Are Bills Created?

Many asset based bills, such as property taxes, cover a single revenue year. They are usually created all at once and in advance to meet statutory requirements for notifying taxpayers However, other bill types may have differing cycles. Vehicle taxes, for example, may be billed on the anniversary of the registration date.

The product provides a batch process that will create pending bills for a given revenue period and tax type. It creates bills for all active tax roles for the tax type and it expects the appropriate obligation to already exist.

FASTPATH:

Your tax types may be configured to create obligations at the appropriate intervals. Refer to the section on maintaining obligations in *Configuring Tax Types* for more information.

Bill Lifecycle

Bills require information unique to the tax type, tax role and bill type in order to calculate charges. In addition, the business rules governing the applicable charges and the computations themselves can be complex. Unlike other system objects, the product does not expect bill details to be manually maintained. Instead the bill details and associated assessments are created by background processes invoked at specific times in the bill's lifecycle.

The product supports the following bill lifecycle, covering the most typical scenarios for billing:

- Bills are initially created in a **Pending** status with minimal information other than the tax role, obligation and revenue period.
- When bills transition to the **Generated** state, algorithms are invoked to capture the value details and create the calculation lines and bill segments that form the basis of the assessed charges.
- If generation is successful, the bills transitions directly to the **Ready To Complete** state.
- If there are any bill generation exceptions, the bills transitions to the **Error** state for manual correction.
- When bills transition to the **Completed** state, algorithms are invoked to finalize the bill. The product expects that the algorithms that create financial transactions for the bill's obligation will be invoked at this time.
- If a bill needs to be reversed, it must be manually transitioned to the **Canceled** state. The product expects that the algorithms that reverse the financial transactions for the bill will be invoked at this time.

Refer to the base business object for bills **C1-TaxBill** for more details.

Bill Types and Algorithms

The processing required at the various stages of the bill's lifecycle is performed by algorithms linked to the bill type. This allows for various business use cases for different bill and tax types to be implemented without requiring different business objects. A specific business object for a bill type is only required if there are explicit elements that need to be provided for a given use case.

Bill types are associated with specific tax types, to provide control over the bill types that may be generated for a tax role.

Using The Calculation Engine With Bills

The bill object is designed to support the use of the calculation engine to handle the creation of the calculation lines that make up the bill. Bills can reference a calculation control version that defines the calculations to be performed.

The base batch process that creates bills refers to configuration on the tax role to determine the appropriate calculation control version.

FASTPATH:
Refer to *Defining Calculation Engine Options* for more information on using calculation rules to compute bill charges.

Using The Batch Control Group

Some revenue authorities choose to process bills in groups based on criteria specific to their business practice.

The base batch process that monitors and processes bills provides the ability to select which bills are processed based on the value of the batch control group field on the bill. Multiple control groups can be selected for inclusion or exclusion based on the batch parameter setting.

The product expects that the batch control group is maintained on the bill either manually or via a custom batch process for that identifies bills for grouping based on your implementation's business rules.

Configuring Bills

The topics in this section describe configuration requirements.

In addition, your implementation should read the detailed description for the base product business objects provided for Bill Type (**C1-TaxBillType**).

Configuring Bill Type Algorithms

The system provides four plug-in spots on the bill type to perform logic that is specific to maintaining a bill of that type.

- The generation plug-in is executed when transitioning a bill of this type from pending to generated. It is responsible for ensuring that the bill is ready for completion. In particular, algorithms for this plug in are responsible for populating the bill value details, calculation lines and bill segments.

  NOTE: Base plug-ins. Click *here* to see the algorithms types available for this system event.

- The determine due dates plug-in is executed from within the algorithm responsible for creating bill segments and is responsible for determining the number of bill segments / installments for the bill and their due dates.

  NOTE: Base plug-ins. Click *here* to see the algorithms types available for this system event.

- The completion plug-in is executed when transitioning a bill of this type from generated to completed. It is responsible for ensuring that the bill is finalized. In particular, algorithms for this plug in spot are responsible for creating financial transactions from bill segments.

  NOTE: Base plug-ins. Click *here* to see the algorithms types available for this system event.

- The cancellation plug-in is executed when transitioning a bill of this type from completed to canceled. It is responsible for ensuring that the bill is reversed. In particular, algorithms for this plug in spot are responsible for creating cancellation financial transactions from bill segments.

  NOTE: Base plug-ins. Click *here* to see the algorithms types available for this system event.

Setting Up Bill Types

A Bill Type defines the configuration information that is common to bills of a given type. The type of information captured on the bill type is governed by the bill type's business object.

To set up a Bill Type, select **Admin** > **Bill Type**.

The topics in this section describe the base-package zones that appear on the Bill Type portal.

Bill Type List

The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent bill type.
- The standard actions of **Edit, Duplicate** and **Delete** are available for each bill type.

Click the **Add** link in the zone's title bar to add a new bill type.

Bill Type

The Bill Type zone contains display-only information about a bill type. This zone appears when a bill type has been broadcast from the Bill Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference C1_TAX_BILL_TYPE.

Billing Batch Jobs

The following batch job must be run to progress bill.

- **C1-TBMDF** (Bill Deferred Monitor with Date). This batch job performs standard transitioning logic to progress bills to the next state. It provides additional selection criteria based on monitor date, tax type and batch control group

Managing Payment Setup

The topics in this section describe maintenance transactions related to payment topics.

> **FASTPATH:**
> Refer to *Tender Management and Workstation Cashiering* before setting up the control tables described in this section.

Setting Up Payment Segment Types

Every obligation references an obligation type. Among other things, the obligation type references a payment segment type. The payment segment type controls how payment segments and their related financial transactions are created. To set up payment segment types, open **Admin** > **Payment Segment Type**.

Description of Page

Enter an easily recognizable **Payment Segment Type** and **Description** for every type of payment segment.

> **FASTPATH:**
> For more information about the source of the distribution codes on financial transactions, see *The Source Of GL Accounts On Financial Transactions*.

For each payment segment type, define the **Payment Segment Fin Algorithm**. The logic embedded in this algorithm constructs the actual financial transaction associated with the payment segment. Refer to *Examples of Common Payment Segment Types* for examples of how algorithms are used on common payment segment types.

If you haven't done so already, you must set up this algorithm in the system. To do this:

- Create a new algorithm (refer to *Setting Up Algorithms*).
- On this algorithm, reference an Algorithm Type that constructs the payment segment financial transaction in the appropriate manner. Click *here* to see the algorithm types available for this plug-in spot.

> **FASTPATH:**
> For more information about current and payoff amount, see *Current Amount versus Payoff Amount*.

Examples of Common Payment Segment Types

The following table shows several classic payment segment types used by many organizations:

Payment Segment Type	*Payment Segment Financial Transaction Algorithm*
Normal payment (if you practice accrual accounting). Refer to *Accrual versus Cash Accounting* for more information.	*Payoff = Pay Amount / Current = Pay Amount (no cash accounting)*
Normal payment (if you practice cash accounting). Refer to *Accrual versus Cash Accounting* for more information.	*Payoff = Pay Amount / Current = Pay Amount (plus Cash Accounting)*
Charity payment	*Payoff =0 / Current = Pay Amount (the GL is affected)*

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_PAY_SEG_TYPE*.

Setting Up Tender Types

Tender types are used to indicate the method in which the tender was made. A unique **Tender Type** must exist for every type of tender that can be remitted. For example, if you allow cash, checks, direct debits from a checking account, and direct debits from a credit card to be tendered, you'd need the following tender types:

Tender Type	*Description*	*Like Cash*	*Generate Auto Pay*	*Require External Source ID*	*Require Expiration Date*	*External Type*
CASH	Cash	Yes	No	N/A	N/A	N/A
CHEC	Check	No	No	N/A	N/A	N/A
OVUN	Cash drawer - over/under	No	No	N/A	N/A	N/A
DDCH	Direct debit - checking	No	Yes	Yes	No	***Checking withdrawal***
CRED	Direct debit - credit card	No	Yes	No	Yes	***Credit card withdrawal***

Go to **Admin** > **Tender Type** to define your tender types.

Description of Page

Enter a unique **Tender Type** and **Description** for the tender type.

Turn on the **Like Cash** switch if this tender type is cash or the equivalent of cash. This indicator controls if the system generates a warning if a cash-only account remits a tender other than cash. It is also used to generate a warning for online cashiers to turn in their tenders when the cash-like amount exceeds the maximum amount balance defined for the *tender source*.

Turn on **Generate Auto Pay** if this type of tender causes an automatic payment request to be routed to a financial institution. For example, this switch will be on if this tender type is used for direct debits from a taxpayer's checking account (because every tender of this type will have an automatic payment request created when the tender is created).

The following fields are only used for tender types associated with automatic payments:

- **External Type** is used by the background process that creates the information that is interfaced to the automatic payment source. Specifically, it controls the record type associated with the different types of automatic payments that are routed to the automated clearinghouse (ACH).

NOTE: The values for this field are customizable using the Lookup table. This field name is EXT_TYPE_FLG.

- **External ID Required** indicates if an Auto Pay Source that references this type of tender must contain an External Source ID. The External Source ID is the unique identifier of the financial institution to which the automatic payment will be routed.

  This switch is typically turned on for tender types associated with checking / saving direct debits. It is turned off for tender types associated with credit card debits (you don't need an external source for a credit card debit; you just need the credit card number).
- **Expiration Date Required** indicates if an Auto Pay option that references an Auto Pay source that references this type of tender must also contain an expiration date (e.g., automatic debit / credit cards).

  Turn this switch off for tender types associated with checking / saving direct debits.

Turn on **Allow Cash Back** if the system should automatically calculate a cash back amount when a tender is remitted for this tender type and the amount tender exceeds the amount being paid.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_TENDER_TYPE*.

Setting Up Tender Sources

A unique **Tender Source** must exist for every potential source of funds. For example,

- Every cashiering station will have a unique tender source.
- Every lock box will have a unique tender source.
- Your remittance processor will have a unique tender source.
- If you allow taxpayers to pay bills automatically (e.g., via EFT), you'll need a tender source for each institution to which you route automatic payment requests. For example, if you route automatic payment requests to the automated clearinghouse (ACH), you'll need a tender source for the ACH.

For example, if you have 3 lock boxes, 2 cash drawers at an area office A, 2 cash drawers at area office B, and a single remittance processor, you'd need the following tender sources:

Tender Source	*Type*	*External Source ID (Lockbox ID)*	*Default Starting Balance*	*Currency Code*	*Suspense Obligation*
CASH-A01	Cashiering	N/A	150.00	USD	N/A
CASH-A02	Cashiering	N/A	150.00	USD	N/A
CASH-B01	Cashiering	N/A	150.00	USD	N/A
CASH-B02	Cashiering	N/A	150.00	USD	N/A
LB-INDUS	Lockbox	112910-A	N/A	USD	9291019281
LB-COMM	Lockbox	938219-C	N/A	USD	4739837372
LB-RESID	Lockbox	372829-B	N/A	USD	1912910192
REMIT	Lockbox	N/A	N/A	USD	1920038437
ACH	Auto Pay	N/A	N/A	USD	N/A

To set up a tender source, select **Admin** > **Tender Source**.

Description of Page

Enter an easily recognizable **Tender Source** and **Description** for the tender source.

Define the **Tender Source Type**. Valid values are: **Ad Hoc, Auto Pay**, **Online Cashiering** and **Lockbox**. The system uses this information to prevent tender controls from different sources from being included under the same deposit control. In other words, you can't mix ad hoc, automatic payment, cashiering and lockbox tenders under the same deposit control.

FASTPATH:
For more information, refer to *Maintaining Deposit Controls*.

If the source is an external system (e.g., a lockbox or an automatic payment destination), use **External Source ID** to define the unique identifier of the source. The background process that interfaces tenders from this source uses this information to create the appropriate tender control when it interfaces payments from external sources.

If this source is a cash drawer, define the **Default Starting Balance**. This balance is defaulted onto new tender controls and may be overridden.

NOTE:
The tender type of the **Start Balance** is defined on the installation record.

If this source is a cash drawer, define the **Max Amount Balance**. When the amount of *cash-like* tenders in a cash drawer exceeds this balance, a warning is issued to remind the cashier to turn in some of the funds to a tender control.

Define the **Currency Code** of tenders linked to this source. All tenders in a source must be of the same currency.

If this tender source is associated with payments that are *interfaced from an external source* (e.g., a lockbox or a remittance processor), use Suspense **Obligation** to define the obligation whose account will hold uploaded payments with an invalid account. Refer to *Payment Upload Error Obligations* for more information about suspense obligations. Also note, because the payment upload process simply books payments that reference invalid accounts to the account associated with this obligation, this account should belong to an account type with the appropriate payment distribution algorithms. This may entail creating a new account type that will only be used on these "suspense accounts". This account type would need the following algorithms:

- We'd recommend using a simple payment distribution algorithm like *PYDIST-PPRTY* (distribute payment based on obligation type's payment priority).
- We'd recommend using an overpayment distribution algorithm like *OVRPY-PPRTY* (distribute overpayment to highest priority obligation type).

Define the **Bank Code** and **Bank Account** into which the tender source's moneys will be deposited. The bank account defines the distribution code used to build the GL details for the payment. Refer to *The Source of GL Accounts on Financial Transactions* for more information. Note that the bank code and bank account can later be overwritten when entering Tender Deposits on *Deposit Control*.

If this tender source is associated with payments that are *interfaced from an external source*, for example tender sources associated with **Auto Pay** and **LockboxTender Source Types**, the information is also used as follows:

- The *payment upload process* uses this information to populate the bank and bank account when it creates deposit control records for the tender controls it creates during the interface. Refer to *Managing Payments Interfaced From External Sources* for more information.
- The *automatic payment interface* uses this information to populate the bank and bank account when it creates deposit control records for the tender controls it creates during the interface.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_TNDR_SRCE*.

Setting Up Payment Cancellation Reasons

Open **Admin** > **Pay Cancel Reason** to define your payment cancellation reason codes.

Description of Page

Enter an easily recognizable **Cancel Reason** and **Description** for the payment cancellation reason.

Cancel Activated Auto Pay indicates whether or not a payment tender with an activated (i.e. stamped with the extract batch code and next run number) auto pay staging record can be canceled. During tender cancellation, if the selected Cancel Reason has this indicator set to **Allowed**, the tender is canceled. (The auto pay staging record is kept, but its scheduled extract date and distribution/freeze date are removed.) If the selected Cancel Reason has this indicator set to **Not Allowed**, tender cancellation will issue an error.

Turn on the **NSF Charge** switch if the system should invoke the non-sufficient funds (NSF) algorithm when a tender is cancelled using this reason code. Refer to *NSF Cancellations* for more information.

The following fields are used to change an account's compliance rating if a tender is canceled using the respective reason code.

- Use **Affect Compliance Rating By** to define how tenders canceled using this reason will affect the account's compliance rating. This should be a negative number. A taxpayer's compliance rating is equal to the start compliance rating amount defined on the installation record plus the sum of compliance rating demerits that are currently in effect.
- Use **Months Affecting Compliance Rating** to define the length of time the demerit remains in effect. This information is used to define the effective period of the compliance rating demerit record.

FASTPATH:
For more information, refer to *Account - Collections*.

NOTE:
The payor gets the compliance rating hit. When you cancel a tender you must specify a cancellation reason. If the cancellation reason indicates a compliance rating demerit should be generated, the system levies the compliance rating transaction on the payor's account.

The **System Default Flag** is specified on those cancellation reasons that are placed on payment segments that are automatically cancelled by the system. This processing only applies if your implementation uses bills created using Classic Billing functionality. Valid values are: **Re-opened Bill**. The **Re-opened Bill** value is used as follows:

- Payments are automatically created for accounts who pay their bills automatically when their bills are completed.
- If such a bill is reopened before the automatic payment is interfaced to the paying authority, the system automatically cancels the payment. The **Re-opened Bill** cancellation reason is placed on such payments.

Automatic Payment Options

If your taxpayers can pay their bills automatically (via direct debit or credit card debits), you'll need to set up the various control tables described in this section.

FASTPATH:
Refer to *Automatic Payments* for more information about how automatic payments are handled in the system.

Setting Up Auto-Pay Route Types

Auto Pay Route Types are used to control when and how automatic payment requests are routed to a financial institution, and when the general ledger is impacted. Select **Admin** > **Auto Pay Route Type** to define your route types.

Description of Page

To modify an auto pay route type, simply move to a field and change its value.

To add a new route type, press + to insert a row, then fill in the information for each field. The following fields display:

- **Route Type** is the unique identifier of the route type.
- **Description** is the description of the route type.
- **Tender Source** is the tender source to use when creating a tender control for the payments. The background process that routes automatic payment requests to a financial institution (e.g., the automated clearing house interface) will mark each automatic payment's associated tender with a tender control for audit and control purposes. The following points describe how this happens:
  - When the system sees that it's time to send an automatic payment to a financial institution, it looks at the automatic payment's auto pay source.
  - Every auto pay source references an auto pay route type.
  - Every auto pay route type references a tender source.
  - A **Tender Source** has a tender control for each group of tenders deposited / interfaced together one batch.
  - The system marks each automatic payment's associated tender with the latest tender control for the **Tender Source**. The system will create a new tender control each time it routes automatic payments to the tender source. Refer to *Managing Payments Interfaced From External Sources* for more information about tender source and tender control.
- **Extract Batch Code** defines the background process that interfaces the automatic payment requests to the financial institution.
- **Auto Pay Date Calculation Alg** populates 3 dates associated with the automatic payment: 1) the date the automatic payment will be sent to the financial institution, 2) the date the general ledger will be impacted by the automatic payment, 3) the date of the payment.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_APAY_RT_TYPE*.

Setting Up Auto-Pay Source Codes

A unique **Auto Pay Source** must exist for every bank / credit card company / bill payment service that your taxpayer's use as the source of the funds when they sign up for automatic payment. For example,

- Every bank will have a unique auto pay source.
- Every credit card company will have a unique auto pay source.

To set up an auto pay source, select **Admin** > **Auto Pay Source Type**.

Description of Page

Enter an easily recognizable **Auto Pay Source Code** and **Description** for the auto pay source.

The **Source Name** is the name of the financial institution.

When the system creates an automatic payment request, it also creates an associated payment tender. This tender (like all tenders) must have a tender type. This field defines the **Tender Type** associated with this auto pay source's tenders. Refer to *Setting Up Tender Types* for more information.

The **External Source ID** is the unique identifier of the financial institution to which the automatic payment will be routed (e.g., the bank routing ID of the bank). This field is typically blank on automatic payments routed to credit card companies because the credit card company doesn't have an external source ID (whereas direct debits from banks must have a bank routing number). Whether this field is required is controlled by the **Tender Type**.

The **Auto Pay Route Type** controls when and how automatic payment requests get routed to a financial institution. It also controls when the general ledger is impacted by the automatic payments financial transaction. Refer to *Setting Up Auto-Pay Route Types* for more information.

The **Work Calendar** defines the financial institution's workdays. This information is used to determine the date on which automatic payment requests will be sent to the financial institution. Refer to *Setting Up External Workday Calendars* for more information.

The **Validation Algorithm** defines how the system validates the taxpayer's account ID at the financial institution. If you haven't done so already, you must set up this algorithm in the system. To do this:

- Create a new algorithm (refer to *Setting Up Algorithms*).
- On this algorithm, reference an Algorithm Type that validates the taxpayer's account ID at the financial institution. Click *here* to see the algorithm types available for this plug-in spot.

Refer to *Account - Auto Pay* for more information.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_APAY_SRC*.

SEPA Payments

The topics in this section provide background information about Single Euro Payments Area (SEPA) payment functionality.

> **NOTE:**
> **This section is only relevant for some organizations.** The system configuration requirements described in this section are only relevant if your organization is a participant in SEPA payment transactions such as direct debit collections.

What Is SEPA?

SEPA (Single Euro Payments Area) is a European Union (EU) integration initiative that is aimed at streamlining processes that are related to cross-border payments.

SEPA consists of the EU member states plus a few additional countries. In SEPA, customers can make electronic Euro payments within and across these countries under the same rights and obligations.

SEPA payment services are based on global ISO (International Organization for Standardization) standards.

SEPA Direct Debit

The SEPA Direct Debit (SDD) scheme allows a creditor to collect money from the debtor, with prior approval from the debtor.

The direct participants are the following:

- Creditor
- Creditor's bank
- Debtor
- Debtor's bank

The debtor and creditor must each hold an account with a payment service provider located within SEPA. The accounts may be in Euro or in any other SEPA currency. However, the transfer of funds between the debtor's bank and the creditor's bank always takes place in the Euro currency.

The indirect participants are the following:

- Clearing and Settlement Mechanisms (CSMs) such as an automated clearinghouse
- Intermediary Banks that offer intermediary services to debtor banks and/or creditor banks

SEPA Direct Debit Mandate
The mandate is the consent and authorization that the debtor gives to the creditor, to allow the creditor to initiate direct debit collections. The creditor is responsible for storing the original mandates, together with any amendments relating to the mandate or information regarding its cancellation or lapse.

The topics in this section describe how mandates are issued and canceled.

Issuing A Mandate
The creditor initiates the issuance of a mandate by sending the mandate form (either paper or electronic) to the debtor with the creditor information filled in. The creditor information includes the creditor's unique identifier as a SEPA creditor. An ISO standard specifies the structure of the creditor identification, which includes country code, a check digit, the creditor's business code and a country-specific identifier for the creditor.

The creditor ensures that the mandate form contains the mandatory legal wording and the mandatory set of information, as specified in the standards.

The debtor must ensure that the required information is supplied and that the mandate is signed, either in writing or electronically. The mandatory debtor information includes the debtor's international bank account number (IBAN) and bank identifier code (BIC).

The creditor assigns a unique reference for the mandate and provides that reference to the debtor before the first initiation of a collection. The debtor can then use both the unique mandate reference and the creditor identification to verify the bank transactions.

Canceling A Mandate
A mandate can be canceled by either the debtor or the creditor, without the involvement of either bank.

SEPA Master Configuration

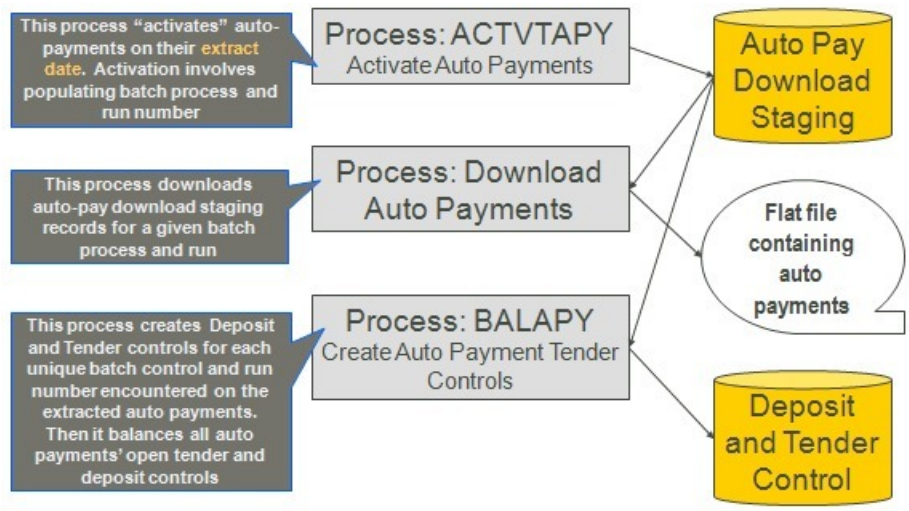
The SEPA Master Configuration contains general information that SEPA extract processes need to format into the output file. This information includes constants and other specific information that identifies the tax authority as a SEPA creditor/debtor.

The base product provides a business object for SEPA Master Configuration, **C1-SEPAMasterConfiguration.**

For details on how to set up master configurations, refer to *Defining Master Configuration* in the Framework help.

Downloading Automatic Payments and Interfacing Them To The GL

The following diagram illustrates the background processes that interface automatic payment out of the system:



The base product provides two options for extracting auto pay staging records - APAYACH (for ACH payments) or C1-SDDCE (for SEPA payments).

The auto pay background processes are described in the following topics.

ACTVTAPY - Activating Automatic Payments

When an automatic payment is first created, it gets marked with an extract date. The extract date is the date the automatic payment will be downloaded to the respective financial institution. The extract date is determined as follows:

- Every automatic payment references an auto pay source.
- Every auto pay source references an auto pay route type.
- Every auto pay route type contains an algorithm that calculates this date.

On the extract date, the automatic payment is "activated". The automatic payment is activated is marked for download the next time its download process runs. An automatic payment's download process is defined on its auto pay source's route type.

APAYACH - Download Automatic Payments To The ACH (automated clearing house)

This process reads all auto pay download staging records marked with a given batch control ID & run number and creates the flat file that's passed to the ACH. Refer to *ACH Record Layouts* for the details of the record layouts.

NOTE: You can rerun this process. You can reproduce the flat file at any time. Simply request this job and specify the run number associated with the historic run.

If you require a different flat file format, you must create a customized extract program. This program may be used as a starting point.

ACH Record Layouts

The topics in this section describe the layout of the records created by *APAYACH - Download Automatic Payments To The ACH (automated clearing house)*.

File Header Record

The ACH extract flat file must have one record of this type and it must be the first logical record on file.

Field Name	*Format*	*Source/Value/Description*
RECORD-TYPE	A1	"1"
PRIORITY-CD	A2	"01"
RESERVED-01	A1	Spaces
IMMEDIATE-DESTINATION	A9	CI_BANK_ACCOUNT.DFI_ID_NUM
COMPANY-ID	A10	CI_BANK_ACCOUNT.ACCOUNT_NBR
FILE-CRE-DT	A6	YYMMDD. Current date
FILE-CRE-TM	A4	HHMM. Current time
FILE-ID-MODIFIER	A1	"A"
RECORD-SIZE-CONST	N3	"094" The "FILLER" at the end of all but the Entry Detail Record serves to bring the total length of each record up to this constant.
BLOCKING-FACTOR	N2	"10"
FORMAT-CD	A1	"1"
ORIG-FIN-INST-NAME	A23	CI_BANK_L.DESCR
COMPANY-NAME	A23	CI_BANK_ACCOUNT_L.DESCR
REFERENCE-CD	A8	Spaces

Company Batch Header Record

The ACH extract flat file must have one record of this type and it must be the second logical record on file.

Field Name	*Format*	*Source/Value/Description*
RECORD-TYPE	A1	"5"
SERVICE-CLASS-CD	A3	"200"
COMPANY-NAME	A16	CI_BANK_ACCOUNT_L.DESCR
COMPANY-DISCRETIONARY	A20	Spaces
COMPANY-ID	A10	CI_BANK_ACCOUNT.ACCOUNT_NBR
STD-ENTRY-CLASS	A3	"PPD"
CO-ENTRY-DESCR	A10	"PAYMENT"
COMPANY-DESCR-DT	A6	Business process date
EFF-ENTRY-DT	A6	Business process date
RESERVED-01	A3	Spaces
ORIGINATOR-STAT-CD	A1	"1"
ORIGIN-DFI-ID	A8	CI_BANK_ACCOUNT.DFI_ID_NUM
BATCH-NBR	N7	The batch number of this batch within the file.

Entry Detail Record

The ACH extract flat file must have one record of this type for every direct debit record.

Field Name	*Format*	*Source/Value/Description*
RECORD-TYPE	A1	"6"
TRANSACTION-CD	A2	If the amount is a debit, this is set to CI_TENDER_TYPE.EXT_TYPE_FLG. If the

Field Name	Format	Source/Value/Description
		amount is a credit, this is set based on the external type flag as follows: • If the value is Checking Withdrawal (**27**), this is set to **22** (Checking Deposit) • If the value is Savings Withdrawal (**37**), this is set to **32** (Savings Deposit) • If the value is Credit Card Withdrawal (**47**), this is set to **42** (Credit Card Deposit)
TRANSIT-RTG-NBR	A9	CI_APAY_SRC.EXT_SOURCE_ID
DFI-ACCT-NBR	A17	CI_APAY_CLR_STG.EXT_ACCT_ID
AMOUNT	N8.2	CI_PAY_TNDR.TENDER_AMT
INDIVIDUAL-ID	A15	CI_PAY_TNDR.PAYOR_ACCT_ID
INDIVIDUAL-NAME	A22	CI_APAY_CLR_STG.ENTITY_NAME
DISCRETIONARY-DATA	A2	Spaces
ADDENDA-REC-IND	A1	"0"
TRACE-NBR	N15	"000000000000000"

NOTE:
External Account ID. The EXT_ACCT_ID field supports up to 50 characters. If the value entered in the field is longer than that supported by the record layout (17 characters), the value will be truncated.

Company Batch Control Record

The ACH extract flat file must have one record of this type and it must follow the Entry Detail records.

Field Name	Format	Source/Value/Description
RECORD-TYPE	A1	"8"
SERVICE-CLASS-CD	A3	"200"
ENTRY-ADDENDA-CNT	N6	The total number of entry detail records in this batch.
ENTRY-HASH	N10	The product of the first 8 digits of the external source id of the auto pay source, multiplied by the number of entry detail records in the batch.
TOTAL-DR-DOLLAR-AMT	N10.2	Total tender amounts of the entry detail records.
TOTAL-CR-DOLLAR-AMT	N10.2	Zero.
COMPANY-ID	A10	CI_BANK_ACCOUNT.ACCOUNT_NBR
RESERVED-01	A19	Spaces
RESERVED-02	A6	Spaces
ORIGIN-DFI-ID	A8	CI_BANK_ACCOUNT.DFI_ID_NUM
BATCH-NBR	N7	The batch number of this batch within the file.

File Control Record

The ACH extract flat file must have one record of this type and it must be the last logical record on file.

Field Name	Format	Source/Value/Description
RECORD-TYPE	A1	"9"
BATCH-CNT	N6	The number of batches in this file.

Field Name	Format	Source/Value/Description
BLOCK-CNT	N6	Calculation of the total number of records in the file / 10.0 + 0.9
ENTRY-ADDENDA-CNT	N8	The total number of entry detail records in this file.
ENTRY-HASH	N10	The sum of the entry hash values on all the batch control records in this file.
TOTAL-DR-DOLLAR-AMT	N10.2	Sum of the total debit entry dollar amounts of all the batches in this file.
TOTAL-CR-DOLLAR-AMT	N10.2	Sum of the total credit entry dollar amounts of all the batches in this file.
RESERVED-01	A39	Spaces

C1-SDDCE - Download SEPA Direct Debit Collections

This process reads all auto pay download staging records marked with the **C1-SDDCE** batch control code and a given run number and creates the flat file that's passed to the SEPA clearing and settlements mechanism. Refer to *SEPA Direct Debit Record Layouts* for details of the record layouts.

NOTE: You can rerun this process. You can reproduce the flat file at any time. Simply request this job and specify the run number associated with the historic run.

If you require a different flat file format, you must create a customized extract program. This program may be used as a starting point.

Refer to *Batch Process Dependencies* for more information on when this process is run.

SEPA Direct Debit Record Layouts

The topics in this section describe the layout of the records created by *C1-SDDCE - Download SEPA Direct Debit Collections.*

NOTE: The following record layouts are based on the CustomerDirectDebitInitiation message (pain.008.001.02) specifications, as described in the Payments Maintenance Message Definition Report in the ISO 20022 standards.

Group Header Record

The SEPA direct debit flat file must have one record of this type.

Since this record includes the number of transactions processed, this record is written at the end of the file after all transaction records have been processed.

NOTE:
The base product provides a data area **C1-SEPAGroupHeader** that contains the group header record layout. All fields are alphanumeric.

The following table lists the fields that the **C1-SDDCE** extract is mapping. To see the rest of the fields, refer to the data area's schema definition.

Field Name	Description	Source / Value
MsgId	Message Identification	SEPA Master Configuration: generalMasterConfiguration/ messageIdentification
CreDtTm	Creation Date/Time	System Date/Time

NbOfTxs	Number of Transactions	Computed at the end of extract processing
InitgPty/Nm	Initiating Party -Name	SEPA Master Configuration: Derived from the Initiating Party (Person).

Payment Information Record

The SEPA direct debit flat file must have one record of this type for every obligation. It includes one or more direct debit transactions.

NOTE:
The base product provides a data area **C1-SEPADirectDebitPaymentInfo** that contains the payment information record layout. All fields are alphanumeric.

The following table lists the fields that the **C1-SDDCE** extract is mapping. To see the rest of the fields, refer to the data area's schema definition.

Field Name	*Description*	*Source / Value*
PmtInfId	Payment Information Identification	From 'Payment Information Identification' characteristic value on Obligation, where the characteristic type is defined in the SEPA Master Configuration
PmtMtd	Payment Method	'DD'
PmtTpInf/SvcLvl/Cd	Service Level (Code)	‘SEPA’
PmtTpInf/LclInstrm/Cd	Local Instrument (Code)	SEPA Master Configuration: generalMasterConfiguration/localInstrument (i.e. ‘CORE’)
PmtTpInf/SeqTp	Sequence Type	Direct Debit Payment Type of the related Direct Debit Mandate.
ReqdColltnDt	Requested Collection Date	Payment Event.Effective Date
Cdtr/Nm	Creditor Name	SEPA Master Configuration: Derived from the Initiating Party (Person).
Cdtr/PstlAdr	Postal Address	SEPA Master Configuration: Derived from the Initiating Party (Person). If an address exists: StrtNm is mapped to Address1, PstCd is mapped to Postal (prefixed with State code, if applicable), TwnNm is mapped to City and Ctry is mapped to Country.
CdtrAcct/Id/IBAN	Creditor Account Identification	Bank Account.Account Number, where Bank Account is determined from the Tender Source of the Auto Pay Route Type that is associated with the **C1-SDDCE** extract process.
CdtrAgt/FinInstnId/BIC	Creditor Agent BIC	Bank Account.DFI ID. where Bank Account is determine from the Tender Source of the Auto Pay Route Type that is associated with the **C1-SDDCE** extract process.
CdtrSchmeId/Id/PrvtId/Othr/Id	Creditor Scheme Identification - Private Identification	SEPA Master Configuration: Derived from the Initiating Party (Person) using the Creditor ID Type specified in the master configuration.
DrctDbtTxInf/PmtId/EndToEndId	Direct Debit Transaction: Payment Identification - End To End Identification	Payment Tender.Payment Tender ID
DrctDbtTxInf/InstdAmt	Direct Debit Transaction: Instructed Amount	Payment Tender.Amount
DrctDbtTxInf/DrctDbtTx/MndtRltdInf/MndtId	Direct Debit Transaction: Mandate Identification	External Mandate Reference from the active Direct Debit Mandate of the account on the tender.
DrctDbtTxInf/DrctDbtTx/MndtRltdInf/DtOfSgntr	Direct Debit Transaction: Date of Signature	Effective Date from the active Direct Debit Mandate of the account on the tender.

DrctDbtTxInf/DrctDbtTx/MndtRltdInf/ ElctrncSgntr	Direct Debit Transaction: Electronic Signature	From the active Direct Debit Mandate of the account on the tender.
DrctDbtTxInf/DrctDbtTx/CdtrSchmeId/Id/ PrvtId/Othr/Id	Direct Debit Transaction: Creditor Scheme Identification - Private Identification	SEPA Master Configuration: Derived from the Initiating Party (Person) using the Creditor ID Type specified in the master configuration.
DrctDbtTxInf/DbtrAgt/FinInstnId/BIC	Direct Debit Transaction: Debtor Agent's BIC	From the active Direct Debit Mandate of the account on the tender.
DrctDbtTxInf/Dbtr/Nm	Direct Debit Transaction: Debtor Name	From the active Direct Debit Mandate of the account on the tender.
DrctDbtTxInf/DbtrAcct/Id/IBAN	Direct Debit Transaction: Debtor Account	From the active Direct Debit Mandate of the account on the tender.

BALAPY - Creating Automatic Payment Tender Controls

This process creates a new tender control (with an associated deposit control) for each unique batch control and run number encountered in the extracted automatic payments (where its payment tender is not yet linked to a tender control). The payment tender of each of these automatic payments is then linked to the corresponding tender control. This process also balances the open tender control records afterwards.

Classic Bills Topics

Various topics about classic, rate-based bills are discussed in this section.

Classic Bills, Payments & Adjustments

Classic Bill Details

The following points highlight important concepts related to classic bills:

- A bill is produced for an account for one or more of its bill-based obligations. Over time, many bills may be produced for an account.
- Bills contain bill segments. A bill segment is created to levy charges for a bill-based obligation. You may configure your system to generate a single bill for a single obligation. For example you may generate one bill for your property tax obligation's charges. You may also include bill segments for multiple obligations in a single bill. For example you may generate a bill that includes bill segments for all the personal property obligations.
- Bill segments contain calculation details. A bill segment contains information showing how the segment was calculated and how it should be printed on the taxpayer's bill.
- A bill segment has a financial transaction. A bill segment has a related financial transaction. A financial transaction contains the financial effects of the bill segment on the obligation's current and payoff balances and on the general ledger.
- Canceling a bill cancels the financial transaction. If the bill segment is eventually cancelled, another financial transaction will be linked to the bill segment to reverse its original financial transaction. The cancellation financial transaction appears on the next bill produced for the account as a bill correction.
- A canceled adjustment’s financial transaction appears on the next bill produced for the account as an adjustment.
- A canceled pay segment’s financial transaction appears on the next bill produced for the account as a negative payment.

The Source Of GL Accounts On Classic Bill FTs

The following describes the source of GL accounts on classic bill financial transactions, some examples of bill related financial events, their standard accounting, and the source of distribution codes used to derive the GL accounts sent to your general ledger.

If a bill segment has a financial effect, the distribution code to debit comes from the distribution code on the obligation type; the distribution code to credit comes from the rate component(s) used to calculate the bill segment.

Financial event	***GL Accounting***	***Source Of Distribution Code***
Create a normal bill segment. *Bill Segment FT Algorithm is Payoff Amt = Bill Amt / Current Amt = Amt Due*	Debit: A/R	Obligation Type
	Credit: Revenue	Rate Component
Create a bill for company usage. *Bill Segment FT Algorithm is Payoff Amt = 0 / Current Amt = 0*	Debit: Company Usage Expense	Obligation Type
	Credit: Revenue	Rate Component
Create a bill for charity. *Bill Segment FT Algorithm is Payoff Amt=0 / Current Amt = Bill Amt*	N/A - charity bills have no effect in the GL	N/A
	N/A	N/A
	Credit: A/R	Obligation Type

Managing Classic Bill Setup

The topics in this section describe maintenance transactions related to classic billing topics. The term ‘bill’ in the following sections refers to refers only to rate based bills.

Defining Bill Segment Types

Every obligation references an obligation type. Amongst other things, the obligation type references a bill segment type. The bill segment type controls how bill segments and their related financial transactions are created.

CAUTION:
We strongly recommend understanding the concepts described in *The Big Picture of Billing* before setting up your bill segment types.

Setting Up Bill Segment Types

To set up bill segment types, open **Admin** > **Bill Segment Type**.

Description of Page

Enter an easily recognizable **Bill Segment Type** and **Description** for every type of bill segment.

For each bill segment type, define the **Create Algorithm**. The logic embedded in this algorithm creates the bill segment.

If you haven't done so already, you must set up this algorithm in the system. To do this:

- Create a new algorithm (refer to *Setting Up Algorithms*).

- On this algorithm, reference an Algorithm Type that creates a bill segment in the appropriate manner. Click *here* to see the algorithm types available for this plug-in spot.

CAUTION:
The BS Create Algorithm is a very important field as it controls how the system creates bill segments. There are some restrictions in respect of the values of certain fields on the obligation type and the bill segment algorithm used on an obligation type.

For each bill segment type, define the **Financial Algorithm**. The logic embedded in this algorithm constructs the financial transaction associated with the bill segment.

If you haven't done so already, you must set up this algorithm in the system. To do this:

- Create a new algorithm (refer to *Setting Up Algorithms*).
- On this algorithm, reference an Algorithm Type that constructs the bill segment financial transaction in the appropriate manner. Click *here* to see the algorithm types available for this plug-in spot.

FASTPATH:
For more information about current and payoff amounts, refer to *Current Amount versus Payoff Amount*.

Define the **Pre-creation Algorithm**. The logic embedded in this algorithm retrieves detailed information needed to bill the bill segment.

If you haven't done so already, you must set up this algorithm in the system. To do this:

- Create a new algorithm (refer to *Setting Up Algorithms*).
- On this algorithm, reference an Algorithm Type that retrieves details needed for billing in the appropriate manner. Click *here* to see the algorithm types available for this plug-in spot.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_BILL_SEG_TYP*.

Setting Up Billable Charge Templates

A user creates a billable charge whenever a taxpayer should be levied an ad hoc charge. For example, if a taxpayer requires a review of their property assessment, you may charge them an administration fee.

NOTE:
Interfacing billable charges from an external system. In addition to being entered manually, billable charges can also be interfaced from an external system. You would interface billable charges if your organization provides "pass through" billing services. Refer to *Uploading Billable Charges* for more information.

A billable charge must reference an obligation. This obligation behaves just like any other obligation:

- **Bill segments are created for the obligation.** Whenever billing is performed for an account with billable charge obligations, the system creates a bill segment for each unbilled billable charge.
- **Payments are distributed to the obligation.** Payments made by an account are distributed to its billable charge obligations just like any other obligation.
- **Overdue debt is monitored.** The credit and collections process monitors billable charge obligations for overdue debt and responds accordingly when overdue debt is detected.

NOTE:

Rates can be applied to billable charges. Billable charges can be connected to an obligation that also specifies a rate. The rate will be applied and lines added to the bill segment after the billable charge lines are added. For example, a rate can insert flat charges or be applied to service quantities associated with the billable charge.

FASTPATH:
Refer to *How To Create An Ad-hoc Bill* for instructions describing how to create a bill for a billable charge outside of the normal bill creation process.

Billable charge templates exist to minimize the effort required to create a billable charge for a taxpayer. A billable charge template contains the default bill lines, amounts and distribution codes used to levy a one-off charge.

The information on the template may be overridden by a user when the billable charge is created.

NOTE:
Templates aren't required. A billable charge can be created without a template for a truly unexpected charge.

After setting up the billable charge templates, you must indicate the obligation types that can use each template. Obviously, only **billable charge** obligation types (as defined on the obligation type's special role) will reference billable charge templates.

Billable Charge Template - Main

Open **Admin** > **Billable Charge Template** to define your billable charge templates.

Description of Page

Enter a unique **Billable Charge Template** ID and **Description** for the billable charge template.

Use **Description on Bill** to define the verbiage that should print on the taxpayer's bill above the billable charge's line item details.

Use **Currency Code** to define the currency in which the billable charge's amounts are expressed.

Use the grid to define the line item details associated with the billable charge (note, the **Total Line Amount** field is automatically calculated. It is the sum of the **Charge Amount** on each of the Line Sequence items). The following fields are required for each entry in the grid.

Sequence	Line sequence controls the order in which the line items appear on the bill segment.
Description on Bill	Specify the verbiage to print on the bill for the line item.
Charge Amount	Specify the default amount to charge for the line item.
Show on Bill	Turn this switch on if the line item should appear on the taxpayer's printed bill. It would be very unusual for this switch to be off.
Appears in Summary	Turn this switch on when the amount associated with this line also appears in a summary line.
Memo Only, No GL	Turn this switch on when the amount associated with this line does not affect the GL (or the total amount owed by the taxpayer).
Distribution Code	Specify the default distribution code associated with this line item.

If you use the drill down button on the left most column in the grid, you will be taken to the Line Characteristics tab with the selected line displayed.

FASTPATH:
For more information about creating a billable charge, refer to *Maintaining Billable Charges*. For more information about billing billable charges, refer to *How To Create An Ad-hoc Bill*.

Billable Charge Template - Line Characteristics

Open **Admin** > **Billable Charge Template** and navigate to the **Line Characteristics** tab to define your billable charge templates line characteristics.

Description of Page

The **Line Sequence** scroll defines the billable charge template line to which you wish to assign characteristic values.

The following fields display:

Characteristic Type	The type of characteristic.
Characteristic Value	The value of the characteristic.

Billable Charge Template - RQ Details

Open **Admin** > **Billable Charge Template** and navigate to the **RQ Details** tab to define your billable charge templates service quantities.

Description of Page

The following fields display:

Sequence	Specify the sequence number of the RQ.
UOM	Select the unit of measure of this RQ. One or more of UOM, TOU, or RQ identifier must be selected.
TOU	Select the time of use period.
RQ Identifier	Select the RQ identifier.
Rate Quantity	Specify the number of units of this rate quantity.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_B_CHG_TMPLT*.

Billable Charge Line Type

NOTE:
Background information. Before using this page, you should be comfortable with the topics described under *Setting Up Billable Charge Templates* and *Uploading Billable Charges*.

Billable charge line types will simplify the effort required to interface billable charges from an external system. Each line type contains values that will be defaulted onto the line details associated with the uploaded billable charges. Obviously, this defaulting is possible only if you specify a billable charge line type on the billable charge upload staging lines.

To set up billable charge line types, select **Admin** > **Billable Charge Line Type**.

Description of Page

Enter an easily recognizable **Billable Charge Line Type** and **Description**.

Use **Currency Code** to define the currency to be defaulted onto billable charge upload lines that reference this line type.

Use **Show on Bill** to define the value to be defaulted into the Show on Bill indicator on billable charge upload lines that reference this line type.

Use **App in Summary** to define the value to be defaulted into the App in Summary indicator on billable charge upload lines that reference this line type.

Use **Memo Only, No GL** to define the value to be defaulted into the Memo Only, No GL indicator on billable charge upload lines that reference this line type.

Use **Distribution Code** to define the values to be defaulted into the Distribution Code field on billable charge upload lines that reference this line type.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_BCHG_UP_XTYP*.

Setting Up Bill (Segment) Cancellation Reasons

Open **Admin** > **Bill Cancel Reason** to define your bill segment cancellation reason codes.

Description of Page

Enter an easily recognizable **Cancel Reason** and **Description** for the bill cancellation reason.

Only use **System Default** on those reason codes that are placed on bill segments that are automatically canceled by the system. Valid value is **Mass Cancel**. The reason code identified as **Mass Cancel** is placed on bill segments that are canceled as a result of the execution of the Mass Cancellation background process. Refer to the **MASSCNCL** batch control (Mass Bill Cancellation (Classic) for more information.

NOTE: Required values. You must have one reason code defined for each of the System Default values.

Defining Bill Cycles and Bill Periods

This section discusses issues related to defining bill cycles and bill periods in the system.

An account may reference a bill cycle. An account's bill cycle may be used to control cyclical billing.

In this section, we describe how to design and set up this cycle. In addition, we discuss how to set up bill period schedules. These are used to define the bill segment end date for special types of obligations.

NOTE:
Recommendation. We recommend reading *Bill Frequency - Bill Cycle vs Bill Segment Duration* before setting up this information.

The Big Picture Of Bill Cycles and Bill Periods

The topics in this section provide background information about a variety of bill cycle and bill period issues.

Bill Cycles

The topics in this section provide background information about a variety of bill cycle features.

The Cyclical Billing Process & Window Billing
The cyclical bill creation process creates most bills. This process works as follows:

- An account can reference a bill cycle. The bill cycle's schedule controls when a cyclical billing process attempts to create bills for the account.
- Every bill cycle has a bill cycle schedule that defines the dates when a cycle's accounts are to be billed. Rather than attempt to create bills on one evening, your implementation may use a concept of "window billing" where the system attempts to produce bills for accounts over a few nights. This concept is useful if your billing is based on information being sent from an external source. It allows you to start billing accounts on the earliest possible day and then bill the stragglers over successive evenings. This results in much better cash flow.
- When the bill cycle creation process runs, it looks for bill cycles with open bill windows. It then attempts to create bills for the accounts in each such cycle. If a bill is successfully created, it is completed immediately and ready to send to the taxpayer. If a bill cannot be created, the system will create a bill in the "error" state and initiate a To Do entry with a message that can be analyzed by your billing staff. When the bill cycle creation process next runs, it deletes all "error" bills and attempts to recreate them. It continues this throughout the bill window. If bills are in error at the end of the window, they will remain in this state until a user fixes them. If the bills are still in error when the cycle's next window opens, a billing error will be generated.

Designing Your Bill Cycles
The number of bill cycles is determined by how much you want to stagger the billing of your taxpayers. You may do this to smooth out calls you may receive for your call center with questions about tax bills.

How Does An Account Get Its Bill Cycle?
Most accounts are created behind-the-scenes through taxpayer registration processing. An account created like this doesn't have a bill cycle. Rather, it sits in limbo awaiting the activation of its first obligation that should be billed using cyclical billing. When an obligation is activated, an activation algorithm should assign the account to an appropriate cycle based on business rules.

Note, an account may be configured to protect its bill cycle from being changed by an algorithm. Refer to *Protecting An Account's Bill Cycle* for more information.

NOTE:
A To Do entry highlights accounts without a bill cycle. A To Do entry highlights those accounts that require a user to specify a bill cycle. This entry is generated for accounts without a bill cycle that have active obligations.

Protecting An Account's Bill Cycle
An account has a single bill cycle, but may have multiple obligations that are billed via cyclical billing process. In this case, when a cyclical obligation is activated, you may not want an algorithm to change the account's bill cycle. To prevent this you need to turn on the account's **protect bill cycle** flag.

When the last obligation for an account is stopped, the protect bill cycle flag is reset. This is to ensure that if the taxpayer starts a new obligation in the future the bill cycle can be set based on the new obligation's activation algorithm rules.

Setting Up Bill Cycles

An account may reference a bill cycle. The bill cycle defines the schedule for cyclical billing of its accounts. To define a bill cycle and its bill cycle schedule, open **Admin** > **Bill Cycle**.

Description of Page

Enter a unique **Bill Cycle** and **Description** for every bill cycle.

Use the **Bill Cycle Schedule** collection to define when bills are produced for the accounts in a given bill cycle. The following fields are required for each instance:

Window Start Date	Specify the date on which the system should start trying to create bills for accounts in the cycle.
Window End Date	Specify the last day on which the system will create bills for accounts in the cycle.
Accounting Date	Specify the financial date associated with the bills' financial transaction. The accounting date defines the financial period(s) to which the bills will be booked in your general ledger.
Freeze and Complete	Turn on this switch if the system should freeze and complete any bill that is created without errors. If this switch is turned off, all bills created by a cyclical billing process should be left in the unfinished state. You would only turn this switch off if you want to verify an entire bill run prior to freezing it (e.g., if you are introducing a new version of a rate). If you turn this off, you will need to return to this page after verifying a bill run and turn it back on for the taxpayers to receive bills. When the cyclical billing process next runs, it should delete all unfrozen bills and recreate them as per the instructions on the bill cycle schedule.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_BILL_CYC*.

Setting Up Bill Periods

Some obligation types reference a bill period. The bill period defines when the obligation's bill segments are produced and the respective end date of each bill segment.

To define a bill period and the bill period schedule, open **Admin** > **Bill Period**.

Description of Page

Enter a unique **Bill Period** and a **Description** for every bill period.

Use the **Bill Period Schedules** collection when the system should create bill segments for obligations that use a given bill period. It also defines the end date of each respective bill segment. The following fields are required:

Bill Date	Specify the earliest date on which the system is allowed to create a bill segment for obligations using this bill period.
Bill Seg End Date	Specify the end date of the bill segment. For future bills, this will be after the bill date. For retrospective bills, this will be before the bill date.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_BILL_PERIOD*.

This information is used by the bill segment creation process to determine the end date of obligations that use a bill period.

Setting Up Bill Route Types

Bill route types define the method used to route bills to accounts. To define a bill route type, open **Admin** > **Bill Route Type**.

Description of Page

Enter a unique **Bill Route Type** and **Description** for every bill route type.

Bill Routing Method controls the type of information that may be defined when the respective **Bill Route Type** is selected on *Account - Person Information*. The following options are available:

- **Postal**. Use this method if the routing is via the postal service.
- **Fax**. Use this method if the routing is via fax.
- **Email**. Use this method if the routing is via email.

> **NOTE:** The values for **Bill Routing Method** are customizable using the *Lookup* table. This field name is BILL_RTG_METH_FLG.

The next two fields control how bills that are routed using this method are *printed* (both in batch and online).

- Use **Batch Control** to define the background process that performs the actual download of the billing information. Refer to *Technical Implementation of Printing Bills In Batch* for more information about these processes.
- Use **Extract Algorithm** to define the algorithm that constructs the records that contain the information that appears on a printed bill. Refer to *Printing Bills* for more information.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_BILL_RT_TYPE*.

Setting Up Bill Messages

There are various informational and warning messages that may appear on an account's bills. Each message is identified with a bill message code. To define a bill message code, open **Admin** > **Bill Message**.

Description of Page

Enter a unique **Message Code** and **Description** for every bill message.

The following attributes control how and where the bill message appears on the taxpayer's bill:

Priority controls the order in which the message appears when multiple messages appear on a bill.

> **NOTE:**
> The values for this field are customizable using the Lookup table. This field name is MSG_PRIORITY_FLG.

Insert Code controls whether a document should be inserted into the bill envelope when the bill message appears on a bill.

Message on Bill is the actual verbiage that appears on the taxpayer's bill. If the message text is not static (e.g., field values need to be substituted into the body of the message), you can use the %*n* notation within the **Message on Bill** to cause field values to be substituted into a message. Refer to *Substituting Field Values Into A Bill Message* for more information.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_BILL_MSG*.

Other Financial Transaction Topics

Various topics about financial transactions are discussed in this section.

Payment Advices

The topics in this section provide background information about payment advice functionality.

> **NOTE:**
> **This section is only relevant for some organizations.** The system configuration requirements described in this section are only relevant if your organization issues payment advices to the taxpayer instead of initiating electronic funds transfer directly to the taxpayer's bank.

What Is A Payment Advice?

Payment advice is a money order that is established at the initiative of the tax authority. When a debt is incurred, the tax authority sends the taxpayer a document that indicates a payment amount and the taxpayer's bank details. If the taxpayer agrees to the information on the payment advice, he or she signs it and returns it to the clearinghouse address that is indicated on the payment advice. The clearinghouse, in turn, sends the dated and signed payment advice to the taxpayer's bank, which completes the payment.

Payment Advice vs. Direct Debit

The existing functionality that creates automatic payments is referred to as direct debit processing. Payment advice processing differs from direct debit processing in the way that automatic payments get initiated. With payment advice processing, the usual automatic payment records - i.e. payment event, payment, tender and auto pay clearinghouse staging - are not created. Instead, a payment advice is printed and sent to the taxpayer. The taxpayer sends the approved payment advice directly to the clearinghouse.

The system does not provide sample processes for extracting and printing payment advice information. Your implementation team would have to create these.

Setting Up The System To Enable Payment Advice

You must set up a *Feature Configuration* to define parameters that control payment advice functionality. Find the Feature Configuration record for the **Financial Transaction Options** feature type. (It may need to be defined if it does not exist).

The following points describe the various **Option Types** that must be defined:

- **Payment Advice Functionality Supported.** This option controls whether the system allows for payment advice processing.
- Enter **Y** if the system should allow for both direct debit and payment advice processing.
- Enter **N** if the system should only allow for direct debit processing.
- **Default Auto Pay Method.** This option is used for defaulting the auto pay method on new account auto pay records.

Refer to *Account - Auto Pay* for more information on auto pay method.

> **NOTE:**
> The system assumes direct debit processing if the above feature options are not defined.

Payment Event Distribution

The base package, by default, creates a single payment for a payment event. If your business requires potentially many payments to be created when payment events are added, you'll need to set up the various control tables described in this section.

FASTPATH:
Refer to *Distributing A Payment Event* for more information about how payment event distribution is handled in the system.

Making Payments Using Distribution Rules

As part of this method, one or more distribution details are provided at payment time along with the usual payment and tender information. Each distribution detail record references a distribution rule and a corresponding value. The distribution rule encapsulates the business rules that govern the distribution of the payment amount into payments using the specified value.

The type of value being captured on the distribution detail and the logic that uses it to create payments are defined on the *distribution rule*.

Rule Value

The primary use of the rule value is to identify the business entity whose balance is to be relieved by creating payment(s). In most cases where the payor account is the same as the payee account it may also used to identify the tender account associated with the payment(s).

Determine Tender Account

The very first step in processing a distribution detail is to identify the tender account (i.e. the payor) associated with the payment. To do that the system calls the **Determine Tender Account***algorithm* defined on the distribution rule providing it with the rule value and other tender information.

Creating Payment(s)

The business logic that distributes a payment amount into one or more payments(s) targeted towards the entity identified by a rule value is held in designated **Create Payment***algorithms* defined on the distribution rule.

Rule Value Can Capture Additional Information

A rule value can also be used to capture additional information provided at payment time, like address information, comments, etc. Obviously payment distribution details with this type of rule value should have a zero payment amount, as they are not real payments. These distribution details end up being linked to a payment event, but unlike other distribution details they do not contribute any payments. You can think of these details as payment event characteristics.

You don't have to set up a **Create Payment** algorithm for distribution rules intended solely to capture additional payment information.

Payments Linked To Assessments

When dynamic credit allocation is practiced, a payment targeted to a specific assessment must have the payment FT referencing the assessment's FT ID. If there is excess credit on the payment segment, it is dynamically allocated to any other assessments for the obligation.

The base package provides a payment freeze algorithm *C1-PYFZ-PYAS* that links a payment FT to a specific assessment. This algorithm looks for a match value on the payment that references the assessment. The assessment is linked to the payment by populating the assessment's FT ID on the payment FT's Group FT ID field.

For more information, refer to *Credit Allocation*.

Setting Up The System To Use Distribution Rules

Setting Up Distribution Rules

Define a Distribution Rule for each payment event distribution method practiced by your business.

Distribution Rule - Main
To set up a distribution rule, **Admin** > **Distribution Rule**.

Description of Page

Enter a unique **Distribution Rule** and **Description** for the distribution rule.

Provide a short and unique **Distribution Rule Label** to be used as the rule's name throughout the system.

Characteristic Type defines the type of entity whose balance is relieved by the payments this rule creates. For example, if this rule targets payments towards a specific obligation, you'd reference a characteristic whose value identifies an obligation. We use the term "rule value" for the characteristic value.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_DST_RULE*

Distribution Rule - Algorithms
Navigate to **Admin** > **Distribution Rule** and navigate to the **Algorithms** tab to set up the algorithms appropriate for your distribution rule.

The **Algorithms** grid contains algorithms that control important functions. You must define the following for each algorithm:

- Specify the algorithm's **System Event** (see the following table for a description of all possible events).
- Specify the **Algorithm** to be executed when the System Event executes. 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.

The following table describes each **System Event** (note, all system events are optional).

System Event	*Optional / Required*	*Description*
Create Payment	Optional	This algorithm is executed to distribute a payment distribution detail payment amount into one or more payments. Click *here* to see the algorithm types available for this system event.
Determine Tender Account	Optional	This algorithm is executed to determine the tender account associated with the payment distribution detail.

Only one such algorithm may be specified.

Click *here* to see the algorithm types available for this system event.

Feature Configuration

You must set up a *Feature Configuration* to define parameters that control various payment event distribution options. Find the Feature Configuration record for the **Financial Transaction Options** feature type. (It may need to be defined if it does not exist).

The following points describe the various **Option Types** that must be defined:

- **Always Enable Distribution Rule.** This option controls whether the system should only use the distribution rule method to add payment events or rather allow both the default method and the distribution rule method to coexist.
  - Enter **Y** if the system should always use distribution rules. With this setting, navigation to the Payment Event page in add mode opens up the *Payment Event Quick Add* page (defaulting it to the **single** payment event dialog). This dialog is designed to create a payment event using distribution rules.
  - Enter **N** if the system should allow both methods. With this setting, navigation to the Payment Event page in add mode opens up the standard *Payment Event - Add Dialog* that uses the default method to create a payment event. If you want to use the distribution rule method, navigate to the Payment Event Quick Add page from the menu.
- **Default Distribution Rule.** This option states distribution rule to be used by default.

Set Up Account Type

If you do dynamic credit allocation, set up the payment freeze algorithm *C1-PYFZ-PYAS*.

We recommend specifying **payment distribution** and **overpayment** algorithms because they are used as default logic in case distribution rules are not supplied.

Set Up Match Type

If you use set the payment freeze algorithm *C1-PYFZ-PYAS*, set up a match type for assessment. This match type should NOT reference an override payment distribution algorithm (if this algorithm is blank, the account type's payment distribution algorithm is used). Refer to *Payments Linked to Assessments* for more details.

Payables Cash Accounting

In some cases certain amounts such as sales tax distributions and 3rd party liabilities are not truly payable until the taxpayer remits payment. We refer to this as "payables cash accounting". This practice should be contrasted with "payables accrual accounting" in which the liability is realized when the debt is recorded (as opposed to when it is paid).

If your organization does not practice payable cash accounting, you may skip this section as accrual accounting is the system default. If you practice payables cash accounting, the contents of this section describe how to configure the system appropriately.

Accrual versus Cash Accounting Example

Accrual accounting means that all payables are booked when the debt financial transaction is created.

If the payable is subject to payables cash accounting, the liability is not booked when the financial transaction is created, rather, the amount of the liability is placed in a "holding" GL account. When the taxpayer pays, the moneys are transferred from the "holding" GL account to the true tax payable account.

The following is an example of the financial events that transpire when a simple sales tax assessment is posted and a payment is received using accrual accounting.

Event	*GL Accounting*	*County A Payable Balance*
Tax assessment created	A/R 110 Revenue - State <100> Payable - County A <10>	(10)
Payment received	Cash 110 A/R <110>	(10)

In the above example, you'll notice that the payable is booked when the adjustment is created. Let's contrast this with what takes place if the payable is subject to payables cash accounting.

Event	*GL Accounting*	*County A Payable Balance*	*County A Holding Balance*
Tax assessment created	A/R 110 Revenue - State <100> Holding - County A <10>	0	(10)
Payment received	Cash 110 A/R <110> Holding - County A 10 Payable - County A <10>	(10)	0

Notice that when the adjustment is created, the payable for the county is not booked, rather, the amount is placed in a "holding" GL account. When the taxpayer pays, the moneys are transferred from the "holding" GL account to the true **County A** payable account.

If the above seems simple, consider the following complications that must be considered:

- What happens if a partial payment is received?
- What happens if there are multiple amounts subject to cash accounting rules?
- What happens if the payment is cancelled?
- What if the payment isn't received and we have to write-off debt?
- What happens if the taxpayer overpays?
- What happens if the obligation is subject to penalty and interest and dynamic credit allocation?

The above points, and more, are discussed below.

Distribution Code Controls Cash Accounting For A GL Account

NOTE:
If you do not understand the significance of distribution codes, please refer to *Setting Up Distribution Codes*.

Whether or not cash accounting is used for a specific GL account is defined on HOLDING GL account's distribution code (i.e., the holding GL account references the true payable account).

It is very important that unique payable and holding distribution codes be used for each type of amount subject to cash accounting rules. For example, for sales tax distribution, a pair of payable and holding accounts is required for each separate distribution amount.

Without unique distribution codes for each payable and holding account, the system cannot keep track of how much of a given amount is being held, awaiting payment.

Cash Accounting and Incurring Debt

When calculating debt that includes payables, the distribution codes associated with the payables (for example on the adjustment type) must be the holding payable distribution codes. No other logic is needed for cash accounting at this time.

Cash Accounting and Relieving Debt

The following section describes functionality required for obligations that practice cash accounting and do NOT practice penalty and interest or dynamic credit allocation.

CAUTION:
Dynamic Credit Allocation. Refer to *P&I and Cash Accounting* for functionality required for obligations that do practice penalty and interest or dynamic credit allocation.

Payment Segment Financial Transaction Algorithms Transfer Holding Amounts to Payable GL Accounts

Logic exists in the pay segment's FT algorithm that transfers amounts from payable holding distribution codes to their respective payable real distribution codes.

FASTPATH:
Refer to *Setting Up Payment Segment Types* for how to define the appropriate FT algorithm.

The following table shows what happens to the financial transaction associated with the payment segment for a cash accounting taxpayer.

Event	*GL Accounting*
Adjustment is created	A/R 110 Revenue - State <100> County Holding <10>
Payment segment relieves receivables	Cash 110 A/R <110>
Additional GL details created when the payment segment FT algorithm transfers the holding amount to a payable account	County Holding 10 County Payable <10>
Net affect of the above	Cash 110 A/R <110> County Holding 10 County Payable <10>

How Does The System Know What Amounts To Transfer From Holding To Payables?

When a payment segment is created for an account that is subject to cash accounting processing, the system determines if there is a credit balance for any holding distribution code in respect of the obligation. If so, it generates additional GL details to transfer moneys from the holding distribution code to the payable distribution code in proportion to the amount of receivables relieved by the payment. Therefore, if 100% of receivables are relieved by the payment segment, 100% of the holding amounts will be transferred to payable distribution codes. Refer to *Partial Payments Result In Partial Payables* for an example of what happens when a partial payment is created.

Partial Payments Result In Partial Payables

The previous example showed the entire County holding amount being transferred to the County payable account. The entire holding amount was transferred because the obligation was paid in full. If a partial payment is received, only part of the holding amount will be transferred to the payable amount (proportional to the amount of receivables reduced by the payment). An example will help make the point.

Event	*GL Accounting*	*County Payable Balance*	*County Holding Balance*
Adjustment created	A/R 110 Revenue - State <100> County Holding <10>	0	(10)
Partial payment received	Cash 27.50 A/R <27.50> County Holding 2.50 County Payable <2.50>	(2.50)	(7.50)

Adjustments That Behave Like Payments

There are several types of adjustments that behave just like payments (in respect of payables cash accounting), for example an overpayment transferred one obligation to another

The above events should cause the system to transfer holding amounts to true payable amounts (notice that the above examples are all transfer adjustments).

However, there are many other adjustments that should not behave like payments. You control how the adjustment works by selecting the appropriate FT algorithm when you *set up adjustment types* (refer to *ADJT-AC* and *ADJT-TC* for a description of the base package algorithms that causes the holding amounts to be manipulated in proportion to the amount of receivable being adjusted). In other words, there are adjustment FT algorithms that cause the transference of holding payable amounts to real payable amounts when the A/R balance is decreased by the adjustment.

Open Item Accounting

The topics in this section provide background information about open-item accounting.

NOTE:
This section is only relevant for some organizations. The system configuration requirements described in this section are only relevant if your organization practices open-item accounting. If your organization practices balance-forward accounting, you need only indicate such on your *account types*; no other setup is required. Refer to *Open Item Versus Balance Forward Accounting* for more information about these two accounting practices.

Open-Item Versus Balance-Forward Accounting

If you practice open-item accounting, you match payments against bills. The term "open-item accounting" is used to describe this accounting practice because:

- Payments are matched against "open items" (i.e., unpaid bills and adjustments)
- Only unmatched bills and adjustments (i.e., open items) affect aged debt.

Contrast open-item accounting with "balance-forward" accounting - in a balance-forward world, payments are not matched to bills. Rather, payments implicitly relieve a taxpayer's oldest debt.

Accounting Method Defined On Your Account Types

You define the type of accounting method that is practiced (*balance-forward versus open-item*) on your *account types*. The account type should be configured based on the accounting method practiced for that tax type.

Match Events

Match events are used to match open-items (i.e., debit and credit financial transactions) together. The topics in this section provide an overview of match events.

Match Events Match Debit FTs To Credit FTs

For open-item taxpayers, the system matches credit financial transactions (FT's) to debit FT's under a *match event*. The following are important points about match events.

- A match event may contain an unlimited number of FT's. For example, the match event can match 2 credit FTs against a single debit FT.
- A match event contains FTs associated with a single account. While the FTs under a match event may belong to multiple obligations, all FTs under a match event must belong to the same account.
- The status of the match event is **balanced** when the sum of the debits equals the sum of the credits. If debits do not equal credits, the status of the match event is **open** and the various FTs would still affect the taxpayer's aged debt. Refer to *Match Event Lifecycle* for more information.

When Are Match Events Created?

The following points describe when match events are created for open-item accounts:

NOTE:
Match events are only created for open-item accounts (i.e., those accounts with an account type that indicates open-item accounting is practiced). Match events may not be created for balance-forward accounts.

- The system can create one or many match events when a payment is added. This match event matches the payment's credit FTs with the debit and credit FTs from bill segments and adjustments. The FTs that are linked to the match event are controlled by the payment's **match type** and **match value** (payments made by open-item taxpayers must reference a match type and match value). Refer to *Payments And Match Events* for more information.
- The system may create a match event when any type of financial transaction is cancelled. This match event groups together the original FT with its cancellation FT. Refer to *How Are Match Events Cancelled?* for more information.
- The system creates a match event when a bill is completed for taxpayers that pay automatically (i.e., direct debit taxpayers). The match event groups together the bill's new charges against the automatic payment's payment segments.
- The system creates a match event when a bill is completed where the new charges are offset by other financial transactions.

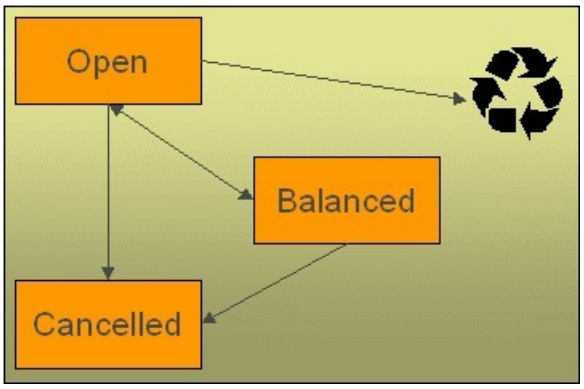
FASTPATH:
Refer to *Bill Lifecycle* for more information about what happens during bill completion.

- The system creates a match event when an obligation closes and the obligation has unmatched FTs. For example, consider an obligation for debt that is written off. This obligation closes when the system creates transfer adjustments to transfer the debt to a write-off obligation (or writes down the debt). The system creates a match event to match the original debt to the transfer adjustments used to write-off the debt.

- A user can create a match event manually at any time. Manual match events would be created under a variety of situations. For example:
- If a taxpayer disputes a charge. Refer to *Disputing Items* for more information about disputes.
- To handle unusual situations when the system is unable to automatically match FT's together.

Match Event Lifecycle

The following diagram shows the possible lifecycle of a match event:



Match events are initially created in the **open** state. Financial transactions (FT's) linked to **open** match events affect arrears, but not in an open-item fashion. Rather, FT's linked to **open** match events affect arrears in a balance-forward fashion. Refer to *Open Item Versus Balance Forward Accounting* for more information about these two accounting methods.

A user may delete an **open** match event. When an **open** match event is deleted, its FT's may be linked to other match events.

The system automatically changes an **open** event's status to **balanced** when the sum of the debit financial transactions (FT's) equals the sum of the credit FT's for each obligation on the match event. It's worth stressing that a match event may contain FT's from many obligation's and each obligation's FT's must sum to zero before the match event can become **balanced**.

A user may re**open** a **balanced** event (by adding / removing FT's so that the match event becomes unbalanced).

A user may **cancel** a **balanced** or **open** match event. Refer to *How Are Match Events Cancelled?* for more information about cancellation.

Payments And Match Events

As described under *When Are Match Events Created?*, the system creates a match event when a payment is added for an open-item account. The system uses the payment's **match type** and **match value** to determine the FT's (e.g., bill segments and adjustments) that will be matched with the payment's FT's (i.e., the payment segments).

Another way to think of this is as follows:

- When most payments are distributed, the system calls the payment distribution algorithm that is plugged-in on the account's account type.
- However, a payment that is made in respect of a specific bill requires a different distribution algorithm because the payment should only be distributed amongst the debt associated with the specific bill being paid. This is accomplished by referencing a match type / match value on the payment. The match type references the appropriate payment distribution algorithm. This algorithm is used rather than the account type distribution algorithm.

For example, if a payment were made in respect of bill ID **192910192101**, this payment would reference a match type of **bill ID** and a match value of **192910192101**. At payment distribution time, the system calls the override payment distribution algorithm associated with this match type. The base package bill ID distribution algorithm does several things:

- It distributes the payment amongst obligations associated with the bill.

- It creates a match event and links the bill's bill segment and adjustment FT's to it.
- Refer to the *Bill ID Match Type Algorithm* for more information about this algorithm.

NOTE:
The match type's distribution logic is not "hard coded". Because the match type's payment distribution logic is embedded in a plug-in algorithm, you can introduce new algorithms as per your company's requirements.

It's worth noting that payment *distribution* and *freezing* are two separate steps that typically happen in quick succession. The system's standard match event algorithms create the match event during payment distribution. This match event exists in the **open** state (because the payment segment's FT's have not yet been linked to the match event and therefore debit FT's do not equal credit FT's). The **open** match event references the debit FT's (the bill segments and adjustments) for which it pays. It is only at payment freeze time that the credit FT's (the payment segments) are linked to the match event thus allowing the match event to be become **balanced**.

If, at freeze time, the payment's credit FT's do not equal the debit FT's on the match event, the match event is left in the **open** state. An alert will appear in the alert zone to highlight the existence of **open** match events (if the appropriate alert algorithm is plugged in the installation record). In addition, you can also set up a To Do entry to highlight the existence of open match events.

How Are Match Events Cancelled?

A user can cancel an **open** or **balanced** match event at any time. When a match event is **cancelled**, the event's FT's again affect arrears (and they can be associated with new match events). In other words, when a match event is **cancelled**, its FT's are released from the match event and become open-items.

In addition to manual cancellation, the system may automatically cancel a match event when the last of its payment FT's, if any, is cancelled (if you plug-in the appropriate FT freeze plug-in on your open-item account types).

For example, consider a match event that was created when a payment was made. If the payment is subsequently cancelled, the match event is also cancelled (thus releasing the match event's FT's) if no other payment FT's are linked to the match event. Please be aware that FT cancellation also causes a new match event to be created. This match event matches the original FT (the payment segment) and its cancellation FT. This means that the only "open items" that will exist after a payment is cancelled are the debit FT's that were originally paid.

NOTE:
Reopening bills associated with automatic payment taxpayers. While many payments are cancelled due to non-sufficient funds, please be aware that if you reopen a bill for which an automatic payment was created, the system will cancel the associated payment. If this payment is associated with a match event (because the account is an open-item account), the match event will be cancelled and a new match event will be created to match the original automatic payment with its cancellation details. This is necessary because a new payment will be created with the bill is subsequently completed and this payment's FT's will be matched to the bill's FT's.

NOTE:
Canceling a payment can result in many match events being created. If a cancelled payment has multiple payment segments, a separate match event will be created for each payment segment.

While payment cancellation is the most common type of FT cancellation, be aware that bill segment or adjustment cancellation may also cause a new match event to be created. We don't necessarily want to always link the cancellation FT and its original FT to the same match event. For example, when the cancellation FT is swept on to the next bill it affects the next bill and not the original FT's bill. For cancellations that will not be swept on to the next bill (payment cancellation, cancellation of an adjustment that is not shown on bill, and bill segment cancellation before the bill is completed) the system creates a new match event that matches the original FT and its cancellation FT. This way, neither FT affects aged debt.

If the original FT was linked to an existing match event and no other FTs are left on this match event it is automatically canceled.

Current Amount Is Matched, Not Payoff

The system matches the current amount of financial transactions, not the payoff amount.

> **FASTPATH:**
> Please refer to *Current Amount versus Payoff Amount* for more information about current and payoff amounts.

Disputing Items

Open-item taxpayers may dispute FT's that they are not comfortable paying. For example, a taxpayer who receives a bill with an anomalous charge may decide to dispute it.

When an open-item taxpayer disputes a charge, a user creates a match event and links the disputed FT(s) to it. This match event will be in the **open** state (because it does not contain FT's that sum to zero). In addition, the match event's "disputed switch" is turned on.

> **NOTE:**
> **Alerts.** An alert is displayed in the alert zone to highlight the existence of disputed match events (if the appropriate alert algorithm is plugged in). In addition, you can also set up a To Do entry to highlight the existence of disputed match events.

While the dispute is being researched, the disputed amount will not affect aged debt, but it still forms part of the taxpayer's balance.

If the dispute goes in your company's favor, the disputed match event should be **cancelled** (thus allowing the FT's to again impact aged debt).

If the dispute goes in the taxpayer's favor,

- You may decide to cancel the offending bill segment(s) / adjustment(s). As described above, these cancellations are going to be swept on to the next bill. The system therefore will not automatically cancel the disputed match event. Notice that the cancellation effect of the disputed items is carried over on to the next bill. This means that the previously disputed items still need to be paid.

  > **NOTE:**
  > **Cancel / rebill.** If you cancel / rebill an offending bill segment, both the cancel and the rebill will become open-items that will be matched when the next bill is paid.

- You may decide to issue an adjustment to counter the effect of the disputed FT's. In this situation, you would simply link the adjustment FT to the disputed FT's (thus allowing the match event to become **balanced**). It is important to use in this case an adjustment that does not show on bill.

Overpayments

An overpayment, by definition, does not "match" to open items. However, the match type algorithms supplied with the base package will result in a **balanced** match event if an overpayment is made. The following points explain how this is achieved:

- The base package's match type algorithms will distribute the payment until the taxpayer's current debt is satisfied.
- The amount of the overpayment will be kept on a separate obligation (this only happens if you plug-in the appropriate Overpayment Distribution algorithm on your account types). Refer to *Overpayment Obligations* for more information.

- When the payment is frozen, the payment segments that satisfy current debt will be matched against their respective open-items. The payment segment used to book the overpayment (on the overpayment obligation) will not be matched.
- When future bills are completed, the credit balance on this "overpayment obligation" will be transferred to the "real obligation's" when future bills are completed (if you have plugged in the appropriate bill completion algorithm on the overpayment obligation's obligation type). If the overpayment satisfies all newly calculated charges, a match event is created that matches the new charges against the funds transferred from the overpayment obligation. Refer to *When Are Match Events Created* for information about how the system creates match events at bill completion time when the new charges on the bill are satisfied by other credits such as overpayments.
- At some point in the future, the overpayment will be exhausted (i.e., all funds will be transferred to "real obligations"). At that point in time, the overpayment obligation will close (assuming you set up the overpayment obligation's obligation type as a "one time"). At close time, the system creates a match event that matches the original overpayment payment segment with the adjustments that were used to transfer funds to the "real obligation's". Refer to *When Are Match Events Created* for information about how the system creates match events when an obligation closes.

Setting Up The System To Enable Open Item Accounting

The following section provides an overview of how to enable open-item accounting.

Match Type Setup

The number of match types that you will need is dependent on the number of ways you want payments to be matched to open items. At a minimum, you will probably need the following match types:

- **Bill ID.** This match type should reference an override payment distribution algorithm that distributes the payment based on the bill ID specified on the payment (in match value). Refer to *Payments And Match Events* for more information.
- **Obligation ID.** This match type should reference an override payment distribution algorithm that distributes the payment based on the obligation ID specified on the payment (in match value). Refer to *Payments And Match Events* for more information.
- **Pay Plan.** This match type should NOT reference an override payment distribution algorithm (if this algorithm is blank, the account type's payment distribution algorithm is used). Refer to *Pay Plans* for more information.

Match Event Cancellation Reason Setup

The number of match event cancellation reasons that you will need is dependent on the number of ways your organization can justify the cancellation of a match event. At a minimum, you will probably need the following match event cancellation reasons:

- **FT Cancellation.** This cancel reason should be referenced on the account type FT Freeze algorithm that is responsible for canceling match events when one of its financial transactions is cancelled.
- **Incorrect Allocation.** This cancel reason should be specified by users when they cancel match events that were created by the system erroneously.

Account Type Setup

The following points describe *account type* oriented set up functions:

- Turn on the open-item accounting switch.
- Set up the following algorithms for each division:
- Specify a **payment freeze** algorithm that causes a payment's FT's to be linked to the match event that was created when the payment was distributed. Refer to *Payments And Match Events* for more information.

- Specify a **FT freeze** algorithm that causes match events to be cancelled (and a new match event to be created) when a FT is cancelled. Refer to *How Are Match Events Cancelled* for more information about cancellation.
- We strongly recommend specifying an **overpayment** algorithm that causes overpayments to be segregated onto an "excess credit / overpayment" obligation. Refer to *Overpayments* for more information.

Overpayment Obligation Type Setup

Specify a **bill completion** algorithm that causes the credit amount on overpayment obligation's to be transferred to newly create debt (created when the bill is created). This algorithm transfers an overpayment obligation's balance to regular obligation's and creates a match event if the overpayment covers the entire bill. Refer to *Overpayments* for more information.

Installation Record Setup

Specify an **automatic payment** algorithm that causes a match event to be created when automatic payments are created for open-item accounts. The base package algorithm will do this for you if you specify the appropriate parameter on the algorithm. Refer to *APAY-CREATE* for more information about this algorithm.

If you want an alert to highlight when the current account has any open match events, plug in the appropriate **Alert** algorithm on your installation record. Refer to *C1-OPN-MEVT* for more information about this algorithm.

If you want to enable manual pay segment distribution for open item accounts, along with other functions, you will need to plug in an installation algorithm for bill balance calculation. Refer to *C1-OI-BI-AMT* for more information about this algorithm.

To Do Entry Setup

Two To Do types are supplied with the base package:

- **TD-MODTL**. This To Do type highlights the presence of open, disputed match events.
- **TD-MONTL**. This To Do type highlights the presence of open, non-disputed match events.

Each of the above To Do types should be configured with the roles that work on entries of each type.

In addition, the account management group and/or divisions from which the default roles are extracted should be updated to define the role that should be defaulted for each of the above To Do types.

FASTPATH:
Refer to *The Big Picture Of To Do Lists* for more information about To Do lists.

Setting Up Match Types

Most payments are distributed amongst obligations using the payment distribution algorithm specified on the payment's account's account type. This algorithm decides how to distribute a payment amongst an account's existing debt if the taxpayer doesn't specify how the payment should be distributed.

A taxpayer can specify how a payment is distributed by specifying a match type and match value on their payments. Consider the following examples:

- Taxpayers that are subject to open-item accounting (this is defined on the account's account type) tell the system exactly which debt is covered by their payments. For example, an open-item taxpayer might make a payment in respect of bill ID **123919101919**.
- Even non open-item taxpayers can direct payments to specific obligations. For example, the system allows a balance-forward taxpayer's payment to be directed to a specific obligation (however, they cannot direct payments to specific bills as only open-item taxpayers can do this).

Match types are used to define the specific type of debt that is covered by a payment. The match type contains the algorithm that effectively overrides the standard payment distribution algorithm defined on the account's account type.

> **NOTE:**
> **Background information.** Please refer to *Payments And Match Events* and *Match Type Setup* for more information about how match types are used.

To set up match types, select **Admin** > **Match Type**.

Description of Page

Enter an easily recognizable **Match Type** and **Description**.

Define the **Pay Dist Override Algorithm** used to distribute payments that reference this match type. If you haven't done so already, you must set up this algorithm in the system. To do this:

- Create a new algorithm (refer to *Setting Up Algorithms*).
- On this algorithm, reference an Algorithm Type that overrides the normal payment distribution algorithm.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_MATCH_TYPE*.

Setting Up Match Event Cancellation Reasons

When a match event is canceled, a cancel reason must be supplied.

> **NOTE:**
> **Background information.** Refer to *How Are Match Events Cancelled?* and *Setting Up Match Event Cancellation* for more information about cancellation.

To set up match event cancellation reasons, select **Admin** > **Match Event Cancel Reason**.

Description of Page

Enter an easily recognizable **Match Event Cancel Reason** and **Description**.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_MEVT_CAN_RSN*.

Fund Accounting

The topics in this section provide background information about fund accounting.

> **NOTE:**
> **This section is only relevant for some organizations.** The system configuration requirements described in this section are only relevant if your organization practices fund accounting. If your organization does not practice fund accounting, you need only indicate such on the *Installation Record*; no other setup is required.

Fund Accounting Overview

Regulations or other restrictions may require some organizations to account for the finances of each of its departments as a separate entity.

To track the finances of departments separately, the organization sets up a fund for each department. A fund is an accounting entity with its own self-balancing set of accounts. Each fund has its own "sub general ledger" with its own chart of accounts, and within each fund, its debits equal its credits at all times. This allows the organization to report on the financial state of each fund independently.

In addition to having a fund for each department, there is also a general fund, which is used to handle inter-fund transfers as well as shared accounts.

A single obligation may have debt related to different funds. For example, tax liability and penalty and interest may go to the same "revenue" fund, and a collection fee may go to a "collection" fund.

In fund accounting, debits and credits must balance for the whole general ledger and debits and credits within each fund must balance.

Fund Accounting Example

Consider an obligation that owes tax liability and then incurs a collection fee. Note that penalty and interest would also accrue, but are not shown in this example.

The accounts receivable (A/R) distribution code to use for financial transactions that affect A/R is linked to the obligation type. The assumption is that the fund for this distribution code is the same "revenue" fund.

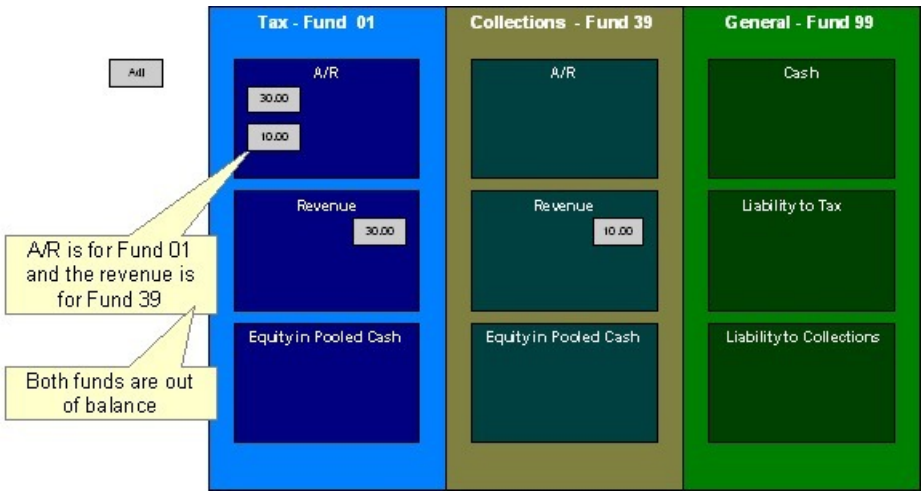
For this example, three funds exist:

- Tax (fund 01)
- Collections (fund 39)
- General (fund 99)

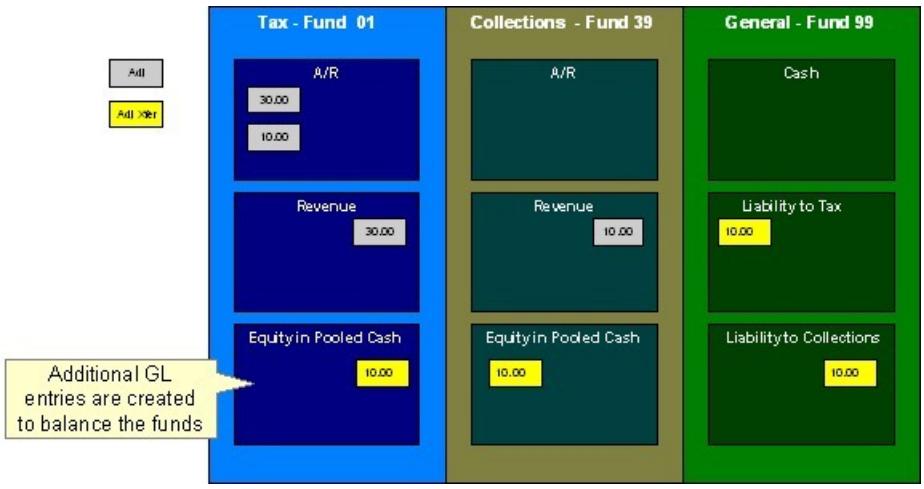
When a tax is levied, the following adjustments are made to the tax fund account producing the following GL entries.

For the tax fund, the GL details of the bill include a debit to the accounts receivable (A/R) account and credits to the revenue account. The taxing authority is owed the entire portion of the adjustment by the taxpayer. The tax fund is balanced.

The following diagram illustrates the initial GL accounting that occurs when a collection fee is levied.



Because A/R is added to the tax fund and the revenue is added to the collections fund, the funds are out of balance. As the tax authority takes on the responsibility to collect the fee, additional entries are created to balance the funds.

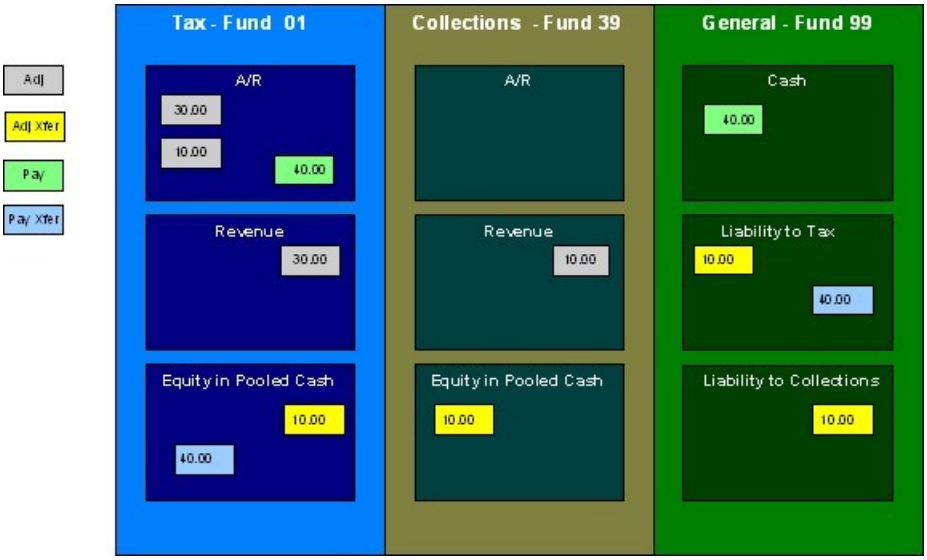


The following diagram illustrates the initial GL accounting that would occur when the payment arrives.

The tax authority's general cash account is debited, and the tax fund's A/R account is credited.

If the accounting were left in this state, the fund accounting principal - that each fund represents an independent entity with a self-balancing chart of accounts - would be violated. This violation is caused due to the fact that cash is recorded on the general fund, not the tax fund, causing the general fund to have an excess debit and the tax fund to have an excess credit.

From an organizational viewpoint, to make the tax fund whole, the tax fund needs to note what portion of the cash it owns, and correspondingly, the tax authority needs to note what portion of the cash is owed to each fund. The following diagram illustrates this point.



To maintain a balance of debits and credits within each fund, the tax and collection funds have an "equity in pooled cash" (EPC) account and the general fund has a liability account for each fund. In addition to debiting the general fund's cash account and crediting the tax fund's A/R accounts, the tax and collection funds' EPC accounts are debited and the general funds liability accounts are credited.

And so, with the additional GL entries, all funds have matching debits and credits.

An Example Of A Bill Segment That References Multiple Funds

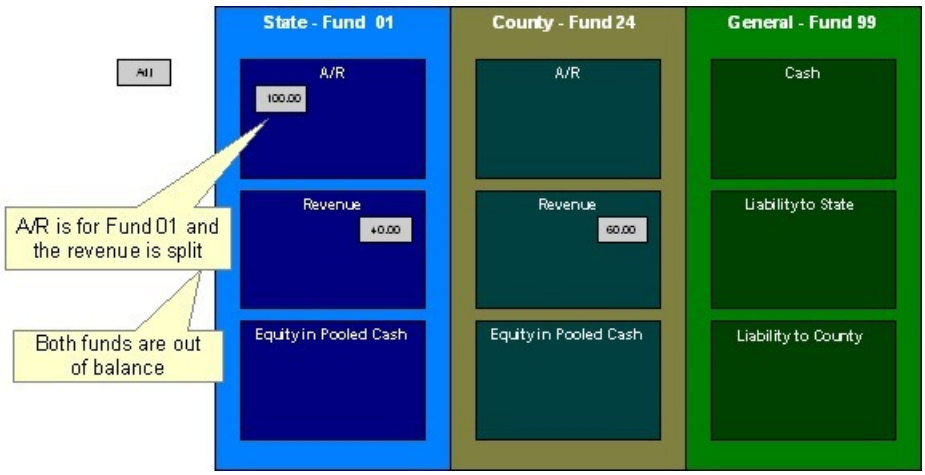
Consider a tax liability that is distributed to multiple jurisdictions where 60% is allocated to the county where the store is located and 40% is allocated to the state.

Note that in this example only two jurisdictions are used; however, a real scenario may break this down further into town, school districts, and so on.

For this example, three funds exist:

- State (fund 01)
- County (fund 24)
- General (fund 99)

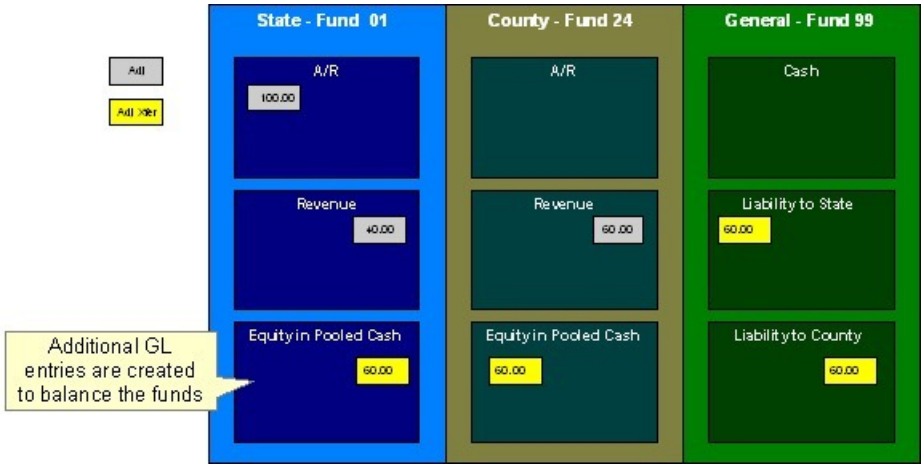
When a $100.00 tax is levied, the following diagram illustrates the initial GL entries for this scenario.



The state fund's A/R is debited, and the state and county funds' revenue accounts are credited.

If left at this, the funds would be out of balance; the state fund would have an overall excess debit and the county fund would have an excess credit.

To balance the funds, the state fund accepts the responsibility for collecting the county taxes from the taxpayer but immediately remunerates the charges to the county fund.



This transfer is done using the general fund. The state fund's EPC account is credited and the liability to state is debited with the amount of the county sales tax revenue. Also, the county fund's EPC account is debited and the general fund's liability to the county account is credited by the county sales tax revenue. In effect, the state fund owes the county charges to the general fund, and the general fund owes the county charges to the county fund.

The following diagram illustrates the initial GL accounting that would occur when the payment arrives.

When the payment arrives, the cash is debited to the general fund's cash account, and the state fund's A/R is relieved. Again, the funds would be unbalanced if left in this condition; the state fund would have an excess of credits and the general fund would have an excess of debits.

To maintain each fund's balance of debits and credits, the general fund's liability to the state fund is credited by the amount of the fund's share of the cash, and the state fund's EPC is debited. Note that the payment has no effect on county fund's EPC and the general fund's liability to the county fund. The county fund "received" its money from the state department when the adjustment was created.

And so, all funds have matching debits and credits.

Accounting Method Is Defined On The Installation Options

You must turn on a switch on the *Installation Record* to enable fund accounting.

Fund Controls Fund-Balancing Entries

There are two levels of debit and credit balancing in fund accounting. There is the balancing required by double entry accounting: the total debits in the entire GL must equal the total credits. This is required regardless of whether fund or corporate accounting is used. The distribution codes for these entries come from varying sources, depending on the type of financial event.

FASTPATH:
Refer to *The Source Of GL Accounts On Financial Transactions* for information on the sources of the distribution codes.

The second level of balancing is specific to fund accounting. Within each fund-not just across the GL-the total debits must equal the total credits. The original distribution code from the financial event has a fund specified. For example, a bill would cause a debit to a fund's A/R distribution code, and included in that A/R distribution code is the fund. It is the definition of the fund that specifies whether fund-balancing entries are required and provides the distribution codes for these entries.

For a departmental fund, the fund-balancing debit and credit would be specified. When a debit is applied to a departmental fund's GL account, an additional account (typically the general fund's liability to the departmental fund) is debited and an account (typically the departmental fund's EPC) is credited. When a credit is applied to a departmental fund's account, an additional account (typically the general fund's liability to the departmental fund) is credited and an account (typically the department's EPC) is debited.

For the general fund, no fund-balancing debits and credits are specified.

Building Fund-Balancing GL Details

Building the GL details for a financial event is a two-step process.

- First, the system generates the regular GL details for a financial transaction (FT). This is done regardless of whether corporate or fund accounting is used.

- Second, with fund accounting activated, the system analyzes the distribution code on each GL detail associated with the FT. If a *fund* is specified on a distribution code, the system checks the definition of the fund. If fund-balancing entries are specified on the fund, two additional GL entries are added to the FT:
- An offsetting entry to the Equity in Pooled Cash account is created for the departmental fund (e.g., if the FT is debiting a given fund, an offsetting credit is created in the funds EPC account).
- Another entry to the departments liability account is created for the general fund.

The result is a consolidated set of GL entries for the FT, incorporating the regular entries as well as the fund-balancing entries.

Setting Up The System To Enable Fund Accounting

The following section provides an overview of how to enable fund accounting.

Turn On Fund Accounting

On the *Installation Record*, indicate that fund accounting is **Practiced**. This is the default setting.

Defining Funds

A fund must be setup for each specific fund in your organization. Don't forget to also set up a fund for the general fund. Navigate using **Admin** > **Fund**.

Description of Page

Enter a **Fund** and a **Description** to identify the fund.

If this fund is used to balance other funds or to hold cash, indicate a **Fund Type** of **General**, otherwise indicate that it is **Specific**.

If the fund type is **Specific**, specify the **Equity Distribution Code** and **Liability Distribution Code**. These codes are used to balance financial transactions that span funds. The equity distribution code should belong to the same **Fund** as the one you are defining. The liability distribution code should belong to the general fund.

Distribution Codes Must Include Fund ID

All of your distribution codes must include their respective fund ID.

FASTPATH:
For more information, refer to *Setting Up Distribution Codes*.

Update Your Funds With Their Respective Equity and Liability Distribution Codes

After distribution codes have been setup, you must update your funds to indicate the equity and liability accounts used to balance inter-fund financial transactions.

Defining Taxpayer Options

The definition of a taxpayer is someone (or something) with financial obligations with your revenue authority. Within the documentation, the terms "taxpayer" and "customer" may be used interchangeably.

The system subdivides taxpayer information into the following records:

- **Person.** The person record holds demographic information about your taxpayers and every other individual or business with which your revenue authority has contact. For example, in addition to normal registered taxpayers, person records may include contacts, accountants, related parties, mortgage brokers, related businesses in a corporate structure, overseas entities, persons of interest, and so on.
- **Account.** Accounts are the entities that group together tax roles and obligations where financial impacts are captured therefore you must create at least one account for every person who has financial obligations with your revenue authority.
- **Tax Role.** A tax role is used to define an instance of a specific tax type for a specific account. It includes information that is specific to the tax type for the account, for example, the dates that the tax is applicable for the account and the filing calendar that defines the filing frequency.
- **Obligation.** An obligation is a contract between the tax authority and the taxpayer. For example, an obligation may represent a specific filing period where a taxpayer is expected to file a return for a given tax type. An obligation may represent an ongoing charge such as a tax preparer fee. An obligation may be used to hold miscellaneous financial information such as an excess credit to later be applied to unpaid tax or debt from a third party source.

Before you can define persons, accounts, tax roles and obligations, you must set up the control tables defined in this section.

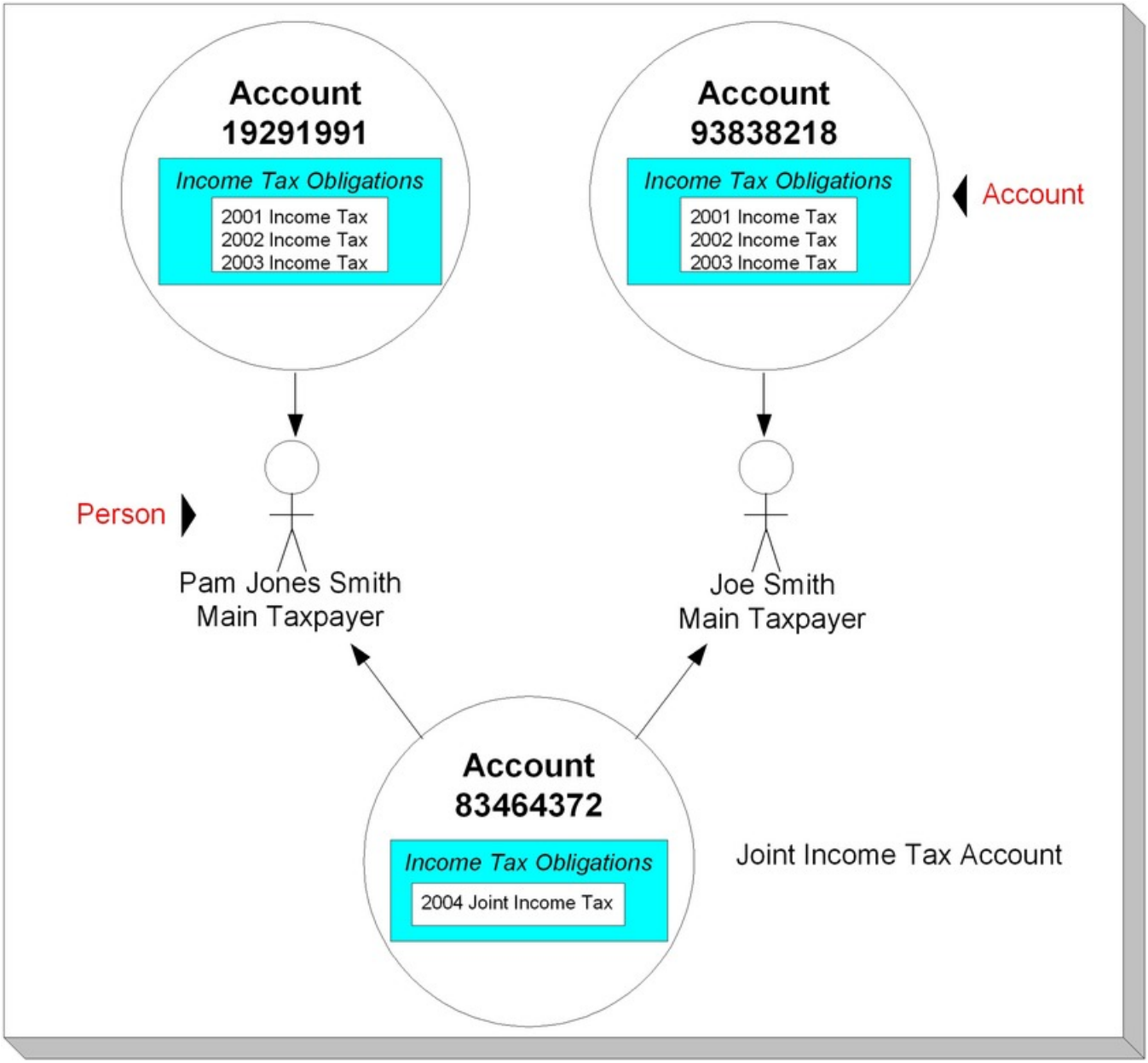
NOTE: In this section, we limit the discussion to tables that control basic demographic and financial information about your taxpayers. Other sections describe the tables that control other taxpayer related functions like forms processing, penalty and interest and collections.

Taxpayer Overview

This section describes how the person, account, tax role and obligation records are used to record your taxpayers' demographic and financial options.

A Simple Example Of Joint Taxpayers

The following picture illustrates two joint taxpayers: Joe Smith and Pam Jones Smith. Joe and Pam are the "main taxpayers" on their own Income Tax Accounts with their own obligations for tax years 2001, 2002, and 2003. Joe and Pam get married and file a joint tax return for tax year 2004. A new account is established for their 2004 obligation. They are both financially responsible for tax year 2004 while they each remain responsible for their prior tax years. Joe and Pam are each linked to two accounts for tax years 2001-2003 and to the new joint account.



Persons

Person records hold demographic information about the individuals and businesses with whom your organization communicates. Demographic information includes phone number(s), names and aliases, identification numbers, employment information, etc.

In the above example, 2 person records would be needed, one for Pam Jones and another for Joe Smith.

A new person is added when you first have contact with a person; the person does not have to be a taxpayer before he or she is added. For example:

- If John Doe is the main contact for ABC Corporation, John might not live in the taxing jurisdiction. You can add John as a new person and link him to any of the ABC Corporation accounts as a contact (but not financially responsible).

- In situations with non-filers and investigations, you can add a new person and associate it with the case. If the tax authority thinks that ABC Corporation is operating as a business but not registered and paying taxes, the tax authority may create a person record at the beginning of the investigation to send correspondence.

NOTE: Businesses are persons too. In addition to humans, you use person records to maintain basic information about the businesses with which your organization has contact.

FASTPATH: For a description of the control tables that must be set up before you can define a person, refer to *Setting Up Person Options*.

Person User Interface

The system supports two style of user interface. The original user interface is a fixed user interface that implementations are not able to customize. The business object driven user interface using portal / zone configuration allows for more customization at the implementation level. The Person user interface was originally implemented with the fixed user interface. However, the current implementation supports the BO driven portal / zone user interface. The product continues to support the original user interface for upgrading clients. However, functionality introduced to the person page after the introduction of the BO driven user interface are only implemented in base product business objects. Any functionality that is not supported the original user interface is noted in the documentation.

Person Names

The person can capture either a single name (Entity Name) or separate name constituents: first name, middle name, last name along with prefix and suffix. The name elements captured are driven by the person business object used. The product provides two person business objects out of the box.

- The Individual Person business object (**C1-PersonIndividual**) supports the separate name constituents. This is expected to be used for person types that represent human persons for implementations that wish to support separate name components.
- The Legal Entity business object (**C1-PersonLegalEntity**) supports a single name field. It may be used for implementations that wish to only support a single name for all persons and for businesses or other non-human persons for implementations that do want to support separate name components for human persons.

For business objects that support separate name components, the single person name field (Entity Name) must also be populated because searches throughout the system still search on the single person name. Refer to the Individual Person business object algorithms for this functionality.

The person business objects support a special option to indicate that the business object supports a single name or separate name constituents. This allows for algorithms to perform processing or validation related to the names based on this setting. The assumed default is single name so business objects that do not configure the setting are treated as using the single Entity Name element.

A small number of searches in the system support searching for a person by separate first name and last name. The person search is one. The *360 Degree search* by person is the other. Most other searches use the single entity name person field to search for a person. If an implementation chooses not to support separate name constituents, but would prefer to use a single name for all persons, a *Feature Configuration* option allows you to configure support for a single name. This will hide the separate first and last name fields on the searches.

- 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 **Person Name Support Type** and define a value of **C1FN**.
- For implementations that use the separate names may choose to create the above option with a value of **C1EN** to be explicit. However, if the option is not populated, the product assumes that separate names are supported.

NOTE: Only the BO driven portal / zone person user interface supports separate name elements. Refer to *Person User Interface* for more information.

Person Addresses

A person may refer to one or more addresses based on an address type. Configuration on the person type indicates the address types that may be linked to a person type. It also includes configuration for whether multiple are allowed for a given address type and whether seasonal addresses may be defined for a give address type.

When linking addresses to a person, the user may indicate a priority that may be used by other algorithms determining an address to use for correspondence. Refer to *Collection Letter* for an example of this functionality.

In addition, addresses for a person may be marked as undeliverable if it has been determined that mail has been returned for the person at the address.

NOTE: Only the BO driven portal / zone person user interface supports links to the centralized address. Refer to *Person User Interface* for more information.

Accounts

The system allows for a taxpayer to define one account for multiple types of taxes. For example, a corporation may have a single account for the corporate income tax, sales and use tax, withholding tax, various excise taxes, etc.

Alternatively separate accounts may be used for each type of tax.

Account ID

The unique number of an account is referred to as the "account ID". It is randomly generated and many other records that are child records of Account or related to any of the account's child records inherit part of its unique number from the Account ID.

NOTE:
Technical note. The non-intelligence of the account ID is also important from the perspective of the parallel processing that takes place when the system creates financial transactions.

Account / Person Cross Reference

A person may be linked to zero or more accounts. A person won't be linked to an account when they have no financial relationship with your organization. A person will be linked to multiple accounts when they have financial relationships with more than one account.

An account must reference at least one person (i.e., the main taxpayer), but may reference an unlimited number of individuals. Multiple persons are linked to an account when several parties have some type of financial relationship with the account (e.g., third party guarantors, account contact, etc.).

When Is An Account Created?

There a several instances when accounts must be created in the system. An account is created when:

- The taxpayer is registered for a tax obligation, or has any financial interactions with the tax authority.
- The taxpayer is registered for a new tax type. The account is created to track the obligations of the taxpayer to file or pay taxes.

- An estimated payment is received from a taxpayer for a tax that is not yet registered. The account must be created to hold the estimated payment.
- A non-filer is identified, and the tax authority decides to send a default tax assessment or penalty.

When Is An Account Expired?

Accounts never expire. Once a taxpayer has an account, the account remains in the system forever. Linked to the account are tax role records that define the applicable time period that a taxpayer is responsible for a given tax type. Obligation records are created for each revenue period where the taxpayer is obliged to file a tax return, and/or make a payment to the revenue authority. When an account has obligations, the system pursues unpaid and overdue debt, refunds credits overdue to the taxpayer, and pursues obligations to file returns that have not been fulfilled. If the account doesn't have active tax roles / obligations, the system will not consider the account for any outstanding issues. An account without active tax roles / obligations is "dormant". It may be used again in the future when the same taxpayer is obliged to file taxes again. If the taxpayer never re-files, the account (along with its financial history) remains dormant forever.

Tax Roles

Tax Roles represent the ongoing obligations of a given tax type within an account at a given point in time. It may be also be thought of as the reason a taxpayer must interact with the revenue authority, or one of the taxpayer's relationships with the revenue authority.

Tax roles include the dates that the tax is effective. If you consider a business, some tax types are required for the entire time a company is in business, such as corporate income tax. Other tax types may only be in effect if the company is engaging in certain activities, which may change over time.

When Is A Tax Role Created?

Most tax roles are created when the revenue authority is aware that a tax type is applicable for an account. For example, when a business taxpayer registers their business and indicates the various tax types that are applicable or when an individual taxpayer files a tax form.

Filing Calendars for Filing Tax Types

For tax types that are filing period based, the onus is on the taxpayer to file the return and pay the appropriate assessment on time. The tax type typically defines the valid filing calendar(s) that govern the frequency of filing and the dates to file for each filing period. For some tax types a single calendar is valid for all tax roles of that tax type. For other tax types, one or more different filing frequencies (and therefore filing calendars) may be applicable and may change over the life of the tax role for an account.

Revenue Calendars for Variable Schedules

Some tax types may need to define more than one schedule of due dates within a give revenue period. The most common example is real property taxes which are often payable in installments. Each installment may have a separate due date and be subject to different penalty and interest rules. These tax types typically have a single calendar which is valid for all tax roles of that tax type.

Tax Roles Can Maintain Obligations

For some tax types there is an ongoing obligation to file, such as sales tax or to pay billed taxes such as property taxes. For these types of taxes, it may be beneficial to include logic to create future obligations based on the start date, end date, and

schedule frequency of the tax role. If the tax role dates or effective calendars change, it may be necessary to adjust the tax role's existing obligations to match.

Configuration on the tax type controls whether obligations should be maintained for tax roles of this type and how and when the obligations are created. Algorithms related to the tax role detect changes to the tax role that may affect the related obligations. For any changes that require creation of obligations, the system determines what obligation types are associated with the tax type and for each one that indicates that filing periods are applicable, calls its **Generate Obligations** algorithm plugged in on the obligation type.

This section describes the processing that is triggered by key tax role changes and provides a summary of the configuration required to implement it.

Adding A New Tax Role

When creating a new tax role, it may be necessary to create historic obligations to bring the tax role current as at the business date.

When a tax role is added, the system first determines if the tax role's tax type is configured to maintain obligations. If so, it checks the start date of the tax role.

- If the start date is in the past, the system performs the obligation creation processing real time.
- If the start date is in the future, obligations are created by batch processing when required

Changing A Tax Role Start Or End Date

A tax role's start and end dates define the period for which it is in effect. If a tax role's end date is populated or either date is changed, existing obligations for periods prior to or beyond the new dates may need to be adjusted or canceled.

When a tax role end date is changed, the following obligation processing occurs:

- If a filing period obligation exists whose start date is less than the new tax role end date and whose end date is greater than that date, the obligation end date will be updated to equal the tax role end date.
- If filing period obligations exist with a start date greater than the new tax role end date, those obligations must be canceled. If there has been any activity on the obligation that prevents cancellation, the process will report an error that must be resolved before continuing.
- If the tax role's end date was populated and has been cleared (indicating that the tax role is still in effect), the assumption is that the latest filing obligation was previously updated to match the tax role end date. That obligation's end date will be updated to align with the obligation's filing period end date.

If a tax role start date is changed, the following obligation processing occurs:

- If a filing period obligation exists whose start date is less than the new tax role start date and whose end date is greater than that date, the obligation start date will be updated to equal the tax role start date.
- If a filing period obligation exists with an date earlier than the new tax role start date, those obligations must be canceled. If there has been any activity on any of the obligations that prevents cancellation, the process will report an error that must be resolved before continuing.
- If the tax role's start date has been changed to an earlier date and the first obligation's start date is verified to be the later of the new tax role start date and the obligation's filing period's start date.
- If the tax role's start date has been changed to an earlier date such that there are no obligations covering the period from the start date to the first existing obligation, appropriate obligations are created to fill the period from the new tax role start date until the first existing obligation.

If there are non-filing period obligations linked to the tax role (obligations whose type indicates that filing is **Not Allowed**), the algorithm will not attempt to cancel them or adjust the dates. The algorithm will check if the obligation start and end dates are still within the tax role start and end dates. If so, no obligation changes are required. If not, the algorithm will report an error which the user must resolve before continuing with the update.

Effective Filing Calendar Changes

Some tax types, such as sales and use, support multiple filing frequencies: typically monthly, quarterly or annually. A tax authority may request a company filing quarterly or annually to file more frequently if their revenue increases. It's not as common for a taxpayer filing monthly to switch to quarterly or annually if the revenue decreases, but it is possible. If a tax role's effective filing calendar is changed, existing obligations for the previous filing frequency need to be adjusted or canceled.

When a change is made to the effective filing calendar for a tax role, the following obligation processing occurs:

- If a new calendar is added or an existing calendar has its effective date moved back, filing period obligations with a start date on or after the new effective date are canceled. If a filing period obligation exists with a start date prior to the new calendar effective date and an end date after that date, the obligation end date is adjusted to be the new calendar effective date minus one day.
- If a calendar is deleted or an existing calendar has its effective date moved forward, filing period obligations with a start date on or after the changed or deleted calendar's prior effective date are canceled. If a filing period obligation exists with a start date prior to the old calendar effective date and an end date after that date, the obligation end date is adjusted to align with the obligation's filing period end date.
- New filing period obligations are created to bring the tax role up to date for the effective calendar change as at the current business date, if required. Note that the system executes the same obligation creation logic that is invoked when the tax role is added. In this situation, the system creates obligations starting from the end date plus one day of the latest valid filing period obligation after the adjustments described above are complete.

NOTE: The system does not allow changes to both the filing calendar collection and the tax role start / end dates. These changes must be done in separate distinct updates.

Periodic Obligation Creation

Once the initial obligations have been created for a tax role, the system assumes that a batch process is used to create obligations on a periodic bases. Configuration controls how / when this occurs:

- If the tax type indicates that obligations are maintained via a monitor, the standard monitor process, configured for **Active** tax roles is used to create the next expected obligation for each obligation type. The tax role monitor is date driven so that not all tax roles are reviewed every time the monitor is run. The **Generate Obligations** algorithm that creates the obligation periodically is responsible for determining the monitor date when the next obligation should be created. This configuration is useful when a tax type supports multiple calendars with different frequencies and where the creation of the new obligations should happen at a predictable time, such as just before the next filing period start date.
- If the tax type indicates that obligations are maintained adhoc, a separate stand-alone batch job may be used to create the obligations. This configuration is useful when a tax type has a standard calendar for all tax roles and when the creation of the obligations is not predictable. For example, for property taxes the frequency is typically annual where the filing period covers a fiscal year. Sometimes the obligations are created several months in advance of the start of the fiscal year, sometimes after the start of the fiscal year.

Regardless of which batch mechanism is used, the system executes the same obligation creation logic that is invoked when the tax role is added, bringing the tax role up to date with the business date.

The system also supplies a base monitor algorithm which transitions the tax role to the **Expired** state when the tax role end date is passed. For monitored tax roles, once the tax role end date is reached and the tax role is expired, no further obligations are created.

Canceling A Tax Role

A tax role may be canceled if it was created in error. In this situation, the system will attempt to cancel all obligations linked to the tax role. If any of the obligations cannot be canceled - for instance, if there are non-canceled financial transactions or a form has been filed for the obligation - the process will issue an error. The user must resolve the specific issue with the obligation before continuing with the cancellation.

Configuration Controls Obligation Management

The processing described in the previous sections is carried out by a number of algorithms, which in turn invoke algorithms in other plug-in spots. The key elements are as follows:

- A Business Object Post Processing algorithm is responsible for the logic that cancels or adjusts any obligations whose periods are affected by changes to the tax role start date, end date or effective calendars.
- A second Business Object Post Processing algorithm is responsible for the logic that creates obligations to bring the tax role's obligations up to date for the current business date. This algorithm caters for the processing required when a tax role is added for the first time and also for the processing required to recreate obligations for a new filing frequency, in circumstances where a change to the tax role effective calendar has been back dated. This algorithm should be configured to execute after the algorithm that cancels unwanted obligations, described above.
- An Obligation Type - Generate Obligations algorithm is required for each obligation type linked to a tax type that is configured to maintain obligations. The base post processing algorithm that creates current and historic obligations for a tax role will invoke this plug in for each obligation type associated with the tax role's tax type. A base algorithm is supplied to generate filing period obligations based on the associated tax role's effective calendar(s).
- For business objects that support obligation maintenance based on a monitor, a Business Object Status Monitor algorithm is responsible for the logic that periodically creates the next obligation for the tax role when the prior obligation end date is reached. It should be plugged in on the Active state of the tax role business object. The base tax role monitor algorithm invokes the same logic as the post processing algorithm that creates obligations real time. It therefore also relies on the Obligation Type - Generate Obligations plug-in spot.
- A second Business Object Status Monitor algorithm is responsible for the logic that transitions a tax role to the Expired state when the tax role end date is reached. It should be plugged in on the Active state of the tax role business object.
- A Business Object Status Enter algorithm is responsible for the logic that cancels all obligations for a tax role when the tax role is canceled. It should be plugged in on the Canceled state of the tax role business object.
- Various Business Object Validation algorithms are supplied to enforce rules related to obligation maintenance that are governed by tax type controls. Refer to *Configuring Tax Types* for more information on tax role related configuration and other tax role validations controlled by tax type settings.

Refer to the base Tax Role *business objects* for example of how to configure the base algorithms that are supplied for the business object plug-in spots described above.

Refer to *Setting Up Obligation Types* for more information on the Generate Obligations plug-in spot and the available algorithms.

Obligations

An obligation is a contract (either formal or implied) between the revenue authority and a taxpayer. An obligation is linked to an account. There is no limit to the number of obligations that may be linked to an account.

When Is An Obligation Created?

Obligations may be created at different times for different tax types. Some tax types may require obligations to be created in advance. For tax types such as individual income taxes and excise taxes, obligation records may be created when the revenue authority receives a tax return.

Refer to *Tax Roles Can Maintain Obligations* for a description of how tax roles can govern the creation of future obligations.

Due Dates for Filing Period Based Obligations

For tax types that are filing period based, the onus is on the taxpayer to file the return and pay the appropriate assessment on time. This section describes the configuration provided for defining and determining due dates.

When should the taxpayer file the return for a given filing period? When defining filing periods for a *filing calendar* you also define the statutory Due Date of the return along with the Grace Date. For taxpayers that request an extension to their filing date, an Override Filing Due Date may be defined on the specific *obligation*. An Override Due Date may also be automatically calculated by the system when an obligation's end date differs significantly from the filing period end date. The obligation type defines an Override Filing Grace Days. The base logic that determines the statutory and override due dates for an obligation uses the override filing grace days in its calculation of the override filing grace date.

Typically the statutory payment due date for a filing period is the same date as the statutory filing due date. However, the dates may be extended independently. Extensions to a payment date are also defined on a specific obligation using the Override Payment Due Date. Also note that the grace date for the payment due date is calculated differently. Instead of using the explicit Grace Date on the filing calendar, the obligation type defines a Payment Grace Days. The logic in the base algorithms that determine if a payment is made on time (whether it be for the statutory due date or the override payment due date) considers the grace days in its calculations.

Due Dates for Billable Obligations

For billable tax types, the revenue authority notifies the taxpayer of any obligation amounts due by issuing a bill.

Bill-based calendars generally have statutory due dates and grace dates but differ from filing based taxes in that the debt may be payable in more than one installment. The due dates of the installments may be extended independently on a bill by bill basis. The base logic that determines the due dates for the financial transactions of billable obligation will reference the related bill segment to determine if an override due date applies.

Financial Transactions Are Linked To Obligations

FASTPATH:
For more information about how financial transactions are linked to obligations, refer to *The Financial Big Picture*.

When Is An Obligation Closed?

For an obligation to be closed, its balance must be zero. Different obligation types may apply additional criteria to ensure that all activity for the obligation is complete. For a filing based obligation type, it may be necessary to check that the a tax form has been posted. For a bill-based obligation, it may be necessary to ensure that there is a completed bill.

When an account is monitored for overdue debt, the system also checks the account's obligations to determine if any of them can be closed. If the obligation balance is zero, the process invokes an optional Obligation Type algorithm that checks additional closure criteria. If those criteria are also met, the obligation is closed.

Refer to *Setting Up Obligation Types* for more information on the Close/Reactivate Criteria plug-in spot and the available algorithms.

Setting Up Person Options

This section describes tables that must be set up before you can define persons.

Defining Name Prefixes

Any implementation that supports separate person names and would like to support a name prefix / title must define valid name prefixes. Go to **Admin** > **Lookup** and search for lookup **NAME_PREFIX_FLG**.

Defining Identifier Types

When you set up a person, you may define the various types of identification associated with the person, e.g., their driver's license number, their tax identity, etc. Every piece of identification associated with a person has an identification type. These identifier type codes are defined using **Admin** > **Identifier Type**.

NOTE:
How are person identifiers used? The reason why identifiers are defined on a person is so that users you can look for a taxpayer using one of their person identifiers. In addition, person identifiers help prevent duplicate persons from being added to the database. This is because the system warns a user before they add a new person when a person exists with the same identifier.

NOTE:
Person identifier types are optional. An *installation option* controls whether at least one identifier type is required on every person.

Description of Page

Enter an easily recognizable **ID Type** and **Description** for the Identifier Type.

If the identifier type has a format against which validation can be performed, use **Identifier Format** to define the algorithm. To do this:

- Create a new algorithm (refer to *Setting Up Algorithms*).
- On this algorithm, reference an Algorithm Type that validates identifier types. Click *here* to see the algorithm types available for this plug-in spot.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ID_TYPE*.

Defining Person Relationship Types

It is possible to associate persons to other person. For example,

- You might want to define the subsidiaries of a parent corporation
- You might want to define spouses as separate persons and then link each person to another person

When you link a person to another person, you must define in what way the person is related to the other person by using a person relationship type code. These codes are defined using **Admin** > **Person Relationship Type**.

Description of Page

Enter the following for each relationship type:

- Enter an easily recognizable **Relationship Type** code.
- Use **Description (Person1=>Person2)** to describe how the first person is related to the second person.
- Use **Description (Person2=>Person1)** to describe how the second person is related to the first person.

> **NOTE:**
> **Person 1 versus Person 2.** When you link persons together, you do it in respect of one of the persons (which we call Person 1). For example, if you want to link the subsidiaries to a parent company, you do this in respect of the parent company (i.e., you define the parent company's subsidiaries using the *Person - Persons* transaction.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_PER_REL_TYPE*.

Defining Person Types

A person exists for every individual or business with which your tax authority has contact. Besides individual and business taxpayers, persons exist for contractors, accountants at corporate taxpayers, third party guarantors, collection agencies, etc.

The person type is used to define business rules for different types of persons. For example:

- The valid external Identifier type.
- A business that is a limited liability partnership, you may define the valid relationship type to use for additional responsible parties.
- The business object that governs the person record, including its user interface behavior.
- The valid address types to use when linking addresses to persons. Refer to *Configuring Your System for Centralized Address* for more information.

> **NOTE:** This is only applicable for systems that are not configured for *legacy address* functionality.

A person type is governed by a *business object*. The base product provides business objects that you may use or extend. Refer to the BO definitions in the application. Or you may create your own.

Open **Admin** > **Person Type** to define the person types used to categorize your persons.

The topics in this section describe the base-package zones that appear on the person type portal.

Person Type List

The Person Type *List zone* lists every person type. The following functions are available:

- Click the *broadcast* icon to open other zones that contain more information about the adjacent person type.
- The standard actions of **Edit, Duplicate** and **Delete** are available for each person type.

Click the **Add** link in the zone's title bar to add a new person type.

Actions

This is a standard actions zone. The **Edit, Delete** and **Duplicate** actions are available.

Person Type

The Person Type zone contains display-only information about a person type. This zone appears when a person type has been broadcast from the Person Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_PER_TYPE*.

Defining Person Information

The person information displayed throughout the system is controlled by a plug-in.

The system first looks to see if the person type references a person business object and if the business object defines an information plug-in. If a BO is not provided or if that BO does not define an information algorithm, the system looks for an information algorithm plugged into the person maintenance object.

If no plug-ins are found on the BO or the MO, the system looks for a Person Information plug-in algorithm on the *installation record*.

If you prefer different formatting logic, your implementation should provide a plug-in at one of the above plug-in spots, as appropriate for your business rules.

Setting Up Account Options

This section describes tables that must be set up for an account.

Setting Up Account Management Groups

Users are informed that something requires their attention by entries that appear in To Do lists. For example, consider what happens when:

- A tax return fails validation for a math error.
- A tax return meets the business rule criteria to trigger a desk audit.
- A taxpayer refund exceeds the business rule review thresholds.
- A letter to a taxpayer is in error because the taxpayer does not have an address record.

You can optionally use account management groups (AMG) to define the respective role to be assigned to To Do entries that are associated with an account and a given To Do type. For example, you can create an AMG called **Credit Risks** and assign this to accounts with suspect credit. Then, whenever an account-oriented To Do entry is created for such an account, it will be assigned a role based on the **Credit Risks** AMG. Refer to *Assigning A To Do Role* for more information.

> **NOTE:**
> **Account management groups are optional.** You need only set up account management groups (and link them to accounts) if you wish to address specific To Do entries associated with specific accounts to specific roles.

Account management groups are defined using **Admin** > **Account Management Group**.

Description of Page

Enter an easily recognizable **Account Management Group** code and **Description** for each account management group. Use the grid to define the **To Do Role** to be assigned to entries of a given **To Do Type** that are associated with accounts that reference the Account Management Group.

> **NOTE:**
> Only To Do entries that are account-oriented take advantage of the roles defined for an account management group (because only accounts reference an account management group).

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ACCT_MGMT_GR*.

Setting Up Account Relationship Codes

When you link a person to an account, you must define in what way the person is related to the account by using an account relationship code. These codes are defined using **Admin** > **Account Relationship Type**.

Description of Page

Enter an easily recognizable **Relationship Type** and **Description** for each relationship type.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ACCT_REL_TYP*.

Setting Up Alert Types

Permanent or temporary alerts may be linked to an Account and will therefore appear in the alert zone. Each alert linked to an account must have an Alert Type. To define valid alert types, navigate to **Admin** > **Alert Type**.

Description of Page

Enter an easily recognizable **Alert Type** code and **Description** for each alert type. Specify the **Alert Days** to indicate the amount of time that alerts of this type will be effective by default. Specify a value of zero to indicate that alerts of this type will be effective indefinitely by default.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ALERT_TYPE*.

Setting Up Account Types

When you set up an account, you must assign it an account type. The topics in this section describe the account type control table.

Account Type - Main

To set up account types, navigate to **Admin** > **Account Type**.

Description of Page

Enter a unique **Account Type** code and **Description** for every account type.

Use **Collection Class** to define the collection class that defaults onto new accounts that belong to this account type. An account's collection class may be subsequently modified if the account has special collection problems or needs.

Use an **Account Business Object** to define a *BO* that may govern additional rules related to accounts of this type.

Turn on **Business Activity Required** if obligations linked to accounts with this account type require a Business Activity description to be entered.

Turn on **Open Item Accounting** if accounts belonging to this account type are subject to open-item accounting. Refer to *Open Item Accounting* for a complete explanation of the significance of this switch.

NOTE: This switch is only applicable to implementations supporting the *classic billing* functionality.

Turn on **Non Tax Agency Payment** if accounts belonging to this account type are used for payments made to reduce non-tax authority debt. For example, if your tax authority sends collection notices or offsets taxpayer refunds on behalf of other agencies, such as child support, college tuition, or parking violations, you should set up the following information to accept such payments:

Create a new account type called "Non Tax Authority Customer".

- Create an obligation type for each type of non-tax authority payment that taxpayers can make. Make sure to enter a distribution code on each obligation type that references the appropriate revenue (or payable) account. If your implementation uses **Classic Billing** you must indicate on each obligation type that it is not billed.
- Create an account to which you'll book such payments. Have this account reference the new account type. We recommend creating a separate account for each obligation type that you created in the previous step.
- Create and activate an obligation for the new account(s).

When someone pays for non-tax authority debt, the operator will add a payment for the above account. On the payment, the operator should record reference information in order to know exactly why the payment was made. Refer to *Payment Event - Main* for more information.

You must define a variety of business rules for every division in which an account type has taxpayers. You do this on the *Account Type - Controls* page. The grid that follows simply shows the divisions for which business rules have been set up.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_CUST_CL*.

Account Type - Bill Messages

When an account type has bill messages, the system will sweep these messages onto bills created for accounts belonging to the account type. Use this page to define an account type's bill messages. Navigate to **Admin** > **Account Type** > **Bill Messages** tab to maintain this information.

NOTE: **Optional information.** This tab is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module. The information is used only for classic billing functionality.

Description of Page

Use the bill messages collection to define **Bill Message** codes that should appear on bills that created for accounts that belong to a given account type. For each message, also specify the **Start Date** and **End Date** when such a message should appear on the bill (leave **End Date** blank if the message should appear indefinitely).

Where Used

The system snaps account type bill messages on a bill during bill completion. For more information about bill messages, refer to *The Source Of Bill Messages*.

Account Type - Controls

You must define a variety of business rules for every division in which an account type has taxpayers. Open **Admin** > **Account Type** > **Controls** tab to maintain this information.

Description of Page

The **Account Type Controls** scroll contains business rules governing accounts that belong to a **Division** and **Account Type**. The following fields should be defined for each **Division**:

- Use **Min Compliance Review Freq (Days)** to define the maximum number of days that can elapse between the reviews of an account's debt by the *overdue monitor*. Note, a value of zero (**0**) means that accounts in this account type will be reviewed every day.
- Use **Compliance Review Grace Days** to define the number of days that algorithms may add to a given due date when requesting that an account should be reviewed by the *overdue monitor*. For example, when completing a bill, an algorithm inserts a record into the account review dates collection setting the review date to the bill due date plus the number entered here.

The grid that follows 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** 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.

CAUTION:
These algorithms are typically significant system processes. The absence of an algorithm may prevent the system from operating correctly.

You can define algorithms for the following **System Events**:

System Event	*Optional / Required*	*Description*
Autopay Amount Over Limit	Optional	This algorithm is called to handle the situation when a system-initiated *automatic payment* is created that exceeds the taxpayer's *maximum withdrawal limit*. Specifically, this algorithm is called when: - The account has a maximum withdrawal limit on their *automatic payment options* - The system attempts to create an automatic payment that exceeds this amount - The automatic payment algorithm that's plugged into the installation record has logic that invokes this algorithm when the above conditions are true. For more information refer to system event **Automatic Payment Creation** in *Installation Options — Algorithms*. If you do not plug-in this type of algorithm and the above situation is detected, the automatic payment will be created and no error will be issued. Refer to *How To Implement Maximum Withdrawal Limits* for more information. Click *here* to see the algorithm types available for this system event.

FT Freeze	Optional	When an FT is frozen, this algorithm is called to do additional work. For example, if you wish to schedule compliance review when an account's balance changes, you may need such an algorithm to handle creating an account review trigger depending on the financial transaction type. Click *here* to see the algorithm types available for this system event.
Levy an NSF Charge	Optional	This algorithm is called when a payment is canceled with a cancellation reason that indicates an NSF. Refer to *NSF Cancellations* for more information about what happens when a payment is canceled due to non-sufficient funds. **Only One Algorithm**. Only one algorithm to levy an NSF charge may be defined for an account type / division combination. Click *here* to see the algorithm types available for this system event.
Overpayment Distribution	Required	When a taxpayer pays more than they owe, this algorithm is called to determine what to do with the excess funds. Refer to *Overpayment Obligations* for a description on how to configure the system to handle your overpayment requirements. **Only One Algorithm**. Only one overpayment distribution algorithm may be defined for an account type / division combination. Click *here* to see the algorithm types available for this system event.
Payment Cancellation	Optional	Algorithms of this type are called when a payment is canceled. Click *here* to see the algorithm types available for this system event.
Payment Distribution	Required	This algorithm is called to distribute a payment amongst an account's obligations. Refer to *Payment Distribution* for more information about how payment distribution works. **Only One Algorithm**. Only one payment distribution algorithm may be defined for an account type / division combination. Click *here* to see the algorithm types available for this system event.
Payment Freeze	Optional	When a payment is frozen, this algorithm is called to do additional work. For example, you may need such an algorithm to recalculate penalty and interest charges on receipt of a payment Click *here* to see the algorithm types available for this system event.

Additional Details

The following controls are only applicable if your implementation uses **Classic Billing** functionality.

Use **Days Till Bill Due** to define the number of days after the bill freeze date that the taxpayer's bill is due. If the due date is a weekend or company holiday, the system will move the due date forward to the next workday (using the workday calendar defined on the account's division).

You can define algorithms for the following billing related **System Events** :

System Event	*Optional / Required*	*Description*
Bill Cancel	Optional	This algorithm provides the ability to include additional cancel logic when canceling online. Algorithms of this type can be called in two modes: D (Determine Bill Page Buttons) and X (Cancel Bill). Mode 'D' governs whether an action button to cancel the bill will appear on the Bill page and mode 'X' performs the actual cancellation logic. Click *here* to see the algorithm types available for this system event.
Bill Completion	Optional	When a bill for an account is completed, bill completion algorithms are called to do additional work. Refer to the description of the Complete button under *Bill Lifecycle* for a description of when this algorithm is called during the completion process. Click *here* to see the algorithm types available for this system event.
Bill Eligibility	Optional	Algorithms for this plug-in spot are called when generating a bill in batch billing. It provides the ability to determine if an account is ineligible for billing and should therefore be skipped from further processing. If an eligibility algorithm is not used, a bill is created for any account in the open bill cycle and is later deleted by the billing process if it detects that there in no information linked to the bill. Click *here* to see the algorithm types available for this system event.
Bill Segment Freeze / Cancel	Optional	When a bill segment for an account in this account type / division is frozen or canceled, an algorithm of this type may be called to do additional work. Refer to *Bill Segment Lifecycle* for more information about freezing and canceling bill segments. Click *here* to see the algorithm types available for this system event.
FT Freeze	Optional	If you practice *Open Item Accounting*, you will need an FT Freeze algorithm to handle the cancellation of match events when a financial transaction is canceled that appears on a match event. Refer to *How Are Match Events Cancelled?* for more information about cancellation. **NOTE:** Open Item Accounting is only applicable to **Classic Billing** functionality. Click *here* to see the algorithm types available for this system event.
Override Due Date	Optional	An account's bill due date will be equal to the bill date plus its account type's Days Till Due. If you need to override this method for accounts in a specific account type, specify the appropriate algorithm here. **Only One Algorithm**. Only one due date override algorithm may be defined for an account type / division combination.

		Click *here* to see the algorithm types available for this system event.
Post Bill Completion	Optional	When an account type has algorithms of this type, they are called after the completion of a bill for an account linked to this account type. Refer to the description of the Complete button under *Bill Lifecycle* for a description of when this algorithm is called during the completion process. Click *here* to see the algorithm types available for this system event.
Pre Bill Completion	Optional	When an account type has algorithms of this type, they are called immediately before completion starts for an account linked to this account type. These algorithms have the potential of: • Deleting a bill. You might want a pre completion algorithm to delete a bill if a condition is detected that should inhibit the sending of a bill to a taxpayer (e.g., the bill just contains information about recent payments). • Aborting the completion process and creating a bill exception. If the algorithm indicates this should be done, the bill is left in the **pending** state and a bill exception is created describing why completion was aborted. You might want a pre completion algorithm to do this if, for example, integrity checks detect there is something wrong with the account or its obligations. If the integrity check fails, the bill can be left in the **pending** state and a bill exception created describing why. Refer to the description of the Complete button under *Bill Lifecycle* for a description of when this algorithm is called during the completion process. Click *here* to see the algorithm types available for this system event.
Payment Freeze	Optional	If you practice *Open Item Accounting*, you will need a Payment Freeze algorithm to link the payment's financial transactions to the match event that was originally created when the payment was distributed. Refer to *Payments and Match Events* for more information. **NOTE:** Open Item Accounting is only applicable to **Classic Billing** functionality. Click *here* to see the algorithm types available for this system event.

NOTE: Optional information. The Days Till Bill Due field is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module but the billing related system events will appear in the drop down list regardless of whether the module is enabled or not.

Setting Up Collection Classes

FASTPATH: Refer to *Setting Up Collection Classes* for a description of how to set up collection classes.

Defining Account Information

The account information displayed throughout the system is controlled by a plug-in.

The system first looks to see if the account type references an account business object and if the business object defines an information plug-in. If a BO is not provided or if that BO does not define an information algorithm, the system looks for an information algorithm plugged into the account maintenance object.

If no plug-ins are found on the BO or the MO, the system looks for an Account Information plug-in algorithm on the *installation record*.

If you prefer different formatting logic, your implementation should provide a plug-in at one of the above plug-in spots, as appropriate for your business rules.

Configuring Tax Types

Tax roles and obligation types must reference a tax type. The base Tax Type business objects includes configuration options that govern certain aspects of tax role and obligation processing.

This section describes the effect of these configuration options within the system.

External ID Usage

Some tax types use external IDs for additional taxpayer identification on tax forms. These IDs may be assigned by the tax authority or by another agency. The variable calendar tax type business objects allows configuration to indicate whether an external ID is required, optional or not allowed on tax roles that reference this tax type.

A base *business object* validation algorithm is supplied to validate the external ID field on a tax role based on this configuration. Refer to the base Variable Calendar Tax Role business object for an example of how to configure this validation.

Maintaining Obligations

When you set up a tax type, you must indicate whether the system is responsible for automatically *maintaining obligations for tax roles* of that tax type. The logic to create and maintain obligations is governed by plug-ins on the tax role business object. Only tax types that whose tax role applicability is set to **Required** may be configured to maintain obligations.

The product provides two tax type business objects that support maintaining obligations: Variable Calendar Tax Type and Asset Based Tax Type. The following points describe maintain obligation configuration supported by both business objects:

- Different tax type may have different requirements for when their obligations are created. The Obligation Maintenance Control option value of **Monitored** indicates that the deferred monitor on the tax role periodically reviews active tax roles and creates the next obligation. A value of **Adhoc** indicates that a separate Adhoc batch job is responsible for creating the next obligation for all the tax roles in the tax type when run.
- Different tax type may have different requirements for whether the next obligation to create should be the one that covers the current period or not. The Last Obligation Control option value of **Through Current Period** indicates that obligations are created up to and including the period that ends after the current date. A value of **Through Next Period** indicates that obligations are created up to and including the period that starts after the current date.
- Different tax type may have different requirements for whether the next obligation to create should be the one that covers the current period or not. The Last Obligation Control option value of **Through Current Period** indicates that obligations are created up to and including the period that ends after the current date. A value of **Through Next Period** indicates that obligations are created up to and including the period that starts after the current date.

The following points highlight additional configuration available on the Variable Calendar Tax Type:

- For tax types that allow different filing frequencies, the different filing calendars are typically set up such that there is a point when calendars of different frequencies have a common Filing Period Start Date. If the tax type is configured to maintain obligations, you may also need to specify whether filing calendar changes for the tax role can occur 'off cycle'.
- Setting the Change Filing Frequency Off Cycle option to **Allowed** will allow users to specify a filing calendar change that becomes effective before the next common filing period start date of the new calendar is reached. This will result in an obligation for either the old or new calendar with a period shorter than the filing period for the effective filing frequency. Note that the system will not allow two obligations to be created where the period covered does not align with the associated calendar's filing. Therefore, the effective date for an off-cycle filing calendar change must align with either a filing period start date of the new calendar or a filing period end date of the old calendar.
- Setting the Change Filing Frequency Off Cycle option to **Not Allowed** will only allow users to specify a filing calendar change that aligns with a filing period start date of both the old and new calendars.
- A base business object validation algorithm is supplied to validate filing calendar changes for a tax role based on this configuration.
- A base business object validation algorithm is supplied to validate that none of the effective calendars for a tax role whose tax type is configured to maintain obligations allows overlapping periods.

The assumption is that tax types that maintain future obligations do not allow overlapping filing periods within the same filing calendar. The base logic to create future obligations assumes that filing periods within a given a filing calendar have contiguous period dates.

Refer to the base Variable Calendar Tax Role business object and the Asset Based Tax Role business object for examples of how to configure the associated validations for this tax type configuration.

FASTPATH: Refer to *The Big Picture of Business Objects* for more information about business objects and the validation algorithm.

Overriding Obligation Filing Due Dates

For filing based tax types, the obligation's filing due date is normally determined by the due date configured on the applicable filing period. However, some situations may result in an obligation where the end date of the obligation does not coincide with the filing period end date. This may occur if the tax type supports multiple filing frequencies and the taxpayer changes to a more frequent filing schedule - for example, from an annual filing to a quarterly filing. If a business ceases to operate and the associated tax role is end dated, this may also result in a filing obligation whose end date is prior to the expected filing period. Tax types may be configured to automatically calculate an override due date for the obligation that covers the shortened period.

The Variable Calendar Tax Type provides the following configuration options for overriding an obligation due date:

- **Override Due Date** indicates if an override due date should be calculated for an obligation of this tax type when the end date of the obligation is different from the filing period's end date.
- **End Days Difference Tolerance** is the minimum number of days difference between the obligation end date and the filing period end date that should cause the due date to be overridden.
- **Months After Obligation End Date** is added to the obligation end date to calculate the override due date month.
- **Day Of The Month** is the day of the month of the new due date, adjusted for differing maximum days in the month.

A base *business object* post processing algorithm is supplied to perform the date calculations described above, based on this configuration. This algorithm should be plugged in on the associated business object for each obligation type associated with the tax type for which due date override is applicable. Refer to the base Filing Period with Tax Role Calendar Obligation business object for an example of how to configure this processing.

Valid Address Types

If tax roles for a tax type may define addresses, the valid address types must be configured on the tax type. Refer to *Configuring Your System for Centralized Address* for more information.

NOTE: This is only applicable for systems that are not configured for *legacy address* functionality.

Valid Calculation Control Types

Tax roles for billable tax types may need to define the effective calculation controls to be used in generating bills. If so, the valid calculation controls must be configured on the tax type, one of which should be designated as the tax type default. Refer to *Defining Calculation Engine Options* for more information about calculation controls.

Setting Up Tax Types

The tax type is used to define business rules for each type of tax you support. Tax type is required when defining any financial obligation so a catchall tax type of **Other** for write-offs, payment plans and other miscellaneous uses may be warranted.

A tax type is governed by a *business object*. The base product provides business objects that you may use or extend. Refer to the BO definitions in the application. Or you may create your own.

Open **Admin** > **Tax Type** to define the tax types used to define information about the tax types you support.

The topics in this section describe the base-package zones that appear on the tax type portal.

Tax Type List

The Tax Type *List zone* lists every tax type. The following functions are available:

- Click the *broadcast* icon to open other zones that contain more information about the adjacent tax type.
- The standard actions of **Edit, Duplicate** and **Delete** are available for each tax type.

Click the **Add** link in the zone's title bar to add a new tax type.

Tax Type

The Tax Type zone contains display-only information about a tax type. This zone appears when a tax type has been broadcast from the Tax Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_SVC_TYPE*.

Overpayment Process Types

The Overpayment Process Type zone displays the list of overpayment process types that are valid for this tax type. Click the Add/Edit button to maintain this list.

The Usage flag may be used to mark a given overpayment process type to use as the default for a given scenario. For example, the product provides a usage value for indicating the **Default for Tax Form Creation** to indicate the overpayment process type to use when one is created as the result of a tax form. This is helpful if a given tax form rule may be used by different tax types.

NOTE: The usage flag is a customizable lookup. Implementers may add their own values. The lookup name is **OP_PROC_TYPE_USG_FLG**.

Setting Up Tax Type Options

This section describes tables that are related to tax types.

Setting Up Revenue Calendars

Revenue calendars are used to define the expected revenue period dates for a given type of obligation. The valid revenue calendar that governs an obligation's revenue period is typically defined on the obligation's *Tax Role* or its *Tax Type*.

The product supports two types of usage for revenue calendars. Filing based calendars are designed to support return based taxes and map a single set of filing related due dates per revenue period. Variable schedule calendars support multiple schedules of dates within a revenue period. Variable schedule calendars are used for billing based tax types which are typically payable in installments with differing due dates.

For more information, refer to the base product business objects provided for filing based taxes (**C1-FilingCalendar** and **C1-FilingPeriod**) and variable schedule taxes (**C1-TaxBillCalendar** and **C1-TaxBillingPeriod**).

To maintain or set up a revenue calendar and its revenue periods, open **Admin** > **Revenue Calendar**.

The topics in this section describe the base-package zones that appear on the Revenue Calendar portal.

Revenue Calendar List

The Revenue Calendar *List zone* lists every Revenue Calendar. The following functions are available:

Click the *broadcast* icon to open other zones that contain more information about the adjacent Revenue Calendar.

The standard actions of **Edit**, **Duplicate** and **Delete** are available for each Revenue Calendar.

Click the **Add** link in the zone's title bar to add a new Revenue Calendar.

Revenue Calendar

The Revenue Calendar zone contains display-only information about a revenue calendar. This zone appears when a revenue calendar has been broadcast from the Revenue Calendar list, or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_FILING_CAL*.

Revenue Periods List

The Revenue Periods *List zone* list all revenue periods for the broadcast calendar. The revenue periods are shown in descending order by date. The zone details vary according to the calendar usage.

For filing based calendars:

- The list includes the period start and end dates, filing due date and filing grace date and revenue year
- Standard edit and delete actions are available.
- Clicking **Add** link in the zone's title bar will add a new filing period.
- Clicking **Add Multiple Periods** link in the zone's title bar will open a pop-up window in which multiple filing periods may be added using a grid input format or uploaded from a spreadsheet

For other calendar usages:

- The list includes the period start and end dates and revenue year
- Standard edit and delete actions are available.
- Clicking **Add** link in the zone's title bar will add a new revenue period.
- Clicking the Begin Date hyperlink in the zone's title bar will navigate to the revenue period portal, where the full details of the period can be maintained, including the schedule of due dates

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_FILING_CAL_PERIOD*.

Revenue Period Portal

This portal appears when a revenue period has been selected from the Revenue Periods list zone.

The topics in this section describe the base-package zones that appear on this portal.

Revenue Period

The Revenue Period zone contains display-only information about a specific revenue period. This zone appears via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_FILING_CAL_PERIOD* .

Setting Up Tax Role Relationship Types

The tax role relationship type is used to define the types of relationships that persons other than the primary taxpayer can have to a tax role. Tax role relationship type is required when linking a related person to a tax role.

A tax role relationship type is governed by a *business object*. The base product provides a business object that you may use or extend or you may create your own. Refer to the BO definition in the application.

Open **Admin** > **Tax Role Relationship Type** to define the tax role relationship types used to classify persons related to a tax role.

The topics in this section describe the base-package zones that appear on the tax role relationship type portal.

Tax Role Relationship Type List

The Tax Role Relationship Type *List zone* lists every tax role relationship type. The following functions are available:

- Click the *broadcast* icon to open other zones that contain more information about the adjacent tax role relationship type.
- The standard actions of **Edit, Duplicate** and **Delete** are available for each tax role relationship type.

Click the **Add** link in the zone's title bar to add a new tax role relationship type.

Tax Role Relationship Type

The Tax Role Relationship Type zone contains display-only information about a tax role relationship type. This zone appears when a tax role relationship type has been broadcast from the Tax Role Relationship Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_TAX_ROLE_REL_TYPE*.

Setting Up Financial Relationship Types

In addition to a tax role relationship type, miscellaneous persons related to a tax role may also have an optional financial relationship type. You can configure those relationship types as Financial Relationship Type extendable lookup values.

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Financial Relationship Type** extendable lookup business object.
- The list of existing financial relationship types are displayed in a standard *List zone*.
- Choose an existing financial relationship type to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new financial relationship type.

Setting Up Industry Codes

Tax roles and obligations can reference industry codes. This code is used to categorize tax roles and obligations for reporting purposes. To define an industry code, open **Admin** > **Industry Code**.

Description of Page

Enter a unique **Industry Code** and **Description**.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_SIC*.

Financial Controls

There are also a number of control tables that must be set up to control the bills, payments, and adjustments that are linked to an obligation. For more information about these tables, please refer to *Defining Financial Transaction Options*.

Configuring Obligation Types

This section provides information on how to configure obligation types.

Designing Obligation Types

The topics in this section provide guidelines describing how to design obligation types. When designing obligation types you will want to consider what the obligation will be used for. Generally speaking, obligation types can be separated into two categories.

- The first type of obligation type relates to the specific tax types of a tax authority. Examples of these include corporate tax and property tax. The specific tax type dictates how bills are handled and what collections activities are available to the tax authority.
- The second type of obligation relates to specific events or transactions that require certain follow-up actions from the tax authority or taxpayer (or both). Examples of these include overpayment obligations and payment plan obligation. With overpayments, the tax authority has the responsibility to properly handle the excess credit a taxpayer has created with a

payment. Payment plans are the responsibility of the taxpayer in that they are required to send in a series of payments on a predefined schedule. Each obligation must be monitored to ensure proper compliance.

Filing Period Obligations

Filing period obligations are one of the tax type specific obligation types. Examples of these tax types include individual income, sales and use, corporate, withholding, and fuel taxes. These are examples of return based taxes in which the taxpayer has the responsibility to file a return for each filing period obligation. There are usually statutory considerations when configuring these obligation types. You will want to consider the following when designing your obligation for these types of taxes.

- The obligation type must reference a defined *tax type*. The specific tax type will dictate the rules for that obligation. It should indicate that a Tax Role is required and should include the valid filing calendars for the tax type.
- The obligation type should be configured to indicate that a filing period is required.
- Distribution code and general ledger division for the obligation directs how the money is accounted. Different taxes may be moved to different accounts. While an individual income tax may go to the general treasury fund, a fuel tax may go the highway construction fund. The distribution code will reference an algorithm that directs how the money will be accounted for.
- Adjustment profile must be defined for the obligation. Adjustment profiles contain the individual listing of adjustment types that are available for that obligation type.
- An appropriate P&I control and P&I algorithms should be defined for the obligation type. Refer to *P&I Rules for a P&I Control Define the Calculation* for more information.
- Define the default debt category priority for credits linked to obligations of this type. Refer to *Debt Categories and their Priorities* for more information.

Each tax type will have its own unique attributes that will change how the obligation is set up. The more details you add to your obligation type, the more robust your processing of that obligation will be. Before configuring for this obligation type you should thoroughly review the statutory considerations and make sure they are all addressed when setting up your obligation type.

Property Tax Obligations

Property tax obligations are another type of tax specific obligation type. Property tax obligations are based off the assessed value of a taxpayer's asset. Typically they are items such as real estate or automobiles but can include boats, RV's, and other high value items. They differ from filing period obligations in that it is the tax authority's responsibility to assess the value and calculate the amount of tax owed. It is then the taxpayer's responsibility to either pay or appeal the assessed value. The considerations are very similar to filing period obligations.

- The obligation type must reference a defined tax type. The specific tax type will dictate the rules for that obligation.
- Payment plans are often utilized for property tax obligations. Due to their infrequent assessment and billing (once or twice a year) the amount is usually large enough where a significant number of taxpayers would have difficulty paying. If payment plans are utilized then make sure to check that option under the billing tab.
- Distribution code and general ledger division for the obligation directs how the money is accounted. Different taxes may be moved to different accounts. While an individual income tax may go to the general treasury fund, a fuel tax may go the highway construction fund. The distribution code will reference an algorithm that directs how the money will be accounted for.
- Rates may be utilized more often for property taxes. Property taxes tend to be a locally administered tax. The breakdown of how the tax is applied to local services can be done using the rate schedule option under the rate tab.
- Adjustment profile must be defined for the obligation. Adjustment profiles contain the individual listing of adjustment types that are available for that obligation type.

Overpayment Obligations

When a taxpayer pays more than they owe, you must decide what to do with the excess money. The following points describe two possibilities:

- You could create a new obligation to hold the excess (let's call it an overpayment obligation). The credit would need to be transferred from this obligation to the tax obligations at an appropriate time.
- You could direct the excess payment on one of the existing tax obligations.

You control which method is used by plugging in the appropriate **Overpayment Distribution** algorithm on each *account type* (i.e., you can choose a different method for different account types). If you choose to hold overpayments on a separate obligation, then you must set up an obligation type.

The following points highlight interesting information about overpayment obligation types:

- It should have an accounts payable distribution code. This is because when a payment segment is created for this type of obligations, the system must credit a liability (an overpayment is a liability).
- It's important to indicate that the overpayment obligation is a one-time obligation. Why? Because this means that the system will automatically close the obligation when it's balance falls to zero (i.e., when appropriate business processes transfer all of the overpayment to tax obligations).
- A bill segment type is not needed because the system never creates bill segments for such obligations (they exist only to hold excess credits).
- P&I controls and the P&I related algorithms are not needed.
- You may also want to turn on the alert message
- You must reference this overpayment obligation type as the parameter value on your overpayment algorithm (this algorithm is plugged in on the desired account types). Refer to *Overpayment Algorithm* for more information about this algorithm.
- You must design appropriate business procedures to use this overpayment when additional debt is incurred on tax obligations.

Write Off Obligations

Some agencies may choose to transfer written of debt from the "normal" obligation onto one or more write-off obligations. When the debt is transferred to a write-off obligation, the distribution code on the "normal" obligation is credited (typically an A/R GL account), and the distribution code on the write-off obligation is debited.

You will almost always need a write-off obligation whose distribution code is the write-off expense. However, if you don't practice cash accounting, you may have uncollectible debt for liabilities (and you don't owe the liability if you don't get paid). In this case you'll need another obligation type for the liabilities.

The following points highlight interesting information about write-off obligation types:

- The distribution code is either an expense or a liability account. This is because when debt is transferred to these types of obligations, the system must debit either an expense account (i.e., write-off expense) or a liability account. It's important to note that in The Ramifications of Write Offs in the General Ledger we explain how this liability account may be overwritten with the liability account that was originally booked.
- They do not need a bill segment type because the system never creates bill segments for such obligations (they exist only to hold uncollectable debt)

NOTE:

The adjustment type used to set the offending obligation's current balance equal to its payoff balance is defined on each write-offable obligation type. The adjustment type used to transfer the delinquent debt to the write-off obligation is defined on the write-off obligation type.

NOTE:
An Alternative. If you have a limited number of liability accounts, you may decide to have a separate write-off obligation for each liability account. Doing this would proliferate the number of obligations created at write-off time. However, it would simplify the remittance of payment to the third party if the reversed liability is ever paid.

Pay Plan Obligations

If you allow your customers to pay overdue debt using a payment plan, you need to set up obligation types for pay plan obligations.

FASTPATH:
For more information about pay plans, refer to *Defining Pay Plan Options*.

Over/Under Cash Drawer Obligations

In order to balance a tender control that is out-of-balance, your organization must set up an account with an obligation whose obligation type references the over/under expense account. You will probably only have one obligation that references this obligation type, but you still must have it if you remit funds via a cash drawer.

FASTPATH:
For more information about over/under processing, refer to *How To Get An Unbalanced Tender Control In Balance (Fixing Over/Under)*.

The following points highlight interesting information about this obligation type:

- It has an expense distribution code. This is because when a payment segment is applied to this type of obligation, the system must debit an expense account for under amounts (and credit it for over amounts).
- It doesn't need a bill segment type because the system never creates bill segments for such obligations (it only has over/under payment segments linked to it).

Payment Upload Error Obligations

If the payment upload process detects an invalid account on a payment upload record, it will create a payment for the suspense obligation defined on the upload process' tender source (see *Setting Up Tender Sources*). You should create a special obligation type for this obligation.

FASTPATH:
For more information about the payment upload process, refer to *Phase 3 - Create Payment Events, Tenders, Payments and Payment Segments*.

The following points highlight interesting information about this obligation type:

- It has an expense distribution code. This code should probably be a suspense account. All payment segments that are created for this obligation will eventually be transferred to a "real" obligation and therefore this GL account's balance should be zero when no payments are in suspense.

- It doesn't need a bill segment type because the system never creates bill segments for such obligations (it only has invalid account payment segments linked to it).

Billable Charge Obligations

You create a billable charge whenever a taxpayer should be charged for a service that occurs outside the normal course of business. For example, if a taxpayer requires a review of their property assessment, you may charge them an administration fee. You can also use billable charges to "pass through" other bill ready charges generated outside the system, by another application, or by a 3rd party supplier.

A billable charge must reference an obligation. This obligation behaves just like any other obligation:

- **Bill segments are created for the obligation.** Whenever billing is performed for an account with billable charge obligations, the system creates a bill segment for each obligation with unbilled charges. If multiple unbilled charges exist for a given obligation, only one bill segment will be created and it will contain details about all of the billable charges.
- **Payments are distributed to the obligation.** Payments made by an account are distributed to its billable charge obligations just like any other obligation.
- **Overdue debt is monitored.** The credit and collections process monitors billable charge obligations for overdue debt and responds accordingly when overdue debt is detected.

Therefore, you must set up at least one obligation type to hold your billable charge debt. You may have multiple charges based on billing frequencies, A/R booking, debt monitoring, etc. It's really up to you.

The easiest way to determine how many billable charge obligation types you'll need is to define every conceivable billable charge (which you should have done when you designed your billable charge templates). Then ask yourself if they have the same billing and payment behavior, if so, you'll have one obligation type. If not, you'll need one obligation type for each combination.

Expiring Obligations

It is possible to assign an expiration date to an obligation. This wouldn't apply to an obligation used to capture amounts owed for a specific tax period. But it could apply to an obligation that covers an ongoing financial relationship, such as a license fee.

For obligations that have an expiration date, an Obligation Expiration background process (batch control **SAEXPIRE**) is used to automatically 'stop' the obligation when the expiration date arrives.

Renewing Obligations

An obligation type may be configured to allow obligations of that type to renew. This would only apply to an obligation that supports the concept of expiration. It is also supported on pay plan if the pay plan is being used as a proactive payment collection mechanism (rather than as a method of recovering unpaid debt for other obligations). Renewal may be performed manually or via a background process. When an obligation is created, the expiration date and renewal date may be defined for the obligation. A renewal flag on the obligation type controls if a renewal is required, optional or not allowed. If renewal is required, a user must specify a renewal date when creating the obligation. The renewal date is defaulted on to an obligation based on the valued of the Days Before Expiration for Renewal field on the obligation type.

An algorithm on the obligation type can customize the processing required to renew an obligation.

The Obligation Renewal background process (batch control **SARENEW**) does the following:

- Executes the obligation renewal algorithm (specified on the obligation type) when the renewal date is reached (i.e., it is on or before the process date). This algorithm is responsible for determining the new expiration and renewal dates.
- If the renewal algorithm is successful, the renewal and expiration date fields on the obligation / pay plan are updated with the new values.

- For pay plan obligations, a new payment schedule may be returned from the renewal algorithm and is appended to the existing schedule.

A user can manually launch the renewal process for a pay plan obligation by clicking **Renew** on the pay plan maintenance page.

Setting Up Obligation Types

This section explains how to create and maintain obligation types.

Obligation Type - Main Information

Open **Admin** > **Obligation Type** to define core information about your obligation types.

Description of Page

Enter a unique combination of **Division** and **Obligation Type** for every obligation type.

Enter a **Description** for the obligation type.

Tax Type defines the tax type for the obligation type.

> **FASTPATH:** For more information about tax types, refer to *Setting Up Tax Types*.

Use an **Obligation Business Object** to define a *BO* that may govern additional rules related to obligations of this type.

Indicate if the **Revenue Period Applicability** for obligations of this type is **Required** or **Not Allowed**.

Select the **Distribution Code** and **GL division** that defines the receivable account for receivable-oriented obligations. For non-receivable oriented obligations, this distribution code depends on the obligation type's function. Refer to *Designing Obligation Types* for some examples.

Select the **Revenue Class** associated with the obligation type (and its obligations). The revenue class may affect the revenue account(s) generated by the obligation's rate.

> **NOTE:** The revenue class field is only visible if your implementation has *turned off* the **C1TB — Billing** module. This information is used only for classic billing and rates functionality.

> **FASTPATH:** Refer to *Rate Component - GL Distribution* for more information about revenue class.

Set the **Eligible for Pay Plan** flag to **Eligible** if you want obligations of this type to be eligible to be covered by a pay plan.

Select the **Payment Segment Type** that defines how payment segments linked to obligations of this type affect the obligation's payoff and current balances and how the general ledger details for the payment are built.

> **FASTPATH:** For more information about payment segment types, refer to *Setting Up Payment Segment Types*.

When a tender is canceled, a cancellation reason must be supplied. If the cancellation reason indicates a NSF (non sufficient funds) charge should be levied, the system invokes the Levy an NSF Charge algorithm specified on the tender's account's *account type*. Because adjustments must be linked to an obligation, the algorithm must determine the appropriate obligation to use to levy the adjustment based on business rules. The charge is levied using the **NSF Adjustment Type** of the appropriate obligation's obligation type.

> **CAUTION:** You must specify adjustment type profiles on the obligation type (on the Adjustment Type window) to ensure that the adjustment type defined here is valid.

FASTPATH: For more information about adjustment types, refer to *Setting Up Adjustment Types*.

Define the **Payment Grace Days** and **Override Filing Grace Days** applicable for obligations of this type. Refer to *Due Dates for Filing Period Based Obligations* for more information about due dates.

Select the **Payment Priority**. This field is available for use by the algorithms that distribute partial payments amongst an account's obligations. Higher priority obligations will have their debt relieved before lower priorities. Refer to *Distribution Based on Payment Priority* and *Delinquent Payment Distribution Algorithm* for information about payment distribution algorithms that use this field.

NOTE: The values for this field are customizable using the Lookup table. This field name is PAY_PRIORITY_FLG.

FASTPATH: For more information about distribution priority, refer to *Distributing A Payment Amongst An Account's obligations*.

Select the **Delinquent Payment Priority**. This field is available for use by the algorithms that distribute partial payments amongst an account's obligations. Higher priority obligations will have their debt relieved before lower priorities. Refer to *Delinquent Payment Distribution Algorithm* for information about a payment distribution algorithm that uses this field.

NOTE:
The values for this field are customizable using the Lookup table. This field name is DEL_PRIORITY_FLG.

Define the default **Debt Category** to assign to bill segment type financial transactions for obligations of this type. Refer to *Debt Categories and their Priorities* for more information.

NOTE: **Required for base algorithms**. The base P&I calculation algorithm and the base *Determine Detailed Balance* algorithm require that every debit financial transaction reference a debt category. This field applies to both standard and classic bill segment financial transactions.

Define the default **Debt Category Priority** for credit financial transactions linked to obligations of this type. Refer to *Debt Categories and their Priorities* for more information.

Turn on **Do Not Overpay** if the system is not allowed to distribute an overpayment to this type of obligation (i.e., the obligation is not allowed to have a system-created credit balance). This field is available for use by algorithms that distribute overpayments. Refer to *Overpayments Held On Highest Priority Obligation* for information about an overpayment algorithm that uses this field.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_SA_TYPE*.

Obligation Type - Detail

Open **Admin, Obligation Type** and navigate to the **Detail** tab to define additional details about a given obligation type.

Description of Page

Turn on **Display As Alert** if an alert should appear in the alert zone if an account has an obligation of this type that isn't **Closed** or **Canceled**. If this switch is on, also enter the **Alert Information** to appear in the zone. We recommend only using this feature on unusual obligation types (e.g., write-offs) so that a user is not presented with an alert for every obligation type.

If this obligation type is used for any of the special roles defined in the drop down of **Special Role Flag**, indicate which one. Valid values are: **Pay Plan**, **Write Off** and **Billable Charge**. This information is used on windows with functionality that

can only be used by obligations used for specific roles. For example, the Pay Plan window group can only reference **Pay Plan** obligations.

NOTE: The values for this field are customizable using the Lookup table. This field name is SPECIAL_ROLE_FLG.

NOTE: The **Billable Charge** special role value is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module. This role applies only to classic billing functionality. Refer to the **Where Used** section below for more information on **Billable Charge** obligation types.

If the Special Role is **Write Off**, you must also define the following adjustment type:

- Use **Adjustment Type (Xfer)** to specify the type of adjustment used to transfer funds from the uncollectable obligations to the write off obligation.

Turn on **One Time Charge** if this obligation type is used for one-time invoices. When a one-time invoice obligation is created, the system sets the stop date of the obligation to be equal to the start date.

NOTE: The One Time Charge field is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module.

Set **Renewal** to **Not Allowed, Optional** or **Required** depending on the business rules for obligations of this type. Renewal logic is not common for revenue period based obligations because those types of obligations typically cover a specific revenue period. Renewal may be applicable for special obligations that are used to track a long term financial obligation like a license and have an expiration date.

If renewal is required or optional, specify the **Renewal Days Before Expiration**.

Where Used

The alert information is used by the alert zone to alert a user when unusual obligations exist for an account. Refer to *Alert Zone* for more information.

Only obligation types designated as being **Billable Charge** may have billable charges linked to them. Refer to *Maintaining Billable Charges* for more information.

Only obligation types designated as **Pay Plan** may be used to set up pay plans. Refer to *Pay Plans* for more information.

Only obligation types designated as being **Write Off** may be specified as the write off obligation type on distribution codes. Refer to *Setting Up Distribution Codes* for more information.

Obligation Type - Billing

Open **Admin, Obligation Type** and navigate to the **Billing** tab to define how the system manages classic bill segments for obligations of a given obligation type.

NOTE: **Optional information.** This tab is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module. The information is used only for classic billing functionality.

Description of Page

Turn on **Eligible for Billing** if the system should create bill segments for obligations of this type.

Define the minimum number of days a bill segment (other than the final segment) must span using **Minimum Days for Billing**. This is useful to prevent initial bill segments that span only a few days.

FASTPATH: For more information about minimum days, refer to *Preventing Short Bill Segments*.

Select the **Bill Segment Type** that controls both how classic bill segments for this obligation type will be created and how the related financial transaction affects the general ledger and the taxpayer's debt.

FASTPATH: For more information about classic bill segment types, refer to *Setting Up Bill Segment Types*.

Use **Default Description on Bill** to define the verbiage that should print on the taxpayer's bill.

NOTE: **Rates overwrite this description.** The Default Description on Bill is not applicable for obligations whose charges are calculated using a rate. Why? Because the description that appears on the bill segment is defined on the rate schedule's rate version.

NOTE: **Billable charges overwrite this description.** The Default Description on Bill is not applicable for obligations whose charges are calculated using a billable charge. Why? Because the description that appears on the bill segment is defined on the billable charge.

Use the **Billing Processing Sequence** if you need to control the order in which obligations linked to this obligation type are processed by classic billing processes.

Use **Bill Print Priority** to define the order in which the obligation type's bill segments should appear on bills (relative to the other obligation types that appear on a bill).

NOTE: The values for this field are customizable using the Lookup table. This field name is BILL_PRT_PRIO_FLG.

Use **Max Bill Threshold** if you want the system to generate a bill error when a bill segment is produced in batch that exceeds a given value. These bill errors will appear on the standard billing queries and To Do lists. If, after reviewing the high value bill segment, an operator truly intends to send the bill out, they should regenerate the bill. Refer to *How To Correct A Bill Segment That's In Error* for more information.

CAUTION: The value entered in this field will DEFAULT onto obligations of this type when they are first created. An operator may change the default value on an obligation in case a specific taxpayer has unusually high bills that continually error out. It's important to be aware that if you change the value of High Bill Amount on an obligation type and there already exist obligations of this type, the existing obligations will contain the original value (the new value on the obligation type will not be propagated on the existing obligations).

Turn on **Characteristic Location Required** if a characteristic location must be linked to the obligation when the obligation is activated. The characteristic location is used to define the taxing authorities associated with the obligation's classic bill segments. It is also used to identify where the obligation's service is located on various windows.

NOTE: This is only applicable for systems that are configured for *legacy address* functionality.

FASTPATH: For more information about how characteristic location is used, refer *An Illustration Of A Rate Factor And Its Characteristics*.

Use the **Initial Start Date Option** to control how billing should calculate the calculation period for the very first bill for obligations of this type. This field is important if your obligation has rate components that include daily charges. Set the field to **Include First Day** if the obligation's start date should be included in the daily charges. Set the value to **Add 1 Day Always** if the obligation's start date should never be included in the daily charges. Set the value to **Add 1 Day for Back-to-back** if the obligation's start date should only be included in the daily charges if no previous taxpayer was responsible for the charge (for example for property tax). This field is not applicable for obligation types with a special role of **Billable Charge**.

Obligations may have the end date of their bill segments defined on a user-maintained bill period schedule. This option is used when bill segments must fall on strict calendar boundaries (e.g., quarterly bills that end on the last day of the quarter).

If this obligation type should be billed like this, select **Use Bill Period** in the **Use Calendar Billing** field. When this option is used, you must define the **Bill Period** whose schedule defines the bill segment end dates.

> **FASTPATH:** For more information about bill period schedules, refer to *Defining Bill Cycles and Bill Periods*. For more information about other bill end date methods, refer to *Ways To Control The End Date Of A Bill Segment*.

Instead of the **Use Bill Period** method, obligations may have their bill segment end date based on a specified date. If this obligation type should be billed like this, select **Anniversary Future Billing** or **Anniversary Past Billing** in the **Use Calendar Billing** field. When either option is used, you must define the **Anniversary Bill Frequency**. This frequency defines the amount of time between bill segments.

> **FASTPATH:** For more information about anniversary billing, refer to *Using The Anniversary Method*. For more information about other bill end date methods, refer to *Ways To Control The End Date Of A Bill Segment*.

Total Bill Amount indicates whether obligations of this type can use the total amount to bill field on the obligation page. Valid values are **Not Allowed** and **Required**.

If **Required** is selected, you must enter the **Total Amount To Bill Label**. The **Total Amount To Bill Label** defines the label that prefixes the total bill amount on the obligation page for obligations of this obligation type.

Recurring Charge indicates whether obligations of this type can use the recurring charge field on the obligation window. Valid values are **Not Allowed**, **Optional** and **Required**. If either **Optional** or **Required** are used, you must enter:

- **Recurring Charge Amount Label**. This defines the label that prefixes the recurring charge amount on the obligation window for obligations of this obligation type.
- **Recurring Charge Frequency**. This defines the following:
  - Specifies the frequency at which the Recurring Charge Amount specified on obligations of the obligation type is to be billed.
  - Serves as the basis for proration of the Recurring Charge Amount.
  - Specifies the frequency at which obligations of the obligation type without a rate will be billed.

Obligation Type - Rate

Open **Admin, Obligation Type** and navigate to the **Rate** tab to define the rates that may be referenced on obligations of a given type.

> **NOTE: Optional information.** This tab is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module. The information is used only for classic billing functionality.

Description of Page

Turn on **Rate Required** if the bill segment creation algorithm for the obligation type expects a rate schedule to be referenced on obligations of this type.

> **FASTPATH:**
> For more information, refer to *Rates*.

Define the date the system uses when selecting an effective-dated rate (from the obligation's rate history) using **Rate Selection Date**. Selecting **Bill Start Date** will cause the system to use the rate effective on the first day of the bill segment's calculation period. Selecting **Bill End Date** will cause the system to use the rate effective on the last day of the bill period. Selecting **Accounting Date** will cause the system to use the rate effective on the accounting date associated with the bill.

The information in the **Rate Schedules** collection defines the rates that may be referenced on obligations of this type. The following fields are required for each obligation type:

Rate Schedule	Specify the rate schedule; its description is displayed adjacent.
Use Rate As Default	Turn on this switch for the rate to be defaulted on new obligations.

Where Used

This information is used to default and validate the rate specified on an obligation. Refer to *Obligation - Rate Info* for more information.

Obligation Type - Adjustment Profiles

Open **Admin, Obligation Type** and navigate to the **Adj Profile** tab to define the adjustment profiles that define adjustment types that may be referenced on obligations of a given type.

Description of Page

Define the **Adjustment Type Profiles** that, in turn, define adjustment types that may be referenced on obligations of a given type.

FASTPATH:
For more information about adjustment type profiles, refer to *Setting Up Adjustment Type Profiles*.

Where Used

This information is used to validate the adjustments linked to the obligation. Refer to *Adjustments - Main Information* for more information.

Obligation Type - Characteristics

To define characteristics common to all obligations of a given type, open **Admin, Obligation Type** and navigate to the **Characteristics** tab.

Description of Page

Use the characteristics collection to define a **Characteristic Type** and **Characteristic Value** common to all obligations of this type.

NOTE:
You can only choose characteristic types defined as permissible on an obligation type record. Refer to *Setting Up Characteristic Types & Their Values* for more information.

Obligation Type - Algorithms

Open **Admin** > **Obligation Type** and navigate to the **Algorithm** tab to define the algorithms that should be executed for obligations of a given type.

Description of Page

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 (descriptions of all possible events are provided below).

- 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.

CAUTION: Warning! These algorithms are typically significant processes. The absence of an algorithm may prevent the system from operating correctly.

The following table describes each **System Event** for which you can define algorithms.

System Event	*Optional / Required*	*Description*
Bill Completion	Optional	These algorithms are executed whenever a bill is completed for an account that contains a non-canceled obligation of this type. **Note**. Algorithms of this type are called for all non-**Canceled** obligations, regardless of whether or not they are billed. If your algorithms should only be processed under certain conditions (for example, only process this algorithm for **Active** obligations), then it is the responsibility of the algorithm to check the conditions before continuing. Click *here* to see the algorithm types available for this system event.
Break Pay Plan Obligation	Optional	These algorithms are executed when a *pay plan* is manually stopped via the *pay plan maintenance page*. Click *here* to see the algorithm types available for this system event.
Cash Accounting True Up	Optional	This algorithm is responsible for making all necessary adjustments to the general ledger to transfer amounts from "holding" general ledger accounts to true payable accounts. It is executed when the Calculate P&I service has been called in Update mode, regardless of whether or not P&I is applicable for the obligation type. Refer to *P&I and Cash Accounting* for more information. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.
Close / Reactivate Criteria	Optional	This algorithm is invoked from the common routine that performs closing / reactivation logic for an obligation. The common routine is invoked from the close action on the obligation maintenance page, when an account's obligations are monitored for overdue debt and whenever an FT is added, canceled or frozen for the obligation. It checks any additional conditions that are necessary to determine if an obligation of this type can be closed or reactivated. Only the first algorithm plugged in on this spot will be executed. Click *here* to see the algorithm types available for this system event.
Determine Detailed Balance	Optional	This plug-in spot is responsible for breaking down an obligation's balance into balances by separate assessments and debt categories (for example: tax, penalty, interest, fees, etc). It is used in the base **P&I Calculation** plug-in and several other services that require the balance of an obligation to be broken down by assessment and debt category. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.

FT Freeze	Optional	These algorithms are executed whenever a financial transaction is frozen that is linked to an obligation of this type. Click *here* to see the algorithm types available for this system event.
Generate Obligations	Optional	This plug-in spot is responsible for generating Obligations of the associated Obligation Type for a Tax Role. It is invoked by the common service that generates obligations for a tax role. In addition to creating obligations for periods up to and including the current business date, algorithms plugged into this spot must indicate the date on which the next obligation of this type is due to be created for the tax role. Refer to*Tax Roles Can Maintain Obligations* for more information. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.
Obligation Activation	Optional	These algorithms are executed when an obligation status changes from **Pending Start** to **Active**. It performs any additional activities that are necessary to activate an obligation. Click *here* to see the algorithm types available for this system event.
Obligation Cancel	Optional	These algorithms are executed when an obligation status changes to **Canceled**. It performs any additional activities that are necessary when an obligation is canceled. Click *here* to see the algorithm types available for this system event.
Obligation Creation	Optional	These algorithms are executed when an obligation is created. Click *here* to see the algorithm types available for this system event.
Obligation Information	Optional	We use the term "obligation information" to describe the basic information that appears throughout the system to describe an obligation. The data that appears in "obligation information" may be constructed using an algorithm plugged in here. Refer to *Defining Obligation Information* for more information on when this algorithm is used. Click *here* to see the algorithm types available for this system event.
Obligation Renewal	Optional	These algorithms are executed by the Obligation Renewal background process whenever an obligation is due for renewal or when the user clicks the Renew button. It performs any activities that are necessary to renew an obligation and returns the new renewal and expiration dates for the obligation. Click *here* to see the algorithm types available for this system event.
Obligation Stop	Optional	These algorithms are executed whenever an obligation's status changes from **pending stop** to **stopped**. Click *here* to see the algorithm types available for this system event.
Obligation Stop Initiation	Optional	These algorithms are executed whenever an obligation's status becomes **pending stop**.

		Click *here* to see the algorithm types available for this system event.
P&I Calculation	Optional	This plug-in spot is responsible for *calculating penalty and interest* for the input obligation. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.
P&I Eligibility	Optional	This plug-in spot is invoked by the base Calculate Penalty and Interest plug-in. It receives an obligation id as input and returns an indication of whether the obligation is eligible or ineligible for P&I. Refer to *P&I Eligibility* for more information. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.
P&I Post Processing	Optional	This plug-in spot is invoked by the base P&I Calculation plug-in after all the penalty and interest calculations are finished. Algorithms plugged into this plug-in spot are responsible for additional logic performed at the end of the P&I process. Refer to *P&I Post Processing* for more information. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.
P&I Pre-processing	Optional	This plug-in spot is invoked by the base P&I Calculation plug-in and is used to populate information needed during P&I calculations. Refer to *P&I Pre-Processing* for more information. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.
P&I Prepare Periodic Balance	Optional	This plug-in spot is called from the Calculate Penalty and Interest plug-in spot for each date range being calculated. It is responsible for passing the appropriate FTs to the **Determine Detailed Balance** plug-in for the current date range. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.
Payment Freeze	Optional	These algorithms are executed whenever a payment is frozen. Click *here* to see the algorithm types available for this system event.
Process Pay Plan Scheduled Payment	Optional	These algorithms are executed by the Pay Plan Scheduled Payment Processing background process whenever a scheduled payment is due. If the pay plan obligation is unmonitored, this algorithm is not called. This algorithm should be specified on pay plan obligation types to create the necessary adjustments for the pay plan obligation. Click *here* to see the algorithm types available for this system event.
Retrieve FT List	Optional	This plug-in spot is responsible for retrieving the existing FTs for an obligation. It obtains all the data for each FT that is needed for **P&I Calculation** logic and the **Determine Detailed Balance** logic. Refer to the *Big Picture of Penalty and Interest* for more information.

Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.

Obligation Type - Pay Plan Recommendation Rule

Open **Admin, Obligation Type** and navigate to the **Pay Plan Rec'n Rule** tab to define the recommendation rules that are valid for pay plan obligations of this type.

Description of Page

If the obligation type's special role is **Pay Plan**, you may define the **Recommendation Rules** that are valid on pay plan obligations of this type. Check the **Use As Default** box to indicate the default recommendation rule for obligations of this type.

FASTPATH:
For more information about pay plans, refer to *Defining Pay Plan Options*.

Where Used

The pay plan recommendation rules are used to recommend the payment amount and payment schedule for pay plan obligations. Refer to *Maintaining Pay Plans* for more information.

Obligation Type - P&I Control

Open **Admin, Obligation Type** and navigate to the **P&I Control** tab to define the penalty and interest control record that governs the *penalty and interest calculation* rules for obligations of this type.

Description of Page

The P&I Control and its P&I Rules define the configuration governing the tax authority's penalty and interest calculations. As these rules change over time, a new P&I Control record with the new applicable P&I Rules is created and linked to the applicable obligation types for the effective date of the change.

The following fields display:

- **Effective Date** is the date the P&I Control rate becomes effective.
- **P&I Control** defines the P&I rules used to calculate the individual penalty and interest charges.

NOTE:
P&I configuration. Refer to *Setting Up Penalty and Interest Options* for more detail about the configuration required for calculating penalty and interest.

Where Used

This information is used by the P&I Calculation plug-in to apply specific rules.

Obligation Type - BC Template

Open **Admin, Obligation Type** and navigate to the **BC Template** tab to define the billable charge templates that can be used on obligations of a given type.

NOTE: Optional information. This tab is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module. The information is used only for classic billing functionality.

NOTE:
Only billable charges have billable charge templates. Only obligations that are defined as Billable Charges (in the Special Role on the Details window) may use the grid on this window.

Description of Page

The information in the **Billable Charge Template** collection defines the obligation type's permissible billable charge templates. A billable charge template contains the default bill lines, amounts and distribution codes used to levy a one-off charge. The following fields are required for each template:

Billable Charge Template	Specify the billable charge template. Its description is displayed adjacent.
Use As Default	Turn on this switch for the template to be defaulted on new billable charges linked to obligations of this type (if any).

Where Used

This information is used to limit the billable charge templates that can be used for a given obligation type.

Obligation Type - BC Upload Overrides

The *BCU2 - Create Billable Charge* background process is responsible for creating billable charges for each billable charge upload staging record interfaced into the system. This process will override the values of the various switches referenced on a billable charge upload staging line if the respective obligation's obligation type has an override value for the billable charge upload staging line's billable charge line type.

NOTE: Optional information. This tab is only visible if your implementation has not *turned off* the **BI — Billing (Classic)** module. The information is used only for classic billing functionality.

NOTE:
If you don't need to override the values of a *Billable Charge Line Type* you don't need to set up this information.

Open **Admin, Obligation Type** and navigate to the **BC Upload Override** tab to define override values for a given Obligation Type / Billable Charge Upload Staging Line Type.

Description of Page

Use the **Billable Charge Overrides** collection to define values to be overridden on billable charge lines uploaded from an external system (refer to the description above for the details). The following switches may be overridden for a given **Obligation Type** and **Billable Charge Line Type.**

- Use the **Show on Bill** switch to define the value to be defaulted into the Show on Bill indicator on billable charge upload lines that reference this line type.
- Use the **Appear in Summary** switch to define the value to be defaulted into the App in Summary indicator on billable charge upload lines that reference this line type.
- Use **Memo Only, No GL** switch to define the value to be defaulted into the Memo Only, No GL indicator on billable charge upload lines that reference this line type.
- Use **Distribution Code** to define the value to be defaulted into the Distribution Code on billable charge upload lines that reference this line type.

Defining Obligation Information

The obligation information displayed throughout the system is controlled by a plug-in.

The system first looks to see if the obligation type references an obligation business object and if the business object defines an information plug-in. If a BO is not provided or if that BO does not define an information algorithm, the system looks for an information algorithm plugged into the obligation maintenance object.

If no plug-ins are found on the BO or the MO, the system looks for a plug-in algorithm on the *Obligation Type*.

If such an algorithm is not plugged-in on the Obligation Type, the system looks for a corresponding algorithm on the *installation record*.

If you prefer different formatting logic, your implementation should provide a plug-in at one of the above plug-in spots, as appropriate for your business rules.

Setting Up Customer Contact Options

This section describes tables that must be set up before you can define customer contacts.

FASTPATH:
Refer to *The Big Picture Of Customer Contacts* for more information about taxpayer (customer) contacts.

Letters Via Customer Contacts

Customer contacts may be configured to cause a letter to be printed. These types of customer contacts reference a letter template, which configures various aspects of how the letter is printed. This section contains additional information about configuration for customer contacts that are letters.

Letter Printing

Letters are printed as a result of a customer contact that is specially configured for letters. The contents of this section describe the technical implementation of letter production.

Letter Templates Control The Information Merged Onto Letters

Customer contacts that trigger letters reference a *customer contact type* that, in turn, references a *letter template*. The letter template controls the following:

- It contains an algorithm that is responsible for extracting the information merged onto your letters. Algorithms of this type are called under the following scenarios:
  - The *background process* that builds the flat file that's passed to your letter print software calls these algorithms to construct the supporting details for each letter.
  - If your letter print software has the ability to construct a real-time image of a letter (in a PDF), you can plug-in an **Online Letter Image** algorithm on the *Installation Record*. This type of algorithm will call the letter's letter template's extract algorithm to extract the information that is merged onto the letter. Refer to *Technical Implementation Of Online Letter Image* for the details.

NOTE: The product provides a sample extract algorithm to integrate with Documaker. The sample integration uses the letter template code to map to the Documaker template.

- It contains the ID of the background process that builds the flat file that's passed to your letter print software. The base package example of this process (known by the batch control ID of **LTRPRT**) simply calls each customer contact's letter template's extract algorithm to format the information placed onto the flat file.

Technical Implementation Of Batch Letter Production

The batch process that extracts letter information (known by the batch control ID of **LTRPRT**) reads all customer contact records in a given run number that are marked with its batch control ID. For each customer contact, it creates numerous records on a flat file. These records contain the taxpayer information that is merged onto your letters.

The information that is placed on each record is controlled by the customer contact's letter template's extraction algorithm. Refer to *Letter Templates Control The Information On Letters* for more information.

The records on the flat file can be constructed in either a fixed-position or field-delimited format. The format that's used is controlled by a parameter supplied to the **LTRPRT** background process.

NOTE:
Print / routing methods. If you require different print formats, you must create new letter extract algorithms and plug them in on your *letter template*.

Technical Implementation Of Online Letter Images

Users can view an image of any letter that is sent to a taxpayer if you set up the following:

- Plug-in an **Online Letter Image** construction algorithm on the *Installation Record*. Refer to *dataDictionary?type=algtype&name=C1-LT-DISP* for an example of such an algorithm. Note, if your letter print software is not capable of producing a PDF containing an image of a letter, users will not be able to view images of letters.
- Plug-in the appropriate extract algorithm on each *letter template*. Algorithms of this type format the records that contain the taxpayer information that is passed to your printing software.

When you plug-in these algorithms, a button appears on *Customer Contact - Main* for customer contacts whose customer contact type references a letter template. When a user clicks this button, the following takes place:

- The installation record's **Online Letter Image** construction algorithm is executed.
- This algorithm calls the customer contact's letter template's extract algorithm. This algorithm constructs the information that's merged onto the letter and returns it to the **Online Letter Image** algorithm. This algorithm, in turn, passes it to your letter print software.
- Your letter print software renders an image of the letter in a PDF and returns it to the **Online Letter Image** algorithm.
- And finally, the **Online Letter Image** algorithm displays the PDF in a separate Adobe session.

Letter Extract Record Structure

This section describes the structure of the record layouts provided with base product flat file letter extract algorithms. All algorithms follow a common pattern and each specific letter extract algorithm includes the details specific for its letter.

The following points highlight the common structure:

- The first 4 bytes are called the **Record Type**. This field is used to identify the type of record.
- The next 26 bytes are called the **Sort Key**. This field is used to ensure the various records used to construct a printed letter appear in the correct order in the interface file.
- The next 12 bytes are called the **Mailing Key**.
- The remaining bytes contain the **Letter Information** that appears on the printed letter. The type of information differs for each record type.

The topics in this section describe each component.

Common Record Types
The topics in this section describe the record structure and values for the common record types. Common record types appear on all letters. There are four types:

- Global Information Record
- Letter Record
- Mailing Information Record
- End of Letter Record

Record Type

The following table lists the common record type values.

NOTE: Specific types of letters will have their own record types. Refer to *Specific Record Types* for letter extracts provided by the base product.

Record Type	*Description*	*Notes*
0010	Global Information Record	Required. 1 per flat file.
1000	Letter record	Required. 1 per letter.
1100	Mailing Information	Required. 1 per letter.
Note	Additional record types are defined for specific letters. Refer to *Specific Record Types* for details.	
9990	End of Letter Record	Required. 1 per letter.

Sort Key

The following table describes the structure of the sort key and the values for the common record types.

Field Name	*Format*	*Source / Value / Description*
LTR_TMPL_CD	A12	
CC_ID	A10	
CC Record Group	A2	This field forces the letter's records into the correct order. Values: 10 – General Letter information 20 – Mailing information Note: Specific letter record types define their own CC Record Group. Refer to *Specific Record Types* for examples. 99 – End Letter
Sub Record Group	A2	Available for specific letter record types to further control the sort of records. Refer to *Specific Record Types* for examples.

Mailing Key

Mailing key contains the postal code.

Letter Information

The following shows the letter information for the common record types together with their associated record type, sort and mailing key.

Global Information Record

This is a “header” record that contains information about the extract run as a whole.

NOTE: Please be aware that if you do not sort your extract file by Sort Key after it is produced, this record will physically be the last record on the extract file. Also note that this record will only be produced by the various letter extract processes if you supply the appropriate parameter value (CNTL-REC-SW=Y).

Field Name	*Format*	*Source / Value / Description*
Record Type	A4	"0010"
Sort Key	A26	This is blank for this record type only.
Mailing Key	A15	This is blank for this record type only.
BATCH_CD	A8	CI_BATCH_INST / The Batch Process that called the Letter Extract COBOL routine
BATCH_NBR	N10	CI_BATCH_INST / A sequence number for serial instances of a Batch Process over time
BATCH_RERUN_NBR	N10	CI_BATCH_INST / The number of times a particular batch has been re-run since its initial run
Letter Count	N10	Total number of letters in this extract
Date/Time	A26	System time of extraction.
CC Id Start	A10	The lowest CC ID in a particular thread in the extract
CC Id End	A10	The highest CC ID in a particular thread in the extract
BATCH_THREAD_NBR	N10	CI_BATCH_THD / Identifies a thread distinctly within a group of threads
Thread Count	N10	Total number of threads in the extract run

Letter Record

One record is produced for every letter to be printed.

Field Name	*Format*	*Source / Value / Description*
Record Type	A4	"1000"
Sort Key	A26	
Mailing Key	A15	

CC_ID	A10	CI_CC / System-assigned identifier for a Customer Contact.
PER_ID	A10	CI_CC / System-assigned identifier for the Person who will receive the letter.
CC_DT	D10	CI_CC / The date of the Customer Contact.
CC_TM	T15	CI_CC / The time of the Customer Contact.
CC_CL_CD	A4	CI_CC / The category of contact.
CC_TYPE_CD	A12	CI_CC / The type of contact within the category.
LTR_TMPL_CD	A12	CI_CC / The template of the letter.
LTR_DT	D10	From the current system date/time - the date to print on the letter.

Mailing Information Record

One record is produced for every letter to be printed.

NOTE: Please note that there may be space and display limitations in the designed letter with respect to field lengths. For example, the system supports 64 bytes for the taxpayer name and address and supports several lines of each. The designed letter may not allow for this much information and could cut off information. Please work closely with the letter template designers for your letters to ensure proper display of data.

Field Name	*Format*	*Source / Value / Description*
Record Type	A4	"1100"
Sort Key	A26	
Mailing Key	A15	
ENTITY_NAME1	A64	If an override mailing name has been specified on the CI_PER row, this field contains the first line of the person's override mailing name (OVRD_MAIL_NAME1). Otherwise, the person's primary name is used (ENTITY_NAME).
ENTITY_NAME2	A64	If an override mailing name has been specified on the CI_PER row, this field contains the 2nd line of the person's override mailing name (OVRD_MAIL_NAME2). Otherwise, this field is blank.
ENTITY_NAME3	A64	If an override mailing name has been specified on the CI_PER row, this field contains the 3rd line of the person's override mailing name (OVRD_MAIL_NAME3). Otherwise, this field is blank.
ADDRESS_SBR		Address Constituents. Total number of bytes = 361. Refer to How The Address is Determined below for the source of the address information.

COUNTRY	A3
ADDRESS1	A64
ADDRESS2	A64
ADDRESS3	A64
ADDRESS4	A64
CITY	A30
NUM1	A6
NUM2	A4
HOUSE_TYPE	A2
COUNTY	A30
STATE	A6
POSTAL	A12
GEO_CODE	A11
IN_CITY_LIMIT	A1

End of Letter Record

Field Name	*Format*	*Source / Value / Description*
Record Type	A4	"9990"
Sort Key	A26	
Mailing Key	A15	

Specific Record Types
This section describes the functionality of specific letters provided by the base product.

Collection Letter
The product supplies a base collection letter extract algorithm *C1-LTR-CLLDC*. It includes the common record types as described above as well as additional records with new record types. These records are described below.

> **NOTE:** Please note that there may be space and display limitations in the designed letter with respect to field lengths. For example, several control table descriptions are included and are 60 bytes. The designed letter may not allow for 60 bytes for a description and could cut off some information. Please work closely with the letter template designers for your letters.

Record Types

The following table lists the record types used for the collection letter.

Record Type	*Description*	*Notes*
1600	Overdue Process record	Required. 1 per letter.
Note	The subsequent record types depend on the 'collecting on' object for the overdue process. The algorithm supports 'collecting on' object of obligation or assessment. If it's obligation, then record types 1620 and 1622 are populated. If it's assessment, then record types 1650 and 1652 are populated.	

1620	Overdue Process Obligation record	A record will exist for each obligation linked as a 'collecting on' object to the overdue process.
1622	Overdue Process Obligation Debt Category record	A record will exist for each combination of obligation and debt category for outstanding debt.
1650	Overdue Process Assessment record	A record will exist for each assessment linked as a 'collecting on' object to the overdue process.
1652	Overdue Process Assessment Debt Category record	A record will exist for each combination of assessment and debt category for outstanding debt.

Sort Key

The following table describes the structure of the sort key and the values for the collection letter record types.

Field Name	*Format*	*Source / Value / Description*
LTR_TMPL_CD	A12	
CC_ID	A10	
CC Record Group	A2	30 - Collection type letters
Sub Record Group	A2	This field forces the subordinate records into the correct order. Values: 10 – Overdue Process record 20 – Overdue Process Obligation record 30 – Overdue Process Obligation Debt Category record 40 – Overdue Process Assessment record 50 – Overdue Process Assessment Debt Category record

Mailing Key

Mailing key contains the postal code.

Letter Information

The following shows the letter information for the collection letter record types together with their associated record type, sort and mailing key.

Overdue Process Record

This record contains information about the overdue process and event that triggered the letter.

Field Name	*Format*	*Source / Value / Description*
Record Type	A4	"1600"
Sort Key	A26	
Mailing Key	A15	

OD_PROC_ID	A12	CI_OD_PROC_LOG / Overdue process that triggered the letter.
OD_EVT_SEQ	N3	CI_OD_PROC_LOG / Overdue event that triggered the letter.
ACCT_ID	A10	CI_OD_PROC / Account being collected on.
OD_PROC_TEMPL_CD	A12	CI_OD_PROC / Overdue process template.
DESCR	A60	CI_OD_PROC_TMP / Description of the overdue process template (using the language of the customer contact's Person).
CRE_DTTM	DT25	CI_OD_PROC / Date/time that the overdue process was created.
CURRENCY_CD	C3	CI_OD_PROC / Currency for the amount.
CHAR_TYPE_CD	C8	CI_OD_PROC_TMP/Char Type of Objects Collecting On

Overdue Process Obligation Record

If the Overdue Process is 'Collecting On' Obligations, this record contains the obligation details. There will be 1 record for each obligation in the collection.

Field Name	*Format*	*Source / Value / Description*
Record Type	A4	"1620"
Sort Key	A26	
Mailing Key	A15	
SA_ID	A10	CI_SA / Id of the Obligation
START_DT	N10	CI_SA / Start Date of the Obligation
END_DT	N10	CI_SA / End Date of the Obligation
DESCR	A60	CI_SA_TYPE_L / Description of the Obligation Type (using the language of the customer contact's Person)

Overdue Process Obligation Debt Category Record

If the Overdue Process is 'Collecting On' Obligations, this record contains the breakdown of the credit allocation by debt category for the given obligation. This is done by calling the "determine balance details" business service (BS). A record exists for every debt category for the obligation's FTs that have outstanding debt.

NOTE: Please note that extract produces a row for each unique debt category that has a balance for each obligation. Your implementation may define granular debt categories, if desired. Please work closely with the letter template designers for your letters to ensure that the display of the debt details allows for the number of possible debt categories for your obligations.

Field Name	*Format*	*Source / Value / Description*
Record Type	A4	"1622"
Sort Key	A26	
Mailing Key	A15	

SA_ID	A10	CI_SA / Id of the Obligation
DEBT_CAT_CD	A8	From Determine Balance Details BS / Debt category
DESCR	A60	From Determine Balance Details BS / Description of Debt Category. (using the language of the Customer Contact's Person)
C1_DEBIT_AMT	N13.2	From Determine Balance Details BS / Assessed Amount
C1-PAY_AMT	N13.2	From Determine Balance Details BS / Payment Amount
C1_WV_AMT	N13.2	From Determine Balance Details BS / Waive Amount
C1_WO_AMT	N13.2	From Determine Balance Details BS / Write Off Amount
C1_OC_AMT	N13.2	From Determine Balance Details BS / Other Credit Amount
C1_BAL_AMT	N13.2	From Determine Balance Details BS / Balance Amount
DEBT_TYPE_FLG	A4	From Determine Balance Details BS / Debt Type

Overdue Process Assessment Record

If the Overdue Process is 'Collecting On' Assessments, this record contains the assessment details. There will be 1 record for each assessment in the collection.

Field Name	*Format*	*Source / Value / Description*
Record Type	A4	"1650"
Sort Key	A26	
Mailing Key	A15	
FT_ID	A12	CI_FT / FT Id of the Assessment
FREEZE_DTTM	N26	CI_FT / Freeze Date Time of Assessment
SA_ID	A10	CI_SA / Id of the Assessment’s obligation
START_DT	N10	CI_SA / Start Date of the Assessment’s obligation
END_DT	N10	CI_SA / End Date of the Assessment’s obligation
DESCR	A60	CI_SA_TYPE_L / Description of the Assessment’s Obligation Type (using the language of the customer contact's Person)

Overdue Process Obligation Debt Category Record

If the Overdue Process is 'Collecting On' Assessments, this record contains the breakdown of the credit allocation by debt category for the given assessment. This is done by calling the "determine balance details" business service (BS) for the

assessment's obligation and then retrieving the detail specific for this assessment. A record exists for every debt category for the assessment's related FTs that have outstanding debt.

NOTE: Please note that extract produces a row for each unique debt category that has a balance for each assessment. Your implementation may define granular debt categories, if desired. Please work closely with the letter template designers for your letters to ensure that the display of the debt details allows for the number of possible debt categories for your assessments.

Field Name	*Format*	*Source / Value / Description*
Record Type	A4	"1652"
Sort Key	A26	
Mailing Key	A15	
FT_ID	A12	CI_FT / Id of the Assessment
DEBT_CAT_CD	A8	From Determine Balance Details BS / Debt category
DESCR	A60	From Determine Balance Details BS / Description of Debt Category. (using the language of the Customer Contact's Person)
C1_DEBIT_AMT	N13.2	From Determine Balance Details BS / Assessed Amount
C1-PAY_AMT	N13.2	From Determine Balance Details BS / Payment Amount
C1_WV_AMT	N13.2	From Determine Balance Details BS / Waive Amount
C1_WO_AMT	N13.2	From Determine Balance Details BS / Write Off Amount
C1_OC_AMT	N13.2	From Determine Balance Details BS / Other Credit Amount
C1_BAL_AMT	N13.2	From Determine Balance Details BS / Balance Amount
DEBT_TYPE_FLG	A4	From Determine Balance Details BS / Debt Type

How the Address is Determined

The address is retrieved as described in *Determining Address*.

NOTE: If an address is not found, the letter is not produced and a warning is issued by the background process responsible for creating the letter extract file.

Suppressing Letters

The following points highlight the “lifecycle” of a customer contact letter:

- **Not yet extracted**. When a customer contact is first created and the customer contact type refers to a letter template, the extract batch control is stamped onto the customer contact along with the current run number of the batch control. Note that internally, the customer contact also has a “print letter” switch that is set to “Y”.

- **Extracted**. When the extract batch process runs, the appropriate information related to the customer contact is sent to the printing software. The customer contact is updated with the extract date / time. At this point, the application does not have any additional information about the status of the printing of the letter as it is in the control of the printing software.

There are some implementations that may want to attempt to suppress a letter from printing if the process that created the customer contact is canceled for some reason. If the letter has not yet been extracted, then it is possible to suppress the letter from being printed. Once the letter has been extracted, it is possible to still prevent mailing of the letter by either stopping the print via the printing software or by intercepting the printed letters before mailing. However, the application does not have any control over intercepting letters after they are extracted.

The product provides the following support for attempting to suppress the letter via an algorithm. Currently there is no support for suppressing the letter using the customer contact page.

- Updating the “print letter” switch. The extract batch process only selects customer contacts where the “print letter” switch is set to “Y”. If an algorithm would like to suppress a letter, it should mark this switch as “N”. Note that if a letter has already been extracted, the switch may still be set to “N” if desired by the implementation. This may be done for audit purposes to indicate that the process attempted to suppress the letter but that it was already extracted.
- Suppression Reason. The product supplies a customer contact characteristic type that may be used to mark a reason for suppression. Algorithms that attempt to suppress the letter should populate the suppression reason characteristic with an appropriate value.
- The customer contact user interface displays letter information and will adjust the information based on whether the print letter switch is Y or N and whether or not the letter has already been extracted.

NOTE: For an example of an algorithm that attempts to suppress a letter, refer to the overdue type reversal algorithm **C1-CC-REVRSL** Reverse Customer Contact

Setting Up Letter Templates

You can set up a customer contact type to generate a form letter whenever a customer contact of this type is added. In fact, this is the only way to generate a letter in the system.

FASTPATH:
Refer to *Letter Printing* for more information about how letters are produced.

Every customer contact that causes a letter to be sent must reference a unique letter template. To define a letter template, open **Admin** > **Letter Template**.

Description of Page

The following fields are required for each letter template:

- **Letter Template** is the unique identifier of the letter template.
- Use **Description** to enter a brief description of the letter.
- Use a **Customer Contact Business Object** to define a *BO* that may govern additional rules related to customer contacts of this type.
- Turn on **Special Extract** if this type of letter should only be created via a system generated event such as a collection letter. Turning on this switch is what prevents a user from adding a customer contact that references this type of letter template (because you don't want a user to be able to request a letter associated with a system generate event by adding a customer contact, rather, they must execute the appropriate process and it will generate the customer contact).
- The next two fields control how letters of this type are printed (both in batch and online). Refer to *Technical Implementation Of Batch Letter Production* for more information about producing letters in batch. Refer to *Technical Implementation Of Online Letter Production* for more information about online letter production.

- Use **Batch Control** to define the process that creates the flat file that is passed to your letter printing software. If you use an **Extract Algorithm** to construct the downloaded information, you can use the **LTRPRT** process.
- Use **Extract Algorithm** to define the plug-in component that constructs the "flat file records" that contain the information to be merged onto letters of this type. This algorithm is called when a user requests an online image of a letter on *Customer Contact - Main* and it may also be called by the batch letter extraction process defined above. Click *here* to see the algorithm types available for this plug-in spot.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_LETTER_TMPL*.

Setting Up Customer Contact Classes

Every customer contact record has a contact type that classifies the record for reporting purposes. And every contact type, in turn, references a customer contact "class". The class categorizes customer contacts into larger groupings for reporting purposes.

Open **Admin** > **Customer Contact Class** to define your customer contact classes.

Description of Page

Enter a unique **Contact Class** and **Description** for each customer contact class.

After you have created your customer contact classes, you'll be ready to setup your *customer contact types*.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_CC_CL*.

Setting Up Customer Contact Types

Every customer contact record has a contact type that controls the behavior of the customer contact.

FASTPATH:
Refer to *The Big Picture Of Customer Contacts* for more information about customer contacts.

Open **Admin** > **Customer Contact Type** to define your customer contact types.

Description of Page

Every customer contact type is identified by a unique combination of **Contact Class** and **Contact Type**.

Enter a brief **Description** of the customer contact type.

Only specify a **Contact Shorthand** if customer contacts of this type can be added in the *Customer Contact Zone*. The value you specify in this field is what the user selects to add a customer contact in this zone.

Use **Contact Action** if something should be triggered when customer contacts of this type are added. The only valid value in this release is **Send Letter**. If you select this option, you must also specify a **Letter Template**. Refer to *Letter Printing* for more information about how letters are produced.

Use the **Customer Contact Type Characteristics** collection to define characteristics that can be defined for contacts of a given type. Use **Sequence** to control the order in which characteristics are defaulted. Turn on the **Required** switch if the **Characteristic Type** must be defined on customer contacts of a given type. Turn on the **Default** switch to default the **Characteristic Type** when customer contacts of the given type are created. Enter a **Characteristic Value** to use as the default for a given **Characteristic Type** when the **Default** switch is turned on.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_CC_TYPE*.

Setting Up Letter Suppression Reasons

If your implementation includes algorithms that support attempting to suppress letters from printing, appropriate letter suppression reasons should be configured.

- Go to **Admin** > **Characteristic Type** and select the characteristic type **C1-REVST**, Letter Suppression Reason.
- Add appropriate values to the Characteristic Value collection as needed.

Defining Pay Plan Options

Tax authorities use pay plans as a collections tool. When a taxpayer agrees to be on a payment plan, it is an acknowledgement of his/her tax debt. Pay plans are typically used to satisfy obligations in which the taxpayer cannot satisfy the total obligation with one lump payment.

The pay plan's terms are typically negotiated between the tax authority and taxpayer. The payment amount and specific date intervals of the pay plan include such factors as total obligation amount and the taxpayer's ability to pay. Payments received are used to satisfy tax, penalty, and interest.

The Big Picture of Pay Plans

A pay plan is a special type of payment plan that encompasses two major elements:

- A set of scheduled payments
- The business rules used to recommend the payment schedule

Pay plans are managed via an obligation whose obligation type has a special role of **Pay Plan**. This type of obligations must have one or more recommendation rules, and are allowed to have payment schedules.

A pay plan's status is just like any other obligation's status. An active pay plan implicitly has a "kept" status (i.e. all scheduled payments have been made). A stopped plan implies that the pay plan has been completed, i.e. paid off, or stopped due to non-payment. It is important to note that the scheduled payments have their own status.

A list of the obligations covered by a pay plan is maintained with the pay plan. This list is used at payment distribution to determine which obligation to pay. An obligation may be covered by a pay plan when its obligation type is flagged as **Eligible for Pay Plan**.

Creating Pay Plans

A payment plan can be created as a result of the following scenarios:

- A collections case is created as a result of overdue debt. One of the available actions for the user responsible for the collections case is setting up a pay plan. Refer to *The Big Picture of Collection Cases* for details on how a collection case can create a pay plan.
- A bankruptcy case seeking readjustment of debt may require the taxpayer (debtor) to fulfill an agreed-upon payment plan. For bankruptcy types that require a pay plan, one of the available actions for the user is to create a pay plan. Refer to *The Big Picture of Bankruptcy* for details on bankruptcy and pay plan creation.
- The taxpayer may also voluntarily seek to enter a payment plan. Refer to *Maintaining Pay Plans* for details on how to create a pay plan manually.

Activating Pay Plans

A pay plan is created in a **pending start** status. For the pay plan to become effective, it needs to be activated. If the pay plan does not require any special approval, the user can activate the pay plan once they have completed setting up the payment schedule. This can be done by navigating to the obligation page, and using the **activate** button.

If the pay plan requires approval, a different process might be implemented depending on the tax authority's rules.

When a pay plan is activated, you can perform special processing using an algorithm plugged in on the obligation Activation system event on the pay plan obligation type. The special processing can be developed to do anything that you would like, for example you could:

- Create a customer contact that with an appropriate letter template can generate a letter to inform the taxpayer of their payment amount and payment schedule.
- Initiate the creation of a payment coupon book for a taxpayer.
- In some cases, the taxpayer may be charged a setup fee for the pay plan. See the base algorithm (*C1-OT-LEVFEE*) for an example.

The system comes supplied with a sample algorithm type (*SAAT-CC*) that simply creates a customer contact to indicate that the pay plan is activated.

Breaking Pay Plans

If the taxpayer does not meet their terms of the pay plan, the pay plan is considered broken. A pay plan can be broken in the one of the following ways:

- The user has used the **Break** action on the pay plan page.
- An automated process, such as monitor algorithm has determined that the taxpayer has broken the terms of the pay plan.

When the pay plan is broken, the pay plan is transitioned to **pending stop** status.

A base package break pay plan algorithm type (*C1-PAYP-BRK*) can be used to create a characteristic value to indicate if a pay plan is manually stopped by a user.

In addition, the algorithm type (*C1-OT-TPPRVW*) will create an account monitor review trigger if the pay plan is not associated with a collections case.

You can plug in an algorithm (of type *SAIS-ST*) on the obligation Stop Initiation system event on the pay plan obligation type to automatically stop the obligation (i.e. transition it to **stopped** status).

To finalize a pending stop obligation, the system calls the stop obligation algorithm plugged-in on the obligation Stop system event on the obligation type.

Stopping Pay Plans

If the taxpayer pays off the outstanding debt, the pay plan is considered stopped. A pay plan can be stopped in one of the following ways:

- The collection case that created the pay plan was closed as a result of the taxpayer paying off the debt, and updates the pay plan to **pending stop**.
- An automated process, such as monitor algorithm has determined that the taxpayer has paid off the debt, and updates the pay plan status to **pending stop**.

As indicated above, an algorithm can be plugged it to transition the pay plan immediately from **pending stop** to **stopped**.

Canceling Pay Plans

A pay plan may need to be cancelled under certain circumstances that are initiated either by the tax authority or the taxpayer. For example:

- A user may need to cancel an erroneous pay plan after it has already been activated.
- A tax authority may cancel pay plans (en masse) in the event of natural disasters.
- When a taxpayer indicates additional hardship, the procedure may involve canceling the existing pay plan and renegotiating a new pay plan.

Canceling a pay plan causes the pay plan status to change to **Cancelled**. Any specific actions that need to take place can be plugged in on obligation Cancel system event. The base package algorithm type (*C1-OT-CRCC*) can be used to create a customer contact when the pay plan is cancelled. Alternatively, (*SACA-CRTODO*) can be used to create a to do entry when the pay plan is cancelled.

Distributing Payments for Pay Plans

Pay plan payments are distributed directly to the covered obligations using payment event distribution rules.

The base-package provides a **Pay A Plan** Distribution Rule — Create Payment algorithm type *C1-DR-PAYPP*. This algorithm assumes that the payment event has a distribution detail that specifies the Pay Plan ID.

To enable this algorithm type:

- Configure an algorithm for C1–DR-PAYPP with the appropriate parameters.
- Create a distribution rule for Pay Plan ID.

  Plug in the algorithm you created in this distribution rule.

Refer to *Payment Event Distribution Rules* for more information on configuring distribution rules.

Processing Scheduled Payments

In addition to the pay plan having a status, the scheduled payments each have their own status. A scheduled payment is created in a **pending** status when the pay plan is activated.

Each scheduled payment is reviewed by the base base-package batch **C1-PAYPS** on the payment due date. The batch will set the scheduled payment status to **processed** after executing the **Process Pay Plan Scheduled Payment** plug-in defined on the obligation type.

This plug-in can contain specific business logic that need to be executed when a scheduled payment is due. Based off the rules that will be configured by the tax authority, a multitude of actions can occur. They range from giving the taxpayer a few extra grace days to make the payment to canceling the current payment plan and forwarding the obligations to a collections authority. A tax authority's business rules as well as each taxpayer's personal history and circumstances should be taken into account when determining what actions to take next.

The base-package provides an algorithm (*C1-CC-CHKSPP*) that will create a to do if a scheduled payment has not been paid. It will also detect when actual payments have fulfilled the pay plan in advance.

If your implementation's rules require additional status values (e.g. kept, late, partial), you will need to do the following:

- Create your own copy of **C1-PAYPS**.
- Add custom values to lookup **NB_SCHED_PAY_STATUS_FLG**.

Automatic Payment and Pay Plans

If a taxpayer wants to pay their pay plan scheduled payments automatically, the account must be set up for automatic payment. In addition, the pay plan must indicate that automatic payment is being used.

FASTPATH:
Refer to *How To Set Up Automatic Payment For A Pay Plan* for more information.

When this is done, a background process referred to as **C1-PAYPA** creates automatic payments on the scheduled payment date by calling the automatic payment creation algorithm plugged in on the installation record.

The base-package provides two auto pay creation algorithms that support pay plans scheduled payments:

- Use algorithm type *APAY-CREATE* if your implementation distributes payments using the standard account type payment distribution.
- Use algorithm type *C1-APAY-CRDR* if your implementation distributes payments using distribution rules.

Alerts For Pay Plans

The system provides *alerts* to highlight the existence of pay plans. These alerts are important to assist the tax authority's users:

- An alert is displayed if the account has a pay plan that is not stopped (e.g. **pending start**, **active** or **pending stop**).
- For taxpayers who are permanently forbidden from having a pay plan, the user should put a permanent *alert on the account*.
- Use an algorithm to highlight cancelled pay plans with an entry in the alert zone. The algorithm type to do this is not provided. Use *C1-STOP-SA*as an example of how to create this type of algorithm.
- Configuring a specific *customer contact type* with the alert algorithm type (*CC BY TYPCL*) can cause alerts to be displayed whenever a user adds a *customer contact* of this type. This method can be used to highlight special conditions relating to the pay plan.

FASTPATH:
For more information about introducing alert conditions in the alert zone, refer to *Installation Options - Algorithms*.

Setting Up Pay Plan Options

The topics in this section describe functionality that you must consider when designing pay plans.

Designing Recommendation Rules

This section describes topics related to designing your recommendation rules.

What is a Pay Plan Recommendation Rule

Users ask the system to recommend the scheduled payments for a pay plan. In general, this recommendation process must establish:

- The amount to be paid

- The dates on which the payments are due

A recommendation rule comprises of three elements:

- Payment schedule algorithms
- An algorithm to calculate an average daily amount. This is optional. If this plug-in must be used, it should be invoked from your payment schedule algorithms
- A collection of default parameter values for the payment schedule algorithm type

The default parameter values for the payment schedule algorithm type may change over time, so the collection contains an effective date. If default values are changed, these changes do not affect pay plans already in effect. Existing pay plans keep the parameter values that were used when the pay plan was started.

A user may override the default parameter values for the payment schedule algorithm type to customize the schedule if an override is allowed for a parameter. Additionally, a user may edit the payment schedule details at any time (provided the payment has not yet been processed).

NOTE:
Normally parameter values for an algorithm type are kept with the algorithm. Because the parameters may vary for each pay plan, while the same algorithm logic is used, the parameter values are kept with the pay plan.

Examples of Recommendation Rules

The following are two common methods of calculating a schedule of payments:

- Taxpayer knows how much and when they can pay. The recommendation rule will calculate the schedule of payment dates given the fixed payment amount, frequency, and the first payment date. For example: monthly payments of $1,000 beginning on August 1, 2007.
- Taxpayer knows when they would like to pay the debt by, and how often they can pay. The recommendation rule will calculate the schedule of payment dates and payment amounts given the first payment date, the last payment date and the frequency. For example: monthly payments to be made starting on August 1, 2007 and ending on February 1, 2008.

Generate Payment Schedule Algorithm Types

The core of the pay plan recommendation rule is the Generate Payment Schedule plug-in. The base package provides two general methods for calculating a payment schedule: fixed amount and fixed duration.

One set of base-package algorithms assume that P&I controls are applicable to the pay plan's covered obligations. These algorithms include penalty and interest charges in the calculated scheduled payments:

- Schedule Fixed-Amount Payments With P&I Forecasting: *C1-PP-FIXAMT*
- Schedule Fixed-Duration Payments With P&I Forecasting: *C1-PP-FIXDUR*

Another set of base-package algorithms assume that the covered obligations do not have P&I controls. These algorithms calculate the scheduled payments based on simple obligation balances:

- Schedule Fixed-Amount Payments Without P&I Forecasting: *C1-NOPI-FAMT*
- Schedule Fixed-Duration Payments Without P&I Forecasting: *C1-NOPI-FDUR*

Penalty and Interest Considerations

If *penalty and interest* (P&I) rules are applicable to the obligations covered by a pay plan, the payment schedule that is generated by the recommendation rule's generate payment schedule algorithm should factor expected penalty and interest calculations.

The penalty and interest plug-in spot may be called in *forecast* mode to forecast the charges to a certain date in the future. The plug-in spot also supports receiving financial transactions supplied by a calling service allowing for "what if" scenarios to be supplied. For example, when forecasting P&I to the future, the generate payment schedule algorithm can include proposed scheduled payments along with existing financial transaction to the P&I algorithm to get a more accurate estimate of the future P&I charges.

Setting Up The System To Enable Pay Plans

The above topics provided background information about how pay plans are supported in the system. The topics in this section describe how to set up the system to enable pay plan functionality.

Characteristic Type

If your implementation requires a characteristic added to the pay plan when the pay plan is broken, you will need to create a characteristic type that specifies **obligation** as its characteristic entity.

Customer Contact Class And Types

If your implementation requires certain customer contacts and/or letters created when the pay plan is activated or stopped, you will need to create appropriate customer contact class and customer contact type(s).

NOTE:
If you want to send letters to your taxpayers when a contact of any of these types is created, you must create an appropriate *letter template* and attach it to the customer contact type.

Algorithms

As described above, in *The Big Picture of Pay Plans*, the base package provides a number of algorithm types for different system events in the pay plan's lifecycle. In order to use any one of these algorithm types, you will need to create an associated algorithm and ensure any required parameters are populated.

If your implementation created additional custom algorithm types, you will also need to define associated algorithms.

Defining a Pay Plan Recommendation Rule

Recommendation rules are used to recommend scheduled payments for pay plans. To define recommendation rules, navigate to **Admin, Pay Plan Recommendation Rule.**

Description of Page

Enter an easily recognizable **Recommendation Rule** code and **Description** for each recommendation rule.

If applicable, specify the **Average Daily Amount Algorithm** used to calculate the average daily amount for this recommendation rule.

Specify the **Payment Schedule Algorithm Type** used to create the recommended payment scheduled for pay plans that use this recommendation rule. The Payment Schedule Algorithm Type cannot be modified if a pay plan that is not stopped or cancelled is using this recommendation rule.

Payment Schedule Parameters enable you to define collections of default parameter values for the payment schedule algorithm type that are effective dated. For each collection:

- **Effective Date** defines the date on which the collection of parameter values becomes effective

- **Pay Plan Rule Parameter Value** specifies the default value of each parameter supplied to the algorithm. Note that the *payment schedule algorithm type* controls the number and type of parameters.
- **Override Flag** indicates whether the user can override the default value for the parameter.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_NB_RULE*.

Obligation Types

This section provides information about setting up the obligation types for the pay plan itself and the obligation types for covered obligations.

Obligation Type for Obligations Covered by Pay Plans

Consider which types of obligations need to be covered by a pay plan. For each obligation type that should be allowed to be covered by a pay plan, ensure that the **Eligible for Pay Plan** flag (on the Billing page) to **Eligible**.

Pay Plan Obligation Type

In order to enable pay plan functionality, you will need to define an obligation type that is suitable for a pay plan. Depending on the business rules of the tax authority, you may need multiple pay plan types, which will require you to define multiple obligation types. For example you might want to create a pay plan type for individual taxpayers, and a different pay plan type for a business.

The following points provide guidelines for creating a pay plan obligation type:

Obligation Type - Pay Plan Recommendation Rule

Add the recommendation rules defined above that are valid for obligations of this type. Also, indicate which recommendation rule should be used as the default.

Obligation Type - Main

- **Tax Type** should either reference a specific tax type or a generic tax type (e.g. miscellaneous fees) depending on your authority's business rules.
- **Revenue Class** should be set to **N/A**. (Revenue classes are not applicable because pay plans do not apply a rate and revenue classes are only relevant for obligation types that use a rate.)
- The **Payment Segment Type** should reference the **Normal Payment**.
- **Do Not Overpay** should be on. Payments are not distributed directly against the pay plan.

Obligation Type - Detail

- **Special Role** is **Pay Plan**.
- **Renewal** may be optional, not allowed, or required depending on your business processes.
- If Renewal is required, specify the **Days Before Expiration for Renewal**.

Obligation Type - Billing

- **Eligible for Billing** flag should be off, as pay plans do not get billed.
- **Characteristic Location Required** should not be checked for pay plans.

- **Eligible for Pay Plan** should be set to **Ineligible**. This option only applies to the obligation types that can be covered by a pay plan.

Obligation Type - Rate

Pay plans do not use rates, so the **Rate Required** flag should be off.

Obligation Type - Algorithms

Plug in any algorithms defined above for the following system events:

- Break Pay Plan
- Initiate Stop
- Obligation Activation
- Obligation Cancel
- Obligation Renewal
- Obligation Stop
- Process Pay Plan Scheduled Payment

Pay Plan Background Processes

Ensure that the following background processes are scheduled:

- Pay Plan Scheduled Payment Processing (**C1-PAYPS**)
- Pay Plan Scheduled Payment Automatic Payment Create (**C1-PAYPA**)

Defining Address Options

This chapter describes options related to addresses.

Centralized Address

The product supports a centralized address repository. All address records are stored in a common table and may be linked to persons, tax roles and assets. Refer to the documentation for each object for more information about how addresses are linked.

> **NOTE: Legacy address functionality.** Implementations that existed prior to the introduction of the centralized address functionality may still be using the address functionality that was originally provided in the product. This is referred to as "legacy" address functionality. Refer to *legacy address* for more information about legacy address functionality.

The following points highlight some information about centralized address functionality:

- The address object displays and captures address constituents based on the configuration on the *country* defined for the address. Your implementation must define the valid countries and the expected address constituents to capture for that country.

  > **NOTE:** The address object does include support for the elements House Type or In City Limit.

- The address object does not have a related Type object that governs the behavior of the address as is found with many other master and transaction objects in the system.

- There is an Address Type extendable lookup supplied. This is used to define how / why an address is linked to another object. For example, a person may have a "legal" address and a "mailing" address. In order to link addresses to a person or a tax role, the valid address types must be configured on the respective person types and tax types.
- The address object does not have a configurable business object lifecycle. Rather it has a simple Active / Inactive flag. When changing an address to be inactive, the system prompts for an inactive reason, which are defined using the Address Inactive Reason extendable lookup
- The system supplies a Find address algorithm plug-in spot on the *installation record*. If your implementation receives information from an external source related to a change to a taxpayer's address, the plug-in spot may be used to determine if the address is already in the centralized address repository.

Legacy Address

The product was originally built with address functionality that is referred to now as "legacy" address functionality. This section describes topics related to that functionality.

Address Feature Configuration Setting

Implementations must opt to use either the centralized address functionality or the legacy address functionality. Because some functionality in the system only applies to one address option or another, the product uses a feature configuration option define which address functionality is being used.

If your implementation is using the legacy address functionality, you must also set up a *Feature Configuration* option to indicate that. 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 **Address Support** and define a value of **LEGACY**.

For implementations that use the centralized address functionality may choose to create the above option with a value of **CENTRALIZED** to be explicit. However, if the option is not populated, the product assumes that centralized address functionality is supported.

Setting Up Location Options

This section describes tables that must be set up before you can define locations.

Defining Location Types

NOTE: This is legacy address functionality and does not apply to implementations that use a centralized address.

Open **Admin** > **Location Type** to define the location types used to categorize your locations.

Description of Page

Enter a unique **Location Type** and a **Description** for every location type.

Use a **Location Business Object** to define a *BO* that may govern additional rules related to locations of this type.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_PREM_TYPE*.

Defining Location Information

NOTE: This is legacy address functionality and does not apply to implementations that use a centralized address.

The location information displayed throughout the system is controlled by a plug-in.

The system first looks to see if the location type references a location business object and if the business object defines an information plug-in. If a BO is not provided or if that BO does not define an information algorithm, the system looks for an information algorithm plugged into the location maintenance object.

If no plug-ins are found on the BO or the MO, the system looks for a Location Information plug-in algorithm on the *installation record*.

If you prefer different formatting logic, your implementation should provide a plug-in at one of the above plug-in spots, as appropriate for your business rules.

Setting Up Postal Defaults

Set up postal defaults if field values can be defaulted onto new addresses based on an address' postal code.

In addition, for implementations using the Location object that is part of the legacy address functionality, there are some additional fields that may be defaulted from postal defaults. The topics in this section describe how to maintain postal defaults.

Postal Defaults - Main

To define postal defaults, open **Admin** > **Postal Code Default**.

Description of Page

Enter the **Country Code** and range of postal codes to which the default values apply using the **From Postal Code** and **To Postal Code**.

NOTE: You may not have postal defaults whose from / to postal codes overlap.

Enter the **County** to be defaulted onto new addresses located in this postal code range.

Enter the **City** to be defaulted onto new addresses located in this postal code range.

Enter the **Division** to be defaulted onto new locations located in this postal code range. This field is only visible if the *address support* is set to Legacy.

Enter the **State** to be defaulted onto new addresses located in this postal code range.

Enter the **Time Zone** to be defaulted onto new locations located in this postal code range. This field is only visible if the *address support*is set to Legacy.

Use the **Characteristic Types and Values** collection to define the **Characteristic Type**s and their respective **Characteristic Value**s to be defaulted on locations located in this postal code range. This field is only visible if the *address support* is set to Legacy.

Use the **Geographic Types and Values** collection to define the **Geographic Type**s and their respective **Value**s to be defaulted on locations located in this postal code range. This field is only visible if the *address support* is set to Legacy.

Where Used

The County, City and State are defaulted when a new address is added on the centralized address object. In addition, for implementations using legacy address, the same information is defaulted onto new addresses defined on location, person correspondence or account / person override.

For implementations using the location object in the legacy address functionality, characteristics and geographic values are also defaulted when the postal code for a location is changed.

Determining Address

There is some functionality in the system that may require an address for correspondence purposes. For example, when sending a letter or when providing the accounts payable system an address for issuing a check. Implementations may provide their own algorithms for determining the address. The base product provides logic to Retrieve Mailing Address that determines the address as follows:

- For implementations using centralized address functionality, the system looks for an address linked to the Person effective for the processing date where the priority flag is set to 10 (preferred for correspondence). If there are seasonal addresses defined for the current season, that address is used. If the functionality has an obligation or account and doesn't have a specific person, the main person on the account is used.

For implementation is using *legacy address* functionality, the following points describe the source of the address:

- If the account's main person has a *seasonal address* effective on the business date, the address is set to the respective seasonal address.
- Otherwise the address source on the *Account - Person* record for the account's main person is checked.
  - If the address source is **Mailing Location on Account**, the address is set to the *account's mailing location*.
  - If the address source is **Account Override**, the address is set to the override address on the *Account - Person* record.
  - If the address source is **Person**, the address is set to the *person's mailing address*.
  - If the address source is not defined, the *person's mailing address* is used.

Defining Forms Processing Options

Forms processing is a core function for a tax authority. This section explains the forms definition and processing functionality of the system and describes how to set up the tables that control forms processing.

The Big Picture of Forms Processing

The product supports registration forms and tax forms.

Most forms have a common structure. The form consists of one or more sections, with each section containing one or more lines or groups of lines. Processing rules can be associated with any of these components.

As form changes are introduced from year to year, the changes usually entail adding or removing specific sections and / or lines, as well as adding / removing the processing rules associated with them.

Forms can come from one or more sources. They can be interfaced in batch from an external system or created internally.

Registration Forms

Registration forms are used for taxpayer registration and / or taxpayer demographic information updates. These forms are processed in the context of a taxpayer. When a registration form is processed, it usually results in the creation of new taxpayers / accounts / tax roles / obligations or updates to existing taxpayer information - e.g. name / address change.

A taxpayer is registered in any of the following ways:

- The taxpayer files a paper registration form
- The taxpayer submits a registration form online.
- A tax authority user registers the taxpayer using an online registration form
- For some tax types, the system can automatically register the taxpayer when the first tax form is processed.

Registration Forms Are Linked to Taxpayers

Registration forms create / update taxpayer information. When a registration form posts, it may include actions like adding / updating accounts, tax roles and obligations.

Unlike tax forms, registration forms typically don't result in assessments. Thus, these forms usually do not have a financial effect.

Registration Forms Have A Common Lifecycle

The base product supplies a parent business object for registration forms that defines the following lifecycle:

Pending	The registration form is created in an initial state where processing rules are not yet executed. This allows the form to be saved as work-in-progress.
Validated	A validation step verifies the information on the registration form. Validation form rules specific for the form type are executed to check the validity of the form data. Any issues detected at this step usually causes form processing to stop.
Suspended	A registration form goes into this state when the validation step detects errors on the form that a user may be able to investigate and resolve. Exceptions are stored in the system so that a user can resolve the issues accordingly. The form needs to be re-validated after the issues are resolved.
Waiting for Information	A registration form goes into this state when the validation step detects missing information, thus preventing the system from further proceeding with form processing. Exceptions are stored in the system so that a user can track the issues accordingly. In addition, this state usually triggers correspondence to the taxpayer, requesting for the missing information. The form is usually re-validated after the missing information is received.
Ready for Posting	When a registration form passes validation, it transitions to Ready for Posting. From here a user may choose to make further changes by re-editing the form. Or the form can transition to Posted.
Re-edited	When a user is creating or correcting a form and it passes validation, there may still be a need to review and correct the data further. A form in the Ready for Posting state may be updated by transitioning it to Re-edited. The form needs to be re-validated once it is re-edited.

Posted	When a registration form passes validation, it can transition to Posted. The posting of a form typically causes other data in the system to be added or updated based on the purpose of the registration form. Posting form rules specific to the form type are responsible for the posting logic.
Canceled	Forms that are not yet posted may be canceled if a user determines that the form was created incorrectly.

The base package provides a registration form business object **C1-ParentRegistrationForm** that has the lifecycle described above. Specific form business objects created using form generation are child forms for a common parent form BO so that the lifecycle is consistent for all forms. The base parent BO may be used or an implementation may create a custom business object. Refer to the business object meta-data for more details on the lifecycle, including the allowed transitions and the algorithms provided.

Tax Forms

Tax forms are the most common types of forms. These forms are typically processed within the context of a filing period. When a tax form is filed, it satisfies an obligation to file. Form processing results in an assessment, which determines either a tax amount due or an overpayment. For tax types that do not require pre-registration, the tax form's processing may also result in taxpayer creation.

Tax Forms Are Linked to Obligations

When a tax form is posted, it is associated with an obligation for a specific filing period. Any financial transactions relating to the filing period will be created under this obligation. The obligation can be created in advance in anticipation of filing, such as in the case of business taxes or created at the time the form is posted, such as in the case of individual income tax.

The form type references one or more obligation types, and this information is used when determining what type of obligation to create for a specific tax form. Typically a form type would only reference one obligation type. For example, taxes such as sales and use, individual income, and corporate income would typically have one obligation type defined per form type. Both the **C1–StandardTaxFormType** and the **C1–FilingCalendarTaxFormType** base business objects support the definition of one obligation type on a form type.

There may be situations where a form type would be associated with more than one obligation type. These include business activity statements, estimated payments, audit forms. A different business object can be used to support these situations. Alternatively, the validation on the base business object can be disabled to allow more than one obligation type for a form type.

The obligation types defined for a form type are used to restrict the form type list for a specific tax type, when a user adds a tax form.

Tax Forms Have A Common Lifecycle

The base product supplies a parent business object for tax forms that defines the following lifecycle:

Pending	The tax form is created in an initial state where processing rules are not yet executed. This allows the form to be saved as work-in-progress.
Validated	A validation step verifies the information on the tax form. Validation form rules specific for the form type are executed to check the validity of the form data. Any issues detected at this step usually causes form processing to stop.
Suspended	A tax form goes into this state when the validation step detects errors on the form that a user may be able to investigate and resolve. Exceptions are stored in the system so that a user can resolve the

	issues accordingly. The form needs to be re-validated after the issues are resolved.
Waiting for Information	A tax form goes into this state when the validation step detects missing information, thus preventing the system from further proceeding with form processing. Exceptions are stored in the system so that a user can track the issues accordingly. In addition, this state usually triggers correspondence to the taxpayer, requesting for the missing information. The form is usually re-validated after the missing information is received.
Ready for Posting	When a tax form passes validation, it transitions to Ready for Posting. From here a user may choose to make further changes by re-editing the form. Or the form can transition to Posted. **NOTE:** For implementations that use form control functionality, the tax form is only progressed to Posted by linking it to a form control that gets approved. Refer to The *Big Picture of Form Control* for more information.
Re-edited	When a user is creating or correcting a form and it passes validation, there may still be a need to review and correct the data further. A form in the Ready for Posting state may be updated by transitioning it to Re-edited. The form needs to be re-validated once it is re-edited.
Posted	When a tax form passes validation, it can be posted in the system. The posting of a form typically causes other data in the system to be added or updated. For example, adjustments are created for the assessments. Taxpayer data may also get updated based on newer information from the form. Posting form rules specific to the form type are responsible for the posting logic.
Adjusted	A posted tax form can be adjusted for any of the following common reasons: • Correcting data capture errors or data entry errors • Line item adjustments initiated by the taxpayer • Adjustments initiated from an audit When a tax form is adjusted, the financial effect of the existing tax form is canceled and new financial transactions are created for the updated line items. Note that the effects of adjusting a form are controlled by form rules.
Transferred	A tax form can be transferred to a different taxpayer/obligation if it previously posted to the incorrect taxpayer/obligation. When a tax form is transferred, the current tax form transitions to Transferred and a new tax form is created, allowing a user to indicate the correct taxpayer / obligation. The financial effect of the existing tax form is removed from the current obligation using form rules. The new form goes through the same lifecycle of validation and posting and new financial transactions are created for the 'transfer to' obligation via the new form's posting rules.
Reversed	Some exceptional cases may require that the financial effect of a tax form be canceled, without necessarily creating new financial transactions. A tax form reversal is a way of voiding a tax form that has already posted.
Canceled	Forms that are not yet posted may be canceled if a user determines that the form was created incorrectly.

The base package provides a tax form business object **C1-ParentTaxForm** that has the lifecycle described above. Specific form business objects created using form generation are child forms for a common parent form BO so that the lifecycle is consistent for all forms. The base parent BO may be used or an implementation may create a custom business object.

Refer to the business object meta-data for more details on the lifecycle, including the allowed transitions and the algorithms provided.

Other Changes After a Tax Form Posts

The following sections describe other possible changes after a tax form posts.

Standalone Amendment Forms	A posted tax form can also be adjusted by processing a standalone amendment form. In this case, the amendment form is processed independently of the original form. New financial transactions are created for the difference between the financial effect of the original form and the financial effect of the amendment form.
Standalone Audit Forms	A standalone audit form can also adjust a previously posted tax form. In this case, the audit form is processed independently of the original form. New financial transactions are created for the difference between the financial effect of the original form and the financial effect of the audit form.

Payments Related to Tax Forms

Some tax types require taxpayers to make estimated payments based on specific conditions - e.g. estimated revenue, estimated tax liability, etc. The system allows for payments to be made in advance. These payments are usually reconciled when the associated tax forms are processed.

The system also caters for payments sent together with tax forms. The payments are usually created when the form posts, suspends or cancels (depending on the situation).

Payments in Advance / Estimated Payments

Some tax types require taxpayers to make estimated payments based on specific conditions -e.g. estimated revenue, estimated tax liability, etc.

When the payment is processed, the obligation may or may not exist yet.

- If the obligation exists, the payment is applied to that obligation
- If an obligation does not exist but the taxpayer has an existing account, the payment is applied to an excess credit obligation under that account.
- If the taxpayer does not have any accounts, the payment is applied to a company suspense account.

In the cases where the payment got applied to an excess credit obligation or company suspense, the payment needs to be transferred when the tax form is processed and the obligation is determined. To do this, a form rule needs to be configured to do this transfer at the point where the form's obligation is identified.

FASTPATH:
Refer to *Defining Form Rules* for details on how to configure rules.

It's important for the payment to capture details that will facilitate the transfer of the payment to the correct obligation when the tax form gets processed. The payment should capture details like the taxpayer's identifier and the tax type / filing period being paid.

Payments with a Tax Form

When payments are sent with a tax form, the payment is usually linked to the form by a unique identifier, such as a document locator.

The payment is processed in two possible ways, which are described in the following sections

Payment Is Processed Separately From The Tax Form
This is applicable for implementations that have separate processes for payments and forms.

In this case, the payment is applied depending on which of the payment and the tax from gets processed first:

- If the tax form is processed before the payment, the payment is applied to the obligation on the form.
- If the payment is processed before the tax form and:
  - The taxpayer has an existing account, the payment is applied to an excess credit obligation under that account
  - The taxpayer does not have any accounts; the payment is applied to a company suspense account.

In the cases where the payment got applied to an excess credit obligation or company suspense, the payment needs to be transferred when the tax form is processed and the obligation is determined. To do this, a form rule needs to be configured to do this transfer at the point where the form's obligation is identified.

FASTPATH:
Refer to *Defining Form Rules* for details on how to configure rules.

It's important for the payment to capture details that will facilitate the transfer of the payment to the correct obligation when the tax form gets processed. The payment should capture details like the taxpayer's identifier and the tax type / filing period being paid.

Payment Is Processed With The Tax Form
This usually occurs when payments are uploaded with tax forms.

In this case, the payment is not created until the form is processed. In order to process payments within tax form processing, a form rule needs to be configured.

FASTPATH:
Refer to *Defining Form Rules* for details on how to configure rules.

Additional Forms Processing Information

The topics in this section highlight additional information about forms processing.

Categorizing States

The business objects provided in the base product include a status option for the states in the lifecycle called Status Category. This option allows one or more categories to be assigned to the states such that other processing in this system related to forms that are in a given state do not require hard-coding of the status values. Following are examples of status categories used in the product for forms.

- Values identify the states in which the form is considered **In Effect** and the states in which it is considered **Not In Effect**. This setting may be used in code to allow or prevent certain actions from occurring based on the state of the form. For example, a user may not cancel an Obligation if there are any tax forms for the obligation whose state is **In Effect**.
- Values identify states that may need to be reviewed as being in the state for too long (**Status Too Long**).
- The **Posted** status defines a status category value for **Posted**, allowing for validation or processing based on whether a form is posted or not.

Controlling Automatic Processing

The goal when processing forms is to automatically process as many forms as possible, without anyone needing to review the form. However, for a form being added or corrected by a user, they system should not inadvertently pick up the form for processing in case a user is not yet finished with it. The way the system controls this differs slightly for Tax Forms and Registration Forms. Note that in both cases, the logic described here is the logic supplied with the base product parent business object for each type of form. Implementations may choose not to adopt this business practice.

Tax Forms

Tax forms include a field called Automatic Post that is set to **Y** only for scenarios where a user is not working on the form. The tax form background processes provided with the base product to process the forms only select forms with this flag set to **Y** along with the other selection criteria included in the background process.

- A form that is created manually does not set the flag to **Y** so it will never be picked up for batch processing while in the **Pending** state. This applies to audit tax forms, tax forms that were created as a result of a transfer, tax forms that were created as a result of an adjustment and tax forms that are simply created manually. A user is able to spend as much time as needed to create the form (and do interim saves). When the form is fully entered, the user clicks **Validate** or **Validate and Post** to progress the form. If the user clicked **Validate and Post** and the form does not have any exceptions, the user is finished. Otherwise,
  - If the user clicks **Validate** and the form passes validation, it transitions to the **Ready for Posting** status. The user can review the form at this point and make additional changes if needed using the **Re-edit** button. Once the form is in a state where the user is happy with it, the user can click **Post** to transition the form to **Posted** real-time or can click **Batch Post**, which sets the Automatic Post flag to **Y** such that the form will be processed the next time the batch monitor process runs.

    NOTE: For implementations that use form control functionality, the tax form is only progressed to posted by linking it to a form control that gets approved. Refer to The *Big Picture of Form Control* for more information.

  - If the form does not pass validation and transitions to the **Suspended** status, the user may correct the form as needed. Once the form passes validation and transitions to **Ready for Posting**, the logic as described above applies.
  - If a validation form rule indicates that additional information is needed and transitions to the **Waiting for Information** status, the same logic applies as for the **Suspended** status. When a user determines that the needed information is received and re-validates the form, the form eventually transitions to **Ready for Posting** and the logic as described above applies.
- The form upload process sets the Automatic Post flag to **Y** when creating a form. Therefore, forms uploaded into **Pending** state are processed by the batch monitor assuming the other selection criteria configured on the batch monitor are satisfied.
  - If the form does not have any exceptions, it progresses to the **Posted** state and the form is finished.
  - If the form does not pass validation and transitions to the **Suspended** status or the **Waiting for Information** status, the automatic post flag is reset to null because at this point a user needs to get involved to progress the form. The logic as described for manually created forms applies. Once the form is corrected and is in **Ready for Posting**, it can be progressed further as previously described.
- A special background process exists to detect tax forms that have been waiting too long in a given state. This allows implementations to detect manually created or corrected forms that are not progressing; and does this outside of the standard form processing batch jobs. The background process is **C1-TXSTL**.

Registration Forms

The process for registration forms is a bit simpler. It does not include an Automatic Post flag.

- A form that is created manually is not picked up for batch processing while in the **Pending** state. The background monitor process plugged into the **Pending** state only looks for forms that were uploaded along with additional selection

criteria. (Refer to the background process **C1-RGMU** for more information). A user is able to spend as much time as needed to create the form (and do interim saves). When the form is fully entered, the user clicks **Validate** or **Validate and Post** to progress the form. If the user clicked **Validate and Post** and the form does not have any exceptions, the user is finished. Otherwise,

  - If the user clicks **Validate** and the form passes validation, it transitions to the **Ready for Posting** status. The user can review the form at this point and make additional changes if needed using the **Re-edit** button. Once the form is in a state where the user is happy with it, the user can click **Post** to transition the form to **Posted** real-time or can simply let the form be picked up the next time the batch monitor process runs.
  - If the form does not pass validation and transitions to the **Suspended** status, the user may correct the form as needed. Once the form passes validation and transitions to **Ready for Posting**, the logic as described above applies.
  - If a validation form rule indicates that additional information is needed and transitions to the **Waiting for Information** status, the same logic applies as for the **Suspended** status. When a user determines that the needed information is received and re-validates the form, the form eventually transitions to **Ready for Posting** and the logic as described above applies.
- Forms uploaded into **Pending** state are processed by the batch monitor assuming the other selection criteria configured on the batch monitor are satisfied.
  - If the form does not have any exceptions, it progresses to the **Posted** state and the form is finished.
  - If the form does not pass validation and transitions to the **Suspended** status or the **Waiting for Information** status, the automatic post flag is reset to null because at this point a user needs to get involved to progress the form. The logic as described for manually created forms applies. Once the form is corrected and is in **Ready for Posting**, it can be progressed further as previously described.
- A special background process exists to detect registration forms that have been waiting too long in a given state. This allows implementations to detect manually created or corrected forms that are not progressing; and does this outside of the standard form processing batch jobs. The background process is **C1-RGSTL**.

The Big Picture of Form Definition

Form definition refers to the process of defining a new form in the system. The product provides a single Form Type control table that is used to define details about each registration form and tax form in your implementation. The form type defines:

- The sections and lines that make up the definition of the form. This includes the format and some basic validation for the values entered in the form line.
- The form rules that should execute when a form of this type is processed.

Designing Form Types

A Form Type is configured for each type of form that the system needs to process.

The following are the steps in configuring a form type:

- Define basic information about the form type, including the business object that controls the behavior of the form type. The base product provides the **C1-StandardTaxFormType** and **C1–FilingCalendarTaxFormType** business objects, which can be used for automatic generation of tax form business objects. Also, determine the applicability of change reasons to the form type.
- Define the sections of the form.
- Define the lines that each section contains.
- Generate the form type.
- Define the valid form change reasons to the form type, if change reasons are applicable.

- Link the form type to form rule groups.

Designing Sections

When designing the sections of your form, determine the number of sections needed. Small or simple forms may contain only a few sections. Complex forms, such as forms with schedules, need a bit more design time, as they may include more sections, including sections that repeat.

Identify any recurring sections. This is common with tax forms that allow multiple occurrences of a schedule. For each recurring section, determine whether or not recurrence should be limited to a finite number.

CAUTION: Although the configuration allows for unlimited recurring sections, the HTML rendering for the user interface is unable to handle a large number of sections and lines. Be careful in using forms to capture data that results in a large number of sections and lines. Such forms need to be fully tested with expected volumes, to ensure that the forms are able to handle your business need.

Refer to the definition of business object **C1-FormSection** for more details.

Designing Lines

After establishing the sections, you need to define the information that is contained in each of the sections. Some sections could include one or more simple lines. Some sections may include one or more repeating groups of lines. Other sections may have a mix of simple lines and repeating groups.

Define each line. Most lines on a tax form are either character or numeric fields. These lines could simply contain a value or could capture additional information.

The base package supports three common types of lines: Standard Line, Group Line and Label Line

Standard Lines

Most form lines fall into this category. It provides the definition of a field on the form, including the label to display.

The base product provides the **C1-StandardLine** business object, which has the common structure of a form line.

A standard line can be configured to either create a new field or point to an existing field in the system. To create a new field, specify **Create New** in the Definition Field Usage and specify the data type, the applicable settings for the data type and the label definition. To point to an existing field, specify **Use Existing** in the Definition Field Usage and specify an existing field in Definition Field Usage.

The base business object supports most basic field data types that the Framework supports - i.e. character, number, money, date, boolean, etc.

Character field types can be validated using a **Validation Pattern** that uses an Extended Lookup, **C1-RegularExpressionLookup**. The Extended Lookup uses a regular expression to define the pattern. The validation is only performed if the Form Line Configuration Validation form rule, **C1-ChkReqSectionsLines** is included on the Form Type.

In addition, special data types are also supported: simple lookup, extendable lookup and foreign key reference.

Simple lookups are used when the line's possible values is a simple list of descriptions. To configure a form line to point to an existing lookup, specify **Use Existing** in the Definition Field Usage and specify an existing lookup field in the Definition Field Name. To configure a form line to create a new lookup field, specify **Create New** in the Definition Field Usage and define the lookup field and values.

NOTE: The initial list of values can be specified on the line configuration. However, once the lookup field exists, any changes to the lookup values must be done via Lookup maintenance.

Extendable lookups are used when the lookup values require additional information. For example, a list of counties may be set up using an extendable lookup. Each county can specify not only the description of the county, but also a distribution code. To configure a form line as an extendable lookup, the extendable lookups have to be defined first, via Extendable Lookup maintenance. When defining the form line, specify **Use Extendable Lookup** in the Definition Field Usage and specify the Extendable Lookup BO.

Foreign key references are used when the form line needs to contain a value that exists in one of the tables in the product. For example, a registration form may specify an industry code, which must be defined in the Industry Code table. To configure a form line as a foreign key reference, specify **Use Foreign Key Reference** in the Definition Field Usage and specify the Foreign Key Reference. In addition, specify the UI Map Usage, to indicate whether the values will be displayed as a dropdown list or as an input field with search.

NOTE: **Input Field** should be specified only if the foreign key reference has a custom search.

Form lines can be configured to map to a Related Form Field. The Related Form Field list consists of columns in the tax form or registration form. When a form line is mapped to a related form field, the line's value is copied to the corresponding table column. When mapping a form line to a related form field, specify the Form Line Mapping setting, to indicate whether the copy happens every time the form is updated or only when a form rule executes.

For each form line, the following elements may be configured:

- As Current - This is required. This element captures the line's current value.
- As Reported - This setting is optional. This element is used to display the original value that was reported for the line. It is populated when the form exits the Pending state.

  CAUTION: This setting should be carefully considered. This should not be enabled for forms with a large volume of lines because it can adversely impact performance. Users can refer to the Form Versions tab of the tax form, to view any of the form's versions, including the original version.

- Override Switch - This switch is used to bypass validation. For example, a form rule may be defined such that "If line 110 is populated, line 120 must have a value greater than 500." Suppose line 110 is populated and line 120 has a value of 499 and the business rule is that when this form suspends, a user can review it and make a decision that the value on the form is valid and that the rule should be bypassed. The user clicks on the Override switch and try to re-validate the form.

  CAUTION: This setting should only be enabled for form lines where a corresponding validation rule is designed to check this switch.

- Change Reason - This is optional. It allows a change reason to be supplied at the form line level (in addition to change reasons at the form level, if applicable). When a user changes the current value of a line, this change reason can also be supplied.

  CAUTION: Capturing a change reason at the line level requires an additional element and thus, adds to the size of the form. This should be carefully considered.

All of the above mentioned elements have a Display Label setting. To ensure the proper display of line details, this setting should always be the same for all applicable elements.

CAUTION: HTML rendering considers labels as elements or widgets too. Therefore, labels add to the form's size. Carefully consider when the labels for these extra elements should display. For instance, when the line only has As Current is applicable, it's probably not useful to display the 'As Current' label. More importantly, when enabling As Reported, Override and/or Change Reason on a repeating group of lines, the 'As Current', 'As Reported', 'Override' and 'Change Reason' labels should be enabled for the first line only.

Group Lines

This type of line is used for defining a repeating group of standard lines. This line contains header information about the group. Every line that belongs to the group refers to their group line.

Determine whether or not recurrence should be limited to a finite number.

Refer to the definition of business object **C1-GroupLine** for more details.

CAUTION: Although the configuration allows for unlimited recurring groups, the HTML rendering for the user interface is unable to handle a large number of repeating groups. Be careful in using forms to capture data that results in a large number of lines. Such forms need to be fully tested with expected volumes, to ensure that the forms are able to handle your business need.
Also, nesting of groups (i.e. groups within groups) is not supported.

Label Lines

This line type is used for displaying text on the form.

Refer to the definition of business object **C1-LabelLine** for more details.

Address Form Lines

The entities that capture addresses in the product break down the constituents into separate fields. An implementation defines the appropriate constituents for each Country and allows for each constituent to have an appropriate label. This way, when displaying addresses in the system, the appropriate fields appear with the appropriate labels.

FASTPATH: Refer to *Defining Countries* for details on how to configure address constituents.

When considering addresses captured by tax forms or registration forms, implementations should consider how the data is captured and how this data is later mapped to the appropriate constituents based on the country defined on the form. The following points should be considered:

- Should all possible countries be loaded in the Country table? For validation purposes, an implementation may choose to load all countries. However, for countries that are not common, it is recommended to choose a consistent set of constituents for mapping from the form and capturing in the master data in the system. If implementations do not wish to load all the countries in the country table, an alternative is to define a special "Other" or "Unknown" country. In this case one of the free format constituents available may be used to capture the country value.
- Consider the definition of State. The product provides a constituent for State and in this case it expects valid states to be defined in the State table (also on the Country page). Implementations will probably not want to define the valid states for all the countries defined in the Country table. However, the Country table provides many free-format fields that available to define the "state" for a country where the list of possible states is not maintained. For example, assuming County information is not captured for most foreign countries, the County field can be used. It's label can be configured to be "State" or "Province" or whatever is appropriate. Address 4 is another possibility if it is rarely used.
- Once the address constituents for different countries are defined, consider forms processing. Forms have a defined set of fields for capturing addresses. When attempting to map those form lines to the system's address components, the address columns on the Form need to be populated based on the country configuration. For countries where the State checkbox is checked, the data on the form representing the State should go into the STATE column and will be validated. For countries where the State checkbox is not checked, the data on the form representing the State should go into the agreed upon other column (for example. COUNTY).

Assigning Business Names to Sections and Lines

Sections and lines are assigned business names to give form rules configuration a way of referencing the sections and lines, without necessarily knowing the specific form types that contain them. This allows form rules to be configured for reuse across several form types.

The actual instances of the sections and lines within a form type are determined when the rules are executed.

FASTPATH:
Refer to *Defining Form Rules* for details on how to configure rules.

Designing Form Change Reasons

As part of designing your form types, you will need to decide if the form should require the user to supply a change reason when modifying a form. The form type includes the following configuration:

- **Overall Change Reason Applicability** - this controls whether change reason is used at the overall form level.
- Set this to **Required** if the user needs to enter a change reason when making changes to a form.
- Set this to **Optional** if the user can choose to enter a change reason but is not required.
- Set this to **Not Applicable** if this form does not use overall change reasons. This will suppress the change reasons grid and comments from the main section of the form's UI map.
- **Line Change Reason Applicability** - this controls whether change reasons are used at the individual form line level.
- Set this to **Applicable** if this form uses change reasons at the form line level for one or more of its form lines. The change reasons definition checkboxes will be enabled when defining a form line.
- Set this to **Not Applicable** if this form does not allow change reasons at the form line level. The change reason definition checkboxes will be disabled when defining a form line.

  In addition to controlling which change reasons fields appear on the form's UI map, the applicability flags also control the validation for change reasons on the form. See *Determining When a Change Reason is Required* for more information.

  If form change reasons are going to be used with this form type, then a list of one or more change reasons needs to be defined. This list defines the valid change reasons for the form type and is used to create the dropdowns on the form for the user to choose from.

  Some change reasons are used by algorithms that update a form, rather than a user. These change reasons will have a system default flag associated with them and will not appear on the dropdown presented to the user. A lookup defines which system transitions can be used. Additional values can be added by an implementation as needed.

  The base package provides the algorithm type *C1-DFLTFCR* that defaults a change reason when a form is suspended or is waiting for information. If your form's business object is using the business object **C1-ParentTaxForm**, you will need to have one change reason with the system default flag of **Form Transition**.

Generating Forms

The base package provides form type business objects that can be used for generating most tax form types.

- **C1-StandardTaxFormType** has a lifecycle that includes a generation step and that allows for regenerations when needed.
- **C1–FilingCalendarTaxFormType** extends **C1-StandardTaxFormType** with a collection of valid filing periods.

The Lifecycle of a Form Type

A form type is created and stays in a 'pending' state while the details about the form type, its sections and its lines are being configured.

Once the structure of the form type, sections and lines are defined, the next step is to generate the form business object and its UI maps.

If form generation encounters any problems, the form type goes into an error state. The user needs to fix the issue(s) and regenerate the form.

On the other hand, if form generation is successful, the form type goes into a 'generated' state until the user activates it.

Activated forms can be inactivated.

If changes need to be made after a form type is already generated, a user could put the form type back into the 'pending' state and change / regenerate the form type accordingly.

The same could be true for activated or inactivated form types - if changes are allowed when the form type is already in either of these states.

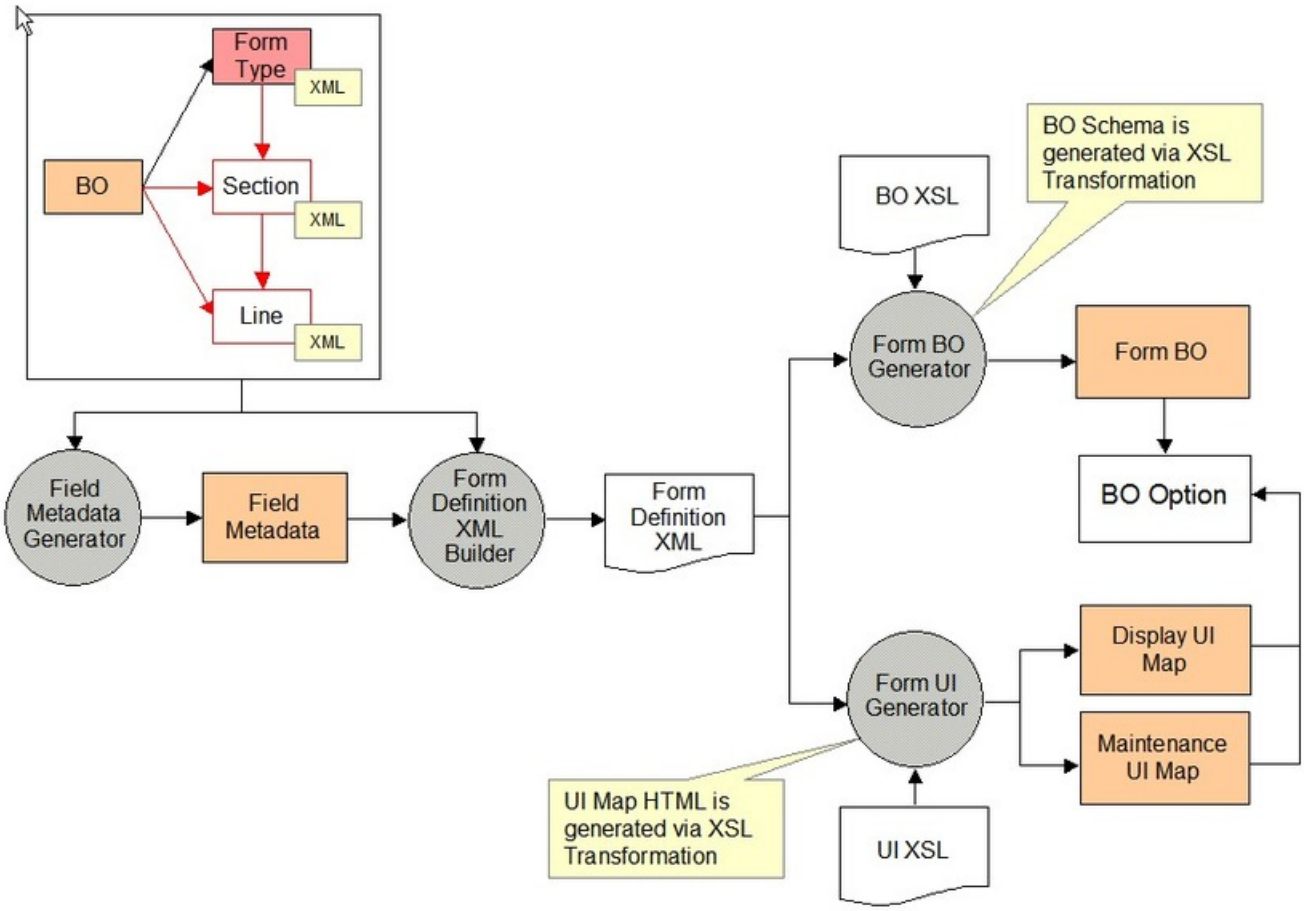
In addition to the actions that move the form type through the states described above, the **Edit, Delete** and **Duplicate** actions are available.

For form types that are activated, a special action of **Generate OPA Rule** is provided.

FASTPATH: Refer to ***Generating an OPA Rulebase Data Model for a Form Type*** for more information.

The Form Generation Process

The following diagram illustrates the form generation process flow.



Form Generation

The steps are discussed in the following sections.

Generating the Form Type

When using the base business object **C1-StandardTaxFormType** or **C1–FilingCalendarTaxFormType** for generating tax forms, the form generator is invoked when the form type goes into the Generated state.

An 'enter' algorithm (*C1-GEN-FORM*) invokes the following processes (in order):

- Form Business Object Generation
- Form Display Map Generation
- Form Maintenance Map Generation

All three processes have to run successfully.

If any of the processes fail, the algorithm creates an appropriate log entry to indicate which one failed. Any components that were generated prior to hitting the error are rolled back.

Form Business Object Generation

This process creates a form business object using the form definition data on the form type. It includes intermediate steps for: creating Field metadata, creating Lookup Fields / Values and extracting form definition data.

Field Metadata Creation

This process goes through the form type's section and line definitions and creates label fields, definition fields and override label fields based on the section and line configurations. For definition fields that are configured as lookups, this process has an additional step of creating the Lookup Fields and their Lookup Values. The generated lookup fields and field values are automatically populated with Java names, so that backend logic can reference them accordingly.

Form Definition Extract

This process extracts the form type / section / line definitions into one XML document that feeds into both the business object creation and UI map generation processes.

Form Business Object Creation

This process creates the form business object using the form definition XML data that was extracted in a prior step. The form business object is created as a 'child' BO that inherits from a parent form business object - as defined on the form type business object's 'Form Parent Business Object' option.

NOTE:
The **C1–FilingCalendarTaxFormType** and **C1-StandardTaxFormType** business objects reference **C1-ParentTaxForm** as their 'Form Parent Business Object'.

Any elements that are common to all forms should be placed in the parent form BO's schema. Other form elements that vary between form types should have corresponding Line definitions. Section and Line definitions are generated into the form BO schema accordingly. Elements in the BO schema will vary depending on the type of line. For ‘standard’ lines in particular, the schema attributes differ based on the Line’s Definition Field Usage:

- Simple input fields are mapped to existing or new simple Field metadata.
- Foreign key reference fields are mapped based on the related Foreign Key Reference code.
- Extendable lookup fields are mapped based on the related extendable lookup BO.

This process also creates the Application Service for the generated business object. The associated access modes are the same as the parent business object's access modes.

NOTE:
These generated Application Services must be configured on your user groups accordingly.

Form Display / Maintenance UI Map Generation

These processes create the form's display and maintenance UI maps and automatically link the maps to the generated form BO.

The 'Form Display/Maintenance UI XLS Stylesheet' specified on the form type business object controls how the HTMLs in these maps are generated.

Reserved Primary Keys

The form generator populates the primary keys of the generated components as follows:

- Form BO code (max length 30) = Form Type code (max length 12)
- Display UI Map code (max length 30) = Form Type code (max length 12) + 'Display'
- Maintenance UI Map code (max length 30) = Form Type code (max length 12) + 'Maint'
- BO Application Service ID (max length 20) = Form Type code (max length 12 - note: this is also the generated BO code) + 'BOAS'

If initial generation of BOs / UI maps / application services finds a conflict with any existing CM primary keys for the same objects, form generation will result in an error. Either the existing CM objects or the new Form Type code should be changed accordingly.

Generating an OPA Rulebase Data Model for a Form Type

If your implementation is planning to validate the whole form using OPA, proceed to generate the OAP rulebase model.

Use the action button that becomes available once the Form Type is successfully generated and activated.

Save the data model file locally. The system stores the data model as an attachment and links it to the Form Type via log entry. Use Form Type Log to locate and download the latest model at any time.

NOTE: Change the data model file extension to ***xsrc*** before making an attempt to import the data model OPA.

FASTPATH: Refer to *Using the OPA Validation Form Rule* for specifics on how to create the OPA Rule using Pre-generated Data Model.

Rule Details

There is no run-time synchronization between OPA determinations server and the base product, therefore no updates happens when new rulebase gets deployed on the integrated OPA instance. This is an advisable housekeeping practice to update the OPA Rulebase Data Model with name of the rulebase created with this model.

Use **Admin –> OPA Rulebase Data Mode**l search to locate the data model and update it's collection of related rulebases.

Regenerating a Form Type

Refer to *The Lifecycle of a Form Type* for information on when / how a form type is regenerated.

Once the form business object / UI maps / application services exist, any subsequent form type regeneration will retain the primary key, as well as most of the references associated with the generated objects - e.g. BO options, BO plug-ins, etc. Only the following updates would take place:

- The existing BO's schema is replaced.
- The existing UI maps' HTML is replaced.
- If the parent form BO referenced on the form type has changed since the last generation:
- The Parent BO and Maintenance Object references on the existing BO are replaced.
- The access modes on the child application services are replaced.

NOTE: If the structure of the form (sections/lines) was changed, the corresponding OPA rulebase data model should be regenerated in order to reflect these changes. The system issues a warning if it finds an existing Form Type log entry that is referencing an attachment whose BO is **C1–OPARulebaseDataModel**.

Overriding the Generated UI Maps

The look-and-feel of the generated UI maps is controlled by an XSL stylesheet that is specified on the form type business object's 'Form Display/Maintenance UI XSL Stylesheet' option.

Overriding All Generated UI Maps

If your implementation needs to override the look-and-feel of all generated UI maps, you can specify your own XSL Stylesheet on the form type business object.

If you are using any of the base form type business object, you need to add a 'Form Display/Maintenance UI XSL Stylesheet' option to the **C1-StandardTaxFormType** BO and specify a higher sequence number on that option.

Overriding Specific Generated UI Maps

If your implementation needs to override the look-and-feel of specific UI maps or if you need to add implementation-specific logic to the generated UI maps, you can do the following:

- Make a CM copy of the generated UI maps and put the additional logic on those copies.
- Plug the CM UI maps into the corresponding BO option types on the generated form BO. Use a higher sequence number than the base-generated BO options. The 'UI map' BO options types are single-instance options, for which the FW knows to use the options with the highest sequence number.

NOTE:
Generated UI maps will use sequence number 10. CM maps must use sequence numbers higher than 10. If your CM maps do not follow this rule, you will lose your CM maps' links to the BO after regeneration.

When the BO and generated UI maps are regenerated, the form generator process simply replaces the XML in the BO schema and the HTML in the UI maps. The BO options added from the initial generation are retained. Thus, any CM UI maps would continue to be in effect.

After regeneration, your implementation must compare the generated maps with the override maps and copy the differences to the override maps accordingly.

Designing The Form's Processing Rules

The final step in configuring a form is the definition of processing rules.

FASTPATH:
Refer to *Defining Form Rules* for details on how to configure rules.

The Big Picture of Form Versions

A form is likely be modified several times during its lifetime. Whenever one or more changes are made to a form, a new form version is created. The rules that determine which changes constitute a new form version vary from one tax authority to another.

In general, there are two main categories of form changes:

- User correction. These are changes made to a form by a user for a variety of reasons such as correcting a scanning error, correcting a taxpayer error, update of a mailing address resulting from a taxpayer phone call, or correction of a form's receive date.
- Auto correction. These are changes made automatically by the system for reasons such as correction of a calculation error.

The tax authority requires the ability to track changes to a form for a couple of reasons:

- Audit Trail. The need to track who made the changes to the form and when the changes were made.
- Taxpayer Inquiry. The tax authority needs to be able to explain to the taxpayer any differences between the information that the taxpayer reported and the current information on the form.

How are Form Versions Created

A form version is created when the form is modified either by a user or by a backend process (e.g. algorithm, service). The base package business objects for tax form (**C1-ParentTaxForm**) and registration form (**C1-ParentRegistrationForm**) include two algorithms, which take a snapshot of the form that is being changed and store it in a special type of log record.

This log record, with a log type of **Form Version**, includes the details of the form version such as the user who made the change, the date and time of the change and a snapshot of the whole changed form.

The form versions get created in the following scenarios:

- A pending form is transitioned to the next state. When the form exits the **Pending** status, an algorithm creates the initial form version. This version is also known as the 'As Reported' version. Its purpose is to capture the form's data as reported by the taxpayer.
- A form enters a state that supports versions. The base business objects have configured an enter plug-in for states that enable versions which captures a version. This caters for scenarios where rules may have made updates to the form since the last version was captured.
- A form is modified and is in a status that indicates a version should be created. Each base business object includes the audit algorithm that creates a form version if the form is in a status that has the status option **Enable Versions** set to **Y** and any of the form's fields have changed.

Form Version Display

A form version is stored as a snapshot on the tax form log record. A user can view this form version on the **Tax Form - Versions** portal. This portal contains a list of the form versions for the tax form in context. A user can select a form version from the list and have it displayed below.

The form version is displayed using a derived map zone, which utilizes the same UI map used by the form itself. A derivation script looks at the form's business object options to determine which display UI map and display map service script should be used. This allows the form version to have the same look and feel as the form itself.

Form Changes Typically Require a Reason

Typically when a user makes a change to a form, they will be required to enter a reason for making the change. Some tax authorities require a user to enter a specific reason for each line that is changed, while others only require a more generic reason that describes the nature of the change for the overall form. The types of form changes supported by the base package are:

- Overall Change Reason. This change reason is specified at the form level and is used to describe the nature of the changes made to the form. Some examples include: corrected scanning error, data entry, and form rules auto correction.
- Line Change Reason. This change reason is specified at the form line level and is used to describe the specific change made to a form line. Some examples include: additional information provided by taxpayer, supporting documentation not accurate. It is possible for some form lines to be associated with a form change reason while others do not. For example, a change to an address might not require a change reason, while a change to the deductions amount will. The forms definition facility allows you to define the lines that need a change reason.

The form type controls which type(s) of change reason are applicable to the form, if any. A form type can be set up to require overall change reasons, form line change reasons, both or none. See *Designing Form Change Reasons* for more information on how a form type can be set up to use change reasons.

Determining When a Change Reason is Required

The base package business objects for tax form (**C1-ParentTaxForm**) and registration form (**C1-ParentRegistrationForm**) include a validation algorithm that use the following conditions to determine if a change reason is required:

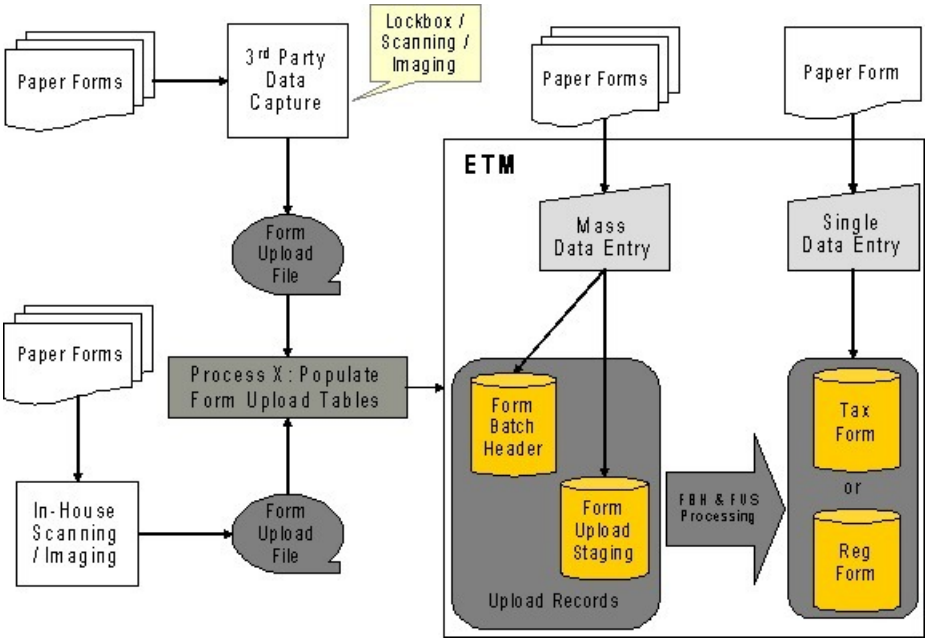
- Change reasons are only required if the status of the form is configured to enable versions.
- If the form type indicates that the Overall Change Reasons Applicability is **Required**, at least one form change reason should be supplied. On the other hand, if the form type indicates that the Overall Change Reasons Applicability is **Not Allowed**, form change reasons cannot be populated.
- If the form type indicates that the Line Change Reason Applicability is **Applicable**, a form change reason will be required for each line that has changed that is defined to have a form change reason. On the other hand, if Line Change Reason Applicability is **Not Applicable**, no line change reasons should be specified.
- Any form change reason that is populated on a form must be valid for the form's form type.

Uploading Forms

The topics in this section describe logic related to uploading batches of forms.

Forms Can Come From Different Sources

Forms are created in the system through a number of different ways. These methods of entering forms in the system are often referred to as 'channels'.



Most forms are uploaded in batch. This is a two-step process:

- Your implementation populates the form upload tables. That is referred to as 'Process X'.
- The base product processes the upload data and creates the corresponding tax forms and / or registration forms.

See *Designing Form Sources* and *Setting Up Form Sources* for details on how to configure your form sources.

Form Batch Header Groups Form Upload Records

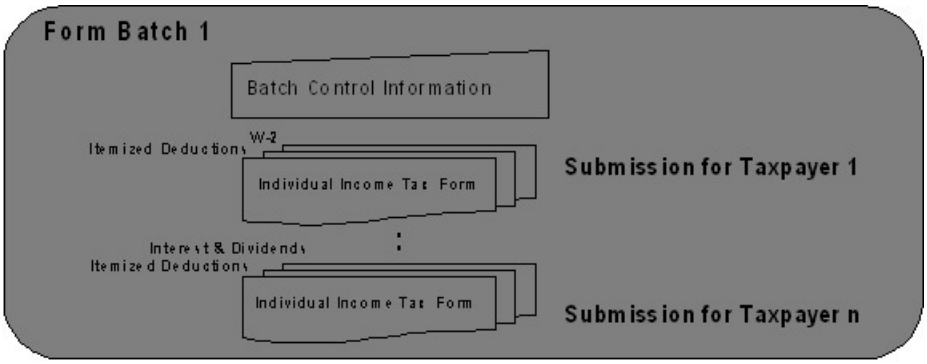
A form batch header is used to group form upload records together. It holds control information - e.g. number of form upload records, total payment amounts, etc.

A form batch header also controls the types of forms that can be put together in the same batch.

Refer *Designing Form Batch Headers* for details on how to configure form batch headers.

A Batch Can Group Forms Into Submissions

A batch can contain one or more submissions. A submission or a 'return' is a group of related forms that a taxpayer submits. It usually contains a main tax form and zero / one / more child forms. An example is an individual income submission where the income tax form is accompanied by a number of schedules and statements.



The product expects all documents supporting a single submission or 'return' to be included in a single form upload staging record that results in a single tax form or registration form, with sections representing the separate schedules and statements.

Form Upload Staging Holds Form Data

Actual tax / registration form data is uploaded via form upload staging record. A form upload staging record references a type, which determines how the upload data is mapped and stored in into the tax / registration form tables. The tax / registration form's type determines the target form business object to which the upload data will be mapped. For 'standard' form lines, the values from the upload record are mapped to the corresponding As Current elements in the target form business object schema. Refer to *Standard Lines* for more information on standard line configuration.

If tax / registration form creation is successful, the created form is linked to the form upload staging record.

Form Upload Staging Type Controls Everything

Each form upload staging record has a reference to its type. Form upload staging type controls how form upload data is stored into the product's tax form and registration form tables.

The bulk of your forms upload configuration will be spent configuring form upload staging types and defining the mapping of data from the different sources to your target form schemas in the system.

If your form sources each use a different record format / layout for interfacing a given form, a form upload staging type must be defined per unique combination of the destination form type and form source.

The mapping of the input form data into the target form schemas is done in the **Map Form Upload Data** algorithm plugged into the business object for the form upload staging type. The base product provides a form upload staging type BO **C1-**

FormUploadStagingType that uses XSL transformation to map the raw XML data into the target tax / registration form schemas.

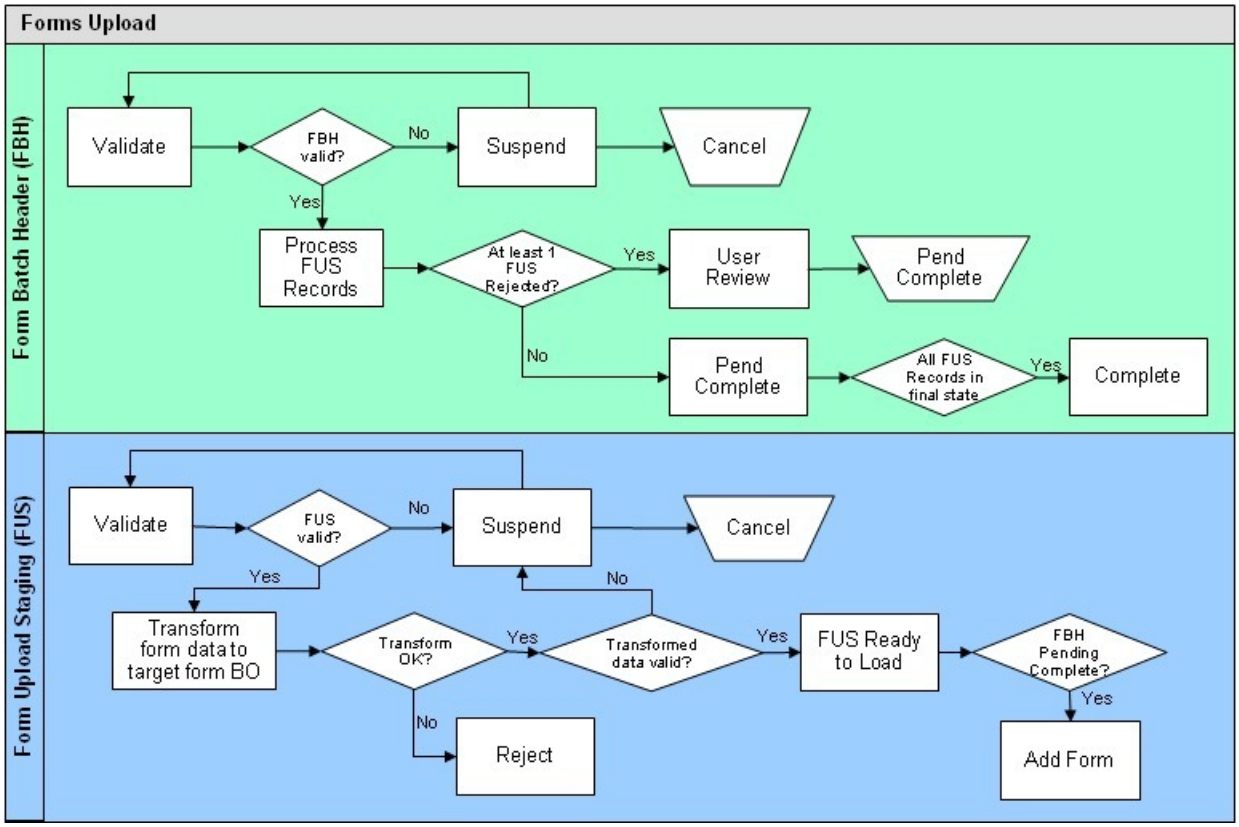
> **NOTE:**
> **Base plug-ins**. Click *here* to see the algorithm types available for this system event.

Refer to *Designing Form Upload Staging Types* and *Setting Up Form Upload Staging Types* for details on how to configure your form upload staging types.

Forms Upload Process Flow

Process Flow for Form Batch Headers and Form Upload Staging Records

The following diagram illustrates the general process flows for form batch headers and form upload staging records. This describes the lifecycles of the base product business objects supplied for form batch header (**C1-StandardformBatchHeader**) and form upload staging (**C1-FormUploadStaging**). The expectation is that implementations should be able to use these base business objects as supplied.



Form upload staging records are not processed until the form batch headers they belong to have passed validation.

Any errors during the validation of a form batch header cause it to suspend for user review. The user is responsible for resolving the issues and re-validating the form batch header. At this point, the form upload staging records are still in their initial states. In some cases, the user may decide that the batch needs to be canceled, in which case the related form upload staging records are also canceled.

When the batch header passes validation, its form upload staging records can start processing. The batch sits in the state **Form Upload In Progress** until either all staging records are in some final state - i.e. form added successfully, rejected or canceled.

Each form upload staging record goes through a number of processing steps before the corresponding tax form or registration form can be added. Any issues from these processing steps prevent the corresponding form from getting added.

- The form upload staging is validated. This validation is not related to the specific form data attached, but rather more general issues with the staging record itself. If any errors are found, the form upload staging transitions to **Suspended** requiring a user to review. The user is responsible for resolving the issues and re-validating the form upload record. In some cases, the user may decide that the form upload staging needs to be canceled. Note that at this point, the corresponding form is not created yet.
- When a form upload staging suspends, its batch header status does not change. The idea is that a user may be able to fix the issue with the staging record or decide to cancel it. Either action on the current staging record should not prevent other staging records in the batch from being processed.
- When the form upload staging passes validation, it goes through the important step of mapping the fields from the raw XML into the target Form business object schema.
  - An error may be received in the process of attempting to map the data. This is typically a result of a problem with the submission and not something a user is able to fix. In this case, the record is rejected.
  - The mapping algorithm may perform some basic form validation, for example to detect missing data such as a receive date. In this case the record is suspended and a user must fix the problems before continuing.
  - If the transformation is successful and no validation errors are found, the form upload staging goes into a state where the tax form or registration form can be added / loaded.

If any of the form upload staging records are rejected, the batch header transitions to **Review Needed** so that a user can review the batch and decide what to do next. A user may take either of these actions:

- If a large number of records were rejected, the user may decide that there is something corrupt with the transmission and choose to Cancel the batch. Canceling the batch also cancels its form upload staging records. Note that at this point, there are no forms existing yet because the batch is in a cancelable state.
- If a small number or records are rejected, the user may decide to let the batch complete and determine the specific issues related to the rejected records.

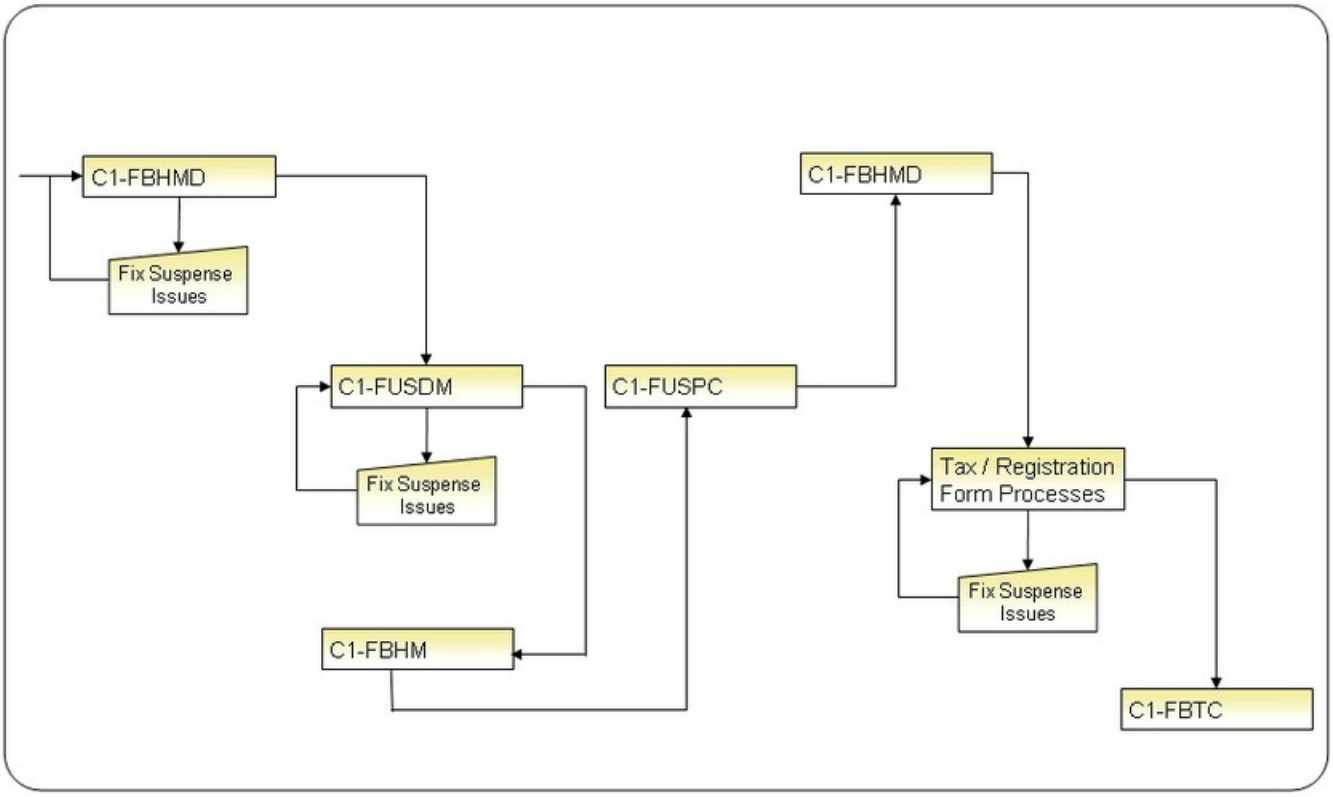
When all form upload staging records are either in **Ready for Load** state or are **Canceled**, the batch transitions to the **Ready to Complete** state. This interim state is one where batch cancellation is no longer possible. This ensures two things:

- That forms for that batch are added at the same time
- That once the forms are added, the batch cannot be canceled. Allowing batch cancellation when some forms are already added would require cleaning up the forms - i.e. canceling any pending / suspended / waiting forms get canceled and reversing any posted tax forms.

When the batch is in a **Ready to Complete** state, the forms in that batch can be added. When the forms are successfully added, their form upload staging records go to their final state, **Form Added**. Once all form upload staging records are in a final state, the batch is completed.

Forms Upload Batch Process Flow

The following diagram shows the forms upload process batch flow when using the base business objects for form batch header **C1-StandardFormBatchHeader** and form upload staging record **C1-FormUploadStaging**, and the base monitor background processes.



The processing of a form, from initial upload to posting is performed by the background processes as follows:

- **C1-FBHMD (Form Batch Header Deferred Monitor)**
  - Form batch header records transitioned from **Pending** to **Form Upload in Progress**.
  - Validates the form batch header records.
- **C1-FUSDM (Form Upload Staging Deferred)**
  - Form upload staging records transitioned from **Pending** to **Ready to Load**.
  - Validates the form upload staging records whose form batch header is in **Upload in Progress**.
- **C1-FBHM (Form Batch Header Monitor)**
  - Form batch header records transitioned from **Form Upload in Progress** to **Pending Complete**.
  - Updates the record counts on the form batch headers.
- **C1-FUSPC (Form Upload Staging Deferred Monitor)**
  - Form upload staging records transitioned from **Ready to Load** to **Form Added**.
  - Processes form upload staging records whose form batch header is **Pending Completion**.
- **C1-FBHMD (Form Batch Header Deferred Monitor)**
  - Form batch header records transitioned from **Pending Complete** to **Complete**.
  - Completes form batch header records.

  At this point the batch monitor processes related to processing tax forms or registration forms need to run. As part of this processing, the individual forms are validated and processed, including creating any payment, where applicable. Refer to *The Nightly Processes* for the list of all form related batch jobs.
- **C1-FBTC (Balance Form Batch Tender Controls)**

- Balances any tender control created for batch headers containing payments.

NOTE: The sections above describe the batch processing and lifecycle transition of the form batch header and form upload staging records using the base business objects. Since this functionality is BO driven, it can be customized based on your specific implementation requirements.

Validating Transformed Form Data

If a form upload staging record is unsuccessful in adding a form, a rollback is performed, the state is changed back to **Ready to Load** and an error is written to the batch run tree. The lifecycle does not support navigating to **Suspended** at this point. It is not common for there to be a problem in adding the form because tax forms and registration forms perform minimal validations when creating. It is possible that one of the few required fields is missing (such as Received Date). However, this is more likely pointing out a technical problem with the integration and not something that would occur in production.

In order to try to catch possible form errors earlier in the process where a user can review and update the form or where an implementer can identify an issue in the implementation, the base product Map to Form algorithm (**C1-FUS-MPFRM**) includes logic to optionally perform a step to validate the form. It uses the business service **F1-BOValidate**, which receives the target form's business object name and the transformed form data. The service executes schema validation as well as executing the BO validation algorithms. If any validation errors are detected, an issue is logged and the form upload staging record transitions to **Suspended**. At this point the user is able to fix the form before attempting to validate it again.

NOTE: Implementations may want to only run this validation during testing or with low volumes as the additional validation per form may have an impact on performance. A Feature Configuration Option is used to indicate if the form validation should be performed or not. Refer to *Configuring Transformed Form Validation* for more information.

Including Payments With Forms

Payments are uploaded with tax forms by specifying payments amounts on the corresponding form upload staging records. The actual sum of payment amounts from the form upload staging records within a batch are verified against the total payment amount specified on the form batch header.

The payment amount on the form upload staging record is simply copied over when the tax form is created. The actual payment may be created at different points in the tax form's lifecycle - depending on what's happening with the form.

- When the form posts, the obligation is already identified. Thus, the payment can be created for that obligation.
- When the form suspends, your implementation may want to create the financial transaction upfront and not wait for the suspense issue to be fixed. In this case, the payment can be created for a suspense obligation that is designated on the batch's tender source. When the form subsequently posts, the payment can be transferred to the correct obligation.
- When the form cancels, your implementation may want to create the payment anyway so that the financial transaction is still recorded in the system. In this case, the payment can be created for a suspense obligation that is designated on the batch's tender source. Manual follow-up is assumed in this case.

Refer to *Payments With a Tax Form* for more details on processing form payments.

Preparing To Upload Forms

The following topics describe the various considerations for preparing the system to upload forms.

Designing Form Sources

A form source is defined for each external source that interfaces forms into the system.

The following points describe a recommended design process:

- Define the categories for your form sources by updating the C1_FORM_CHANNEL_FLG lookup flag. Examples of these broad categories are: Lockbox, Third Party Data Capture, In-House Data Capture, etc.
- Determine the information about your external sources that the system needs to capture.
- Configure you tender sources. A unique tender source is usually associated to each form source.

The base product provides a form source business object **C1-FormSource** that maps all of the fields on the form source maintenance object.

If this BO's structure is sufficient for your implementation, you can use the BO as is. Your implementation can extend the BO's processing logic by adding / overriding algorithms and BO options.

If your implementation needs to capture additional information, you can: inherit from the base BO, copy the base BO or create your own BO.

Refer to existing help on configuration tools for more details on configuring business objects.

A Generic Form Upload Staging Business Object

The base product provides the form upload staging business object **C1-FormUploadStaging** that was designed to be generic such that your implementation can use it out of the box.

This BO has a raw XML (CLOB) field that is used to hold the actual form details. Staging the form details as raw XML provides the following benefits:

- A uniform way of interfacing form details:
  - For different types of forms
  - From various external sources that may upload data for a particular form type using different record structures/ layouts.
- External sources and Process X (i.e. the process that reads the input files and stores the form data into the form upload tables) do not need to know about the structure of the tax form and registration form business objects in the system.
- Form details can be uploaded into the system with minimal validation.
- As forms change in structure from year to year or as new form types are added, there is no need to create new form upload staging business objects. Your implementation just needs to configure new form upload staging types (that reference the generic form upload staging BO), and define the mapping logic for the new forms.

The mapping logic configured on the form upload staging types takes care of transforming the data. This BO also has a transformed XML (CLOB) field that holds the transformed data. The value of this field is used when the tax / registration form is added.

Use **C1-FormUploadStaging** if the structure and lifecycle suits your implementation's form batch headers. As with any base BO, your implementation can extend the BO's processing logic by adding/overriding algorithms and BO options.

If your implementation needs to capture additional information, you can do any of the following:

- Inherit from the base BO - if the base BO lifecycle and processing logic works for you.
- Copy the base BO or create an entirely new BO - if your form upload staging records have a different lifecycle

Refer to existing help on configuration tools for more details on configuring business objects.

Designing The Mapping of Upload Data From The Different Sources

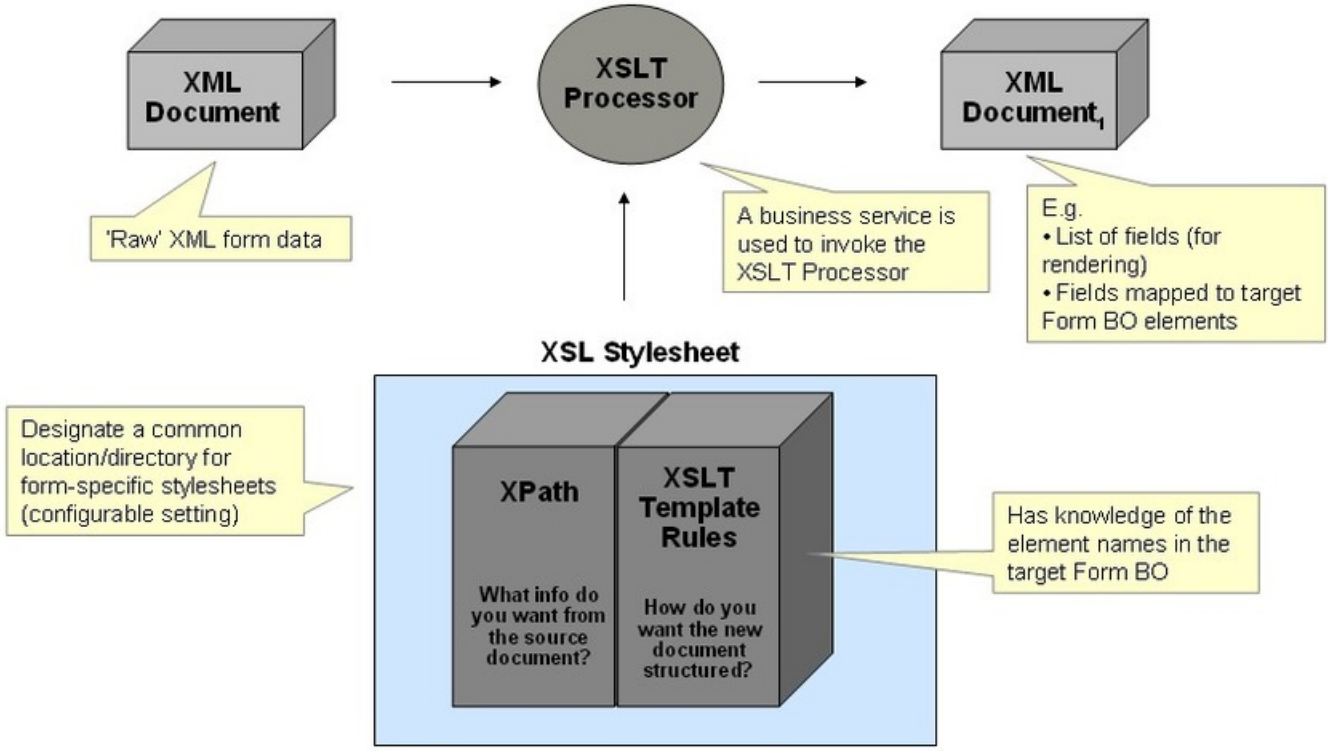
Given that the system expects the form data to come in as raw XML, your implementation needs to decide on the approach for mapping the raw XML data into the target form BO schemas. This decision usually entails looking at existing tools that are already available to your implementation.

Using XSL Transformation

The base product uses XSL transformation (XSLT) as an example for how to map the raw form upload data into the target form objects.

Since the input raw form upload data and the target form BO schemas are both in XML format, it makes sense to use XSLT. XSLT is a standard technique for transforming one XML document to another XML document. The key components in this approach are the XSLT Processor and the XSL style sheets.

The base product algorithm allows an implementation to configure whether the source XML to use for the XSL is the raw form data uploaded from the external source or if it is the full form upload staging business object. Refer to *C1-FUST-XSLT* for more information



XSL Transformation

The framework is already using an XSLT processor for transforming XMLs not only into other XMLs but also into HTMLs. A base business service calls an existing Java method for invoking that XSLT processor.

The base product provides a sample XSL file for mapping to the **C1-SalesAndUseTaxForm** business object - *C1-SalesAndUseTaxForm.xsl*. This XSL is configured to do a full business object transformation.

> **NOTE:**
> The sample Sales & Use XSL logic assumes a very specific 'raw' XML data form that was not based on any single real-life sales & use form. This sample XSL is just meant to demonstrate this particular mapping approach.

Both base product and CM XSL files need to be stored in specific locations in the file system designated at installation time.

- Base files are stored in **@SPLEBASE@/splapp/resources/xsl/**.
- CM files are stored in **@SPLEBASE@/splapp/resources/xsl/cm/**.

XSL Transformation Is Not Required

Although base logic uses XSLT for transforming form upload data, your implementation is not required to use this approach. The base logic that invokes XSLT is in a 'Map Form Upload Data' plug-in on the Form Upload Staging Type BO. You can override the base logic by inactivating the base logic and adding your own. This is done as part of configuring your form upload staging types, which is described in the next section.

Designing Form Upload Staging Types

The following topics describe the various considerations for configuring your form upload staging types.

Form Upload Staging Type (Admin) Business Object

The base product provides the **C1-FormUploadStagingType** business object. This object maps all of the fields on the maintenance object plus additional fields (in the CLOB) for the suspense To Do Type and To Do Role. Since the form upload staging type does not have a soft status, **C1-FormUploadStagingType** does not have a lifecycle.

Use the base BO if the structure suits your form upload staging types. Otherwise, you can either subclass the BO or create an entirely different BO. Refer to existing help on configuration tools for more details on configuring business objects.

When opting to use the **C1-FormUploadStagingType** BO and your chosen mapping technique is not XSLT, you need to do the following:

- Inactivate the base algorithm **C1-FUST-XSLT (FUS Type - XSL Transformation)** by adding a BO option to **C1-FormUploadStagingType** with:
  - BO option type = **Inactivate Algorithm**
  - BO option value = **C1-FUST-XSLT**.
- Plug in your CM algorithm on the **Map Form Upload Data to Target Form** plug-in spot on the **C1-FormUploadStagingType** BO.

> **NOTE:** If your chosen approach is to not have mapping logic at all - i.e. Process X will populate the Transformed XML field in the staging record - you still need to plug in the CM algorithm, but the algorithm will do nothing but terminate.

C1-FormUploadStagingType also has BO options for automatic rendering of raw XML data on the UI.

- **Display HTML Generator XSL Stylesheet** = **@SPLEBASE@/splapp/resources/xsl/c1FormUploadStagingUIMapForDisplay.xsl**
- **Schema Extractor XSL Stylesheet** = **@SPLEBASE@/splapp/resources/xsl/c1FormUploadStagingSchemaForUIMap.xsl**
- **Maintenance HTML Generator XSL Stylesheet** = **@SPLEBASE@/splapp/resources/xsl/c1FormUploadStagingUIMapForInput.xsl**

> **NOTE:** The generated maintenance HTML (third option) is just for editing raw XML data in existing form upload staging records. It is not used for adding form upload staging records online. A mass data entry solution is not included in this release.

If your implementation needs to render the raw XML data in a different way, you simply add option values for these three option types, using a higher sequence number. (For 'single' BO option types, the framework knows to get the highest sequence number.)

Defining Form Upload Staging Type Data

The following describes the steps in defining your form upload staging types.

- Determine the number of form upload staging types needed based on the number of your form types (that can be uploaded) and the sources that can interface those form types.
- Create a form upload staging type for each unique combination of form type and form source.
  - Select the form upload staging type (admin) business object. See *Form Upload Staging Type (Admin) Business Object* for details configuring this BO.
  - Specify the form upload staging type code (primary key)
  - Put in a description of the form upload staging type
  - Specify an **Active** status if you want to record to be effective immediately. Otherwise, specify an **Inactive** status and update the status later when the form upload staging type is ready.
  - Specify the related transaction business object - the form upload staging BO. The base product provides a *generic form upload staging BO* for this purpose.
  - Specify the form source.
  - Specify the form type.
  - If you are using XSLT to map raw XML form data to the target form BOs and you are using the base algorithm **C1-FUST-XSLT**, specify the XSL Transformation File Name. The file name must include the full path - e.g. **com/splwg/cm/domain/forms/formUploadStaging/xsl/salesAndUseForm.xsl**.
  - If you selected the **C1-FormUploadStagingType** administrative base BO, specify the suspense To Do type and To Do role.

Configuring Transformed Form Validation

As described in *Validating Transformed Form Data*, if your implementation wishes to enable validation of the transformed form schema during the Map to Form step, you must set up a *Feature Configuration* option. Find the Feature Configuration record for the **Forms Processing** feature type. (It may need to be defined if it does not exist). Add the **Option Type** of **Validate Upload Data**. Define the value **C1VA** if validation of the transformed schema should occur and **C1DV** if it should not.

NOTE: The default behavior is not to validate so there is no need to set up the feature configuration option if the validation should not occur.

Designing Form Batch Headers

The following points describe a recommended design process:

- Define the information that your form batch headers need to capture, e.g.:
  - The valid form types that can be included in the batch - i.e. single vs. multiple
  - Record counts
  - Total amounts
- Examine the lifecycle of your form batch headers. Part of this effort is figuring out the points in the form batch header's lifecycle in which there is 'handshaking' with the form upload staging records' lifecycles.
- Design your form batch header processing algorithms.

- Identify issues that cause form batch processing to stop until a user can resolve the issues. Determine the appropriate notification action for such issues - e.g. To Do entries
- Identify conditions that require a review of the form batch header. Determine the appropriate action for triggering such review - e.g. To Do entries
- Identify conditions that cause form batch processing to complete. Determine the actions that need to take place at completion - e.g. final update of counters.
- Etc.

The base product provides the **C1-StandardFormBatchHeader** business object, which is designed to work for both batch uploads and mass data entry. It allows for multiple valid form types within the same batch. It also includes processing counters that capture the results of processing the included form upload staging records. This BO's lifecycle supports cancellation, validation, suspense, review and completion and is designed to work with the lifecycle of the form upload staging BO that is also provided in base - i.e. **C1-FormUploadStaging**.

Use **C1-StandardFormBatchHeader** if the structure and lifecycle suits your implementation's form batch headers. As with any base BO, your implementation can extend the BO's processing logic by adding/overriding algorithms and BO options.

If your implementation needs to capture additional information, you can do any of the following:

- Inherit from the base BO - if the base BO lifecycle and processing logic works for you.
- Copy the base BO or create an entirely new BO - if your form batch headers have a different lifecycle

Refer to existing help on configuration tools for more details on configuring business objects.

Setting Up Form Processing Options

The topics in this section discuss the various options for setting up the processing of forms.

Setting Up The System To Enable Forms Processing

This table describes all objects that must be defined as part of the forms processing setup process. It lists the order in which objects should be defined. It also identifies the other objects that are associated with or referenced by each setup object, thus providing a useful map of the relationships between objects in the system.

Seq	*Object*	*Description*	*Prerequisite*	*Associated With / Referenced By*	*Admin Submenu*
1	Form Type	Type of form	Obligation Type	Form Section, Form Line, Child Form Types, Valid Obligation Types, Tax Form, Registration Form, Form Upload Staging Type	Form Type
2	Form Section	Section of a form type	Form Type	Form Type, Form Line	Form Type
3	Form Line	A line in a section. Defines the type of information captured / displayed on the line	Form Section	Form Type, Form Section, Field, Lookup Field	Form Type
4	Form Change Reason	Predefined reasons for changes to information on the form		Form Type	Form Change Reason
5	Form Rule Group	A logical grouping of form rules		Form Type, Form Rule	Form Rule Group

Seq	Object	Description	Prerequisite	Associated With / Referenced By	Admin Submenu
6	Form Rule	Defines how information on the form is processed	Form Rule Group	Form Rule Group, Registration Form Exception, Tax Form Exception	Form Rule
7	Form Source	Predefined sources of forms	Tender Source	Tender Source, Form Upload Staging Type, Form Batch Header, Form Upload Staging, Tax Form, Registration Form	Form Source
8	Form Upload Staging Type	Type of form upload staging record	Form Source, Form Type	Form Source, Form Type, Form Batch Header, Form Upload Staging	Form Upload Staging Type

Setting Up Form Types

Form Types contain the rules that control how forms are processed. To set up a Form Type, open **Admin Menu** > **Form Type**.

Form Type Query

Use the *query portal* to search for an existing form type. Once a form type is selected, you are brought to the maintenance portal to view and maintain the selected record.

Form Type - Main

This portal appears when a form type has been selected from the Form Type Query portal.

The topics in this section describe the base-package zones that appear on this portal.

Actions

This zone displays the actions that control the processing of the form type and generation of the form.

FASTPATH: Refer to *Generating Forms* for more information on the form type lifecycle and form generation.

Form Type

The Form Type zone contains display-only information about selected form type.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_FORM_TYPE*.

Section List

This zone lists the sections of the form type in sequential order. The Edit, Duplicate, and Delete actions are available. You can click the Add link in the zone's title bar to add a new section. You can click a form section hyperlink to go to the maintenance portal for that form section.

Line List

This zone accepts a broadcast form section and lists the section's lines in sequential order. The Edit, Duplicate, and Delete actions are available. You can click the Add link in the zone's title bar to add a new line. You can click a line hyperlink to go to the maintenance portal for that form line.

Child Form Types

This zone displays the list of tax form types to which the current form type is a parent and is only visible if child form types exist. The base product does not currently provide functionality that uses this form type relationship.

Form Type - Rules

To view the Form Type - Rules page, open **Admin Menu** > **Form Type** select a form type, and then navigate to the **Rules** tab.

This page displays the form type's rule groups in prime key order. A row is displayed for every rules linked to the form type rule group. The list includes the form rule information with a hyperlink to the rule's maintenance portal. You can add or edit the form type rule group by clicking the link in the title bar.

Form Type - Log

To view the Form Type - Log page, open **Admin Menu** > **Form Type** select a form type, and then navigate to the **Log** tab.

This page contains a standard *log zone*.

Setting Up Sections and Lines

Setting Up Form Sections

This portal appears when a section has been selected from the Section List on the Form Type portal or from the Current Form Type's Sections dashboard zone.

The topics in this section describe the base-package zones that appear on this portal.

Actions

This is a standard actions zone. The **Edit, Delete** and **Duplicate** actions are available.

Form Section

This zone contains display-only information about selected form section.

Please see the zone's help text for information about this zone's fields.

Form Section Line List

This zone accepts a broadcast form section and lists the section's lines in sequential order. The **Edit, Delete** and **Duplicate** actions are available. You can click the **Add** link in the zone's title bar to add a new line. You can click a line hyperlink to display the line details.

Setting Up Form Lines

This portal appears when a line has been selected from the Section Line List on the Form Type portal or the Form Section Portal.

The topics in this section describe the base-package zones that appear on this portal.

Actions

This is a standard actions zone. The **Edit, Delete** and **Duplicate** actions are available.

Form Line

This zone contains display-only information about selected form line.

Please see the zone's help text for information about this zone's fields.

Setting Up Form Change Reasons

Typically the tax authority will want to track the reason/s behind a form change, especially if the changes were made by a user. The user will be required to select from a dropdown of form change reasons whenever making a change that requires a reason. To set up a Form Change Reason, open **Admin Menu** > **Form Change Reason**.

The topics in this section describe the base-package zones that appear on the Form Change Reason portal.

Form Change Reason List

The Form Change Reason *List zone* lists every form change reason. The following functions are available:

- Click the *broadcast* icon to open other zones that contain more information about the adjacent form change reason.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each form change reason.
- Click the **Add** link in the zone's title bar to add a new form change reason.

Actions

This is a standard actions zone. The **Edit, Delete** and **Duplicate** actions are available.

Form Change Reason

The Form Change Reason zone contains display-only information about the form change reason. This zone appears when a form change reason has been broadcast from the Form Change Reason List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Form Types

The Form Types List zone displays a list of form types that currently use the broadcast form change reason. The following functions are available:

- Click the **Add** link in the zone's title bar to link a new form type to the broadcast form change reason.
- Use the **Delete** action to delete a link between the broadcast form change reason and a form type.

Setting Up Form Sources

A form source is created for every external source that interfaces tax / registration forms into the system.

To set up a form source, select **Admin Menu** > **Form Source**.

The topics in this section describe the base-package zones that appear on the Form Source portal.

Form Source List

The Form Source *List zone* lists every form source. The following functions are available.

- Click the *broadcast* icon to open other zones that contain more information about the adjacent form source.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each form source.
- Click the **Add** link in the zone's title bar to add a new form source.

Form Source

The Form Source zone contains display-only information about a form source. This zone appears when a form source has been broadcast from the Forms Source List or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_FORM_SRCE*.

Setting Up Tender Sources

A *tender source* is created for each form source that interfaces payments with tax forms.

These tender sources will be used on the form batch headers' tender controls.

The tender source also specifies the suspense obligation to which payments should be applied if the tax form's obligation is not yet determined at the time of payment creation - e.g. when the form gets suspended or canceled.

To set up a form source, select **Admin Menu** > **Tender Source**. Refer to existing help on setting up tender sources.

Setting Up Form Upload Staging Types

A form upload staging type is created for a unique combination of form type and form source.

Use the Form Upload Staging Type transaction to view and maintain form upload staging types. To set up a form upload staging type, select **Admin Menu** > **Form Upload Staging Type**.

Form Upload Staging Type Query

Use the *query portal* to search for an existing form upload staging type. Once a form upload staging type is selected, you are brought to the maintenance portal to view and maintain the selected record.

You can click the **Add** link on this portal to add a form upload staging type.

Form Upload Staging Type Portal

This portal appears when a form upload staging type has been selected from the Form Upload Staging Type Query portal or if this portal is opened via drill down from another page.

The topics in this section describe the base-package zones that appear on this portal.

Form Upload Staging Type

The Form Upload Staging Type zone contains display-only information about the form upload staging type.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_FORM_UPLD_STG_TYPE*.

The Big Picture of Form Control

The base product's standard set of form processing batch jobs are configured by default to process all tax and registration forms received. Any form that passes validation is processed through to **Posted** if all the batch processes are run. The batch processes support input parameters to process only forms of certain form type or for a certain batch header ID, but this is considered unusual and not part of standard production nightly processing.

There are some implementations that want to control volumes of tax forms that are posted and prefer to select which tax forms should be posted. In addition, certain implementations may choose to hold off on processing a certain set of tax forms. The product provides an object called Form Control that may be used by implementations that prefer to work this way. The topics in this section provide more information about form control records.

NOTE: The form control functionality does not apply to registration forms, only to tax forms.

How Are Form Controls Created?

The product expects that the form control is created via a web service. The expectation is that analysis is performed using an appropriate reporting or analysis tool and that the tax form IDs are selected in that tool. The reporting / analysis tool can then create a file and an appropriate mechanism like Oracle Service Bus transforms the file and interfaces the information via a web service call. The web service is used to create the new form control and link the selected tax forms.

The product supports automatic creation of form controls for batch-uploaded tax forms. A special batch process can be run after the forms upload and tax form validation processes. This batch process will pick up any ‘ready for posting’ tax forms and create a form control for each distinct form batch header. The form batch header’s included tax forms are then linked to the form control.

The product does not provide any logic for manually defining which tax forms to include in the form control.

The form control type includes configuration to indicate whether the list of IDs provided in a new form control represent internal tax form IDs or rather external references (document locator number or DLN).

The form control record is created in the **Pending** status. The base product attaches a deferred monitor to the pending state so that the validation of the IDs occurs in batch allowing for large volumes. Depending on an implementation's business practice, this deferred monitor may be one to run often during the day.

Once the record is validated, it is routed for approval. Refer to *Form Control Review / Approval* for more information.

Tax Form Configuration for Form Control

The form control functionality expects that the standard base batch processes to upload tax forms and validate the tax forms are still run. The form control relates to tax forms that are in **Ready for Posting** status.

Implementations that choose to use form control processing must adjust the configuration of the **Ready for Posting** status in the parent tax form BO lifecycle. Refer to *Tax Form BO Configuration* for more information.

Form Control Review / Approval

Once the validation of the tax forms linked to the form control has completed a user must review the form control and determine the next steps. The form control type defines the To Do type and To Do role used to alert the appropriate users that a form control is ready for review. Refer to *Form Control Review* for more information on the actions the user may take.

Posting Tax Forms

Once a form control is approved, its tax forms may be posted. The approval step stamps the form control with the batch job that is responsible for posting the tax forms. The batch job is taken from the form control type. The current run number for that batch job is stamped as well. The base product provides a batch job (C1-FCPTF - Process Form Control Tax Forms) that is responsible for finding form controls for the current run number and progressing all the tax forms with an **Active** link status to its next state.

NOTE: If the batch job determines that any of the tax forms are no longer in the appropriate state, the link status is updated to **Skipped** as an audit.

Configuring Form Control Options

If your implementation supports form controls, the topics in this section describe configuration requirements.

In addition, your implementation should read the detailed descriptions for the base product business objects provided for Form Control Type (**C1-FormControlType**) and Form Control (**C1-FormControl**).

Setting Up Form Control Types

A Form Control Type defines the configuration information that is common to form controls of a given type. The type of information captured on the form control type is governed by the form control type's business object.

To set up a Form Control Type, select **Admin Menu** > **Form Control Type**.

The topics in this section describe the base-package zones that appear on the Form Control Type portal.

Form Control Type List

The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent form control type.
- Click the **Add** link in the zone's title bar to add a new form control type.

Form Control Type

The Form Control Type zone contains display-only information about a Form Control Type. This zone appears when a Form Control Type has been broadcast from the Form Control Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_FORM_CTRL_TYPE*.

Tax Form BO Configuration

For implementations that opt to use form control processing must adjust the configuration of the **Ready for Posting** state of the Parent Tax Form BO (**C1-ParentTaxForm**) as follows so that it does not automatically progress to **Posted**.

- Remove the Monitor Process configured for the status.
- Deactivate the base monitor algorithm. To do this add a BO Status option with an option type of **Inactive Algorithm** and an option value of **F1-AT-RQJ**.

In addition, the following configuration enables the tax form user interface to display information about the form control that a tax form is linked to:

- Identify status values that may be linked to a form control. The suggested values are **Ready for Posting**, **Posted**, **Adjusted**, **Reversed** and **Transferred**.
- For each status identified, add an option type of **Status Category** and an option value of **C1FA** (Related Control Applies).

Form Control Batch Jobs

The following batch jobs must be scheduled as per your implementation's business rules:

- **C1–CREFC** (Create Controls For Uploaded Forms). This batch process creates form controls for batch-uploaded forms. To create form controls using this process, the batch job must be run after all the forms upload processes have run. This background process selects **Ready for Posting** tax forms that reference a Form Batch Header ID and that are not yet linked (as **Active**) to an existing form control. The selected tax forms are grouped by form batch header so that a **Pending** form control can be created for each unique form batch header. All forms related to the form batch header are linked (as **Active**) to the form control.
- **C1-FCMD** (Form Control Monitor (Deferred)). This batch job selects form control records that are **Pending** and validates that the tax forms in the list are valid and in an appropriate state. Once this batch job completes, the processed form controls are ready for approval. Implementations should schedule this based on the business practice of the users that are creating the form controls and the users that are expected to approve the form controls. The assumption is that the approval should be done in a timely manner. So one option is to schedule this job on a frequent schedule, such as every 15 minutes. That way the approvals are processed quickly throughout the day.

  NOTE: Email routing. If your implementation plans to use email routing for the "form control requires approval" To Do entry, then the background process **F1-TDERR** (To Do External Routing) must be scheduled after the monitor batch job with the same or similar frequency.

- **C1-FCPTF** (Process Form Control Tax forms). This batch job selects form controls that are stamped with this batch code and the current run number and posts the "active" tax forms. This batch job is creating financial transactions among other objects created by posting a tax form and the assumption is that implementations will run this in their nightly batch run.

Refer to *Batch Process Dependencies* for more information.

Implementing Web Service Options

The product provides the following configuration to support interfacing a list of tax forms to link to a form control via a web service.

The XAI Inbound Service **C1-FormControlUpload** provides the API for the service script **C1-FrmCtrlUp**. This service script includes logic creating a form control and linking a group of tax forms. Note that the script has been designed to be called iteratively for cases where a large file is received and the interface tool that processes the file can process it in chunks.

FASTPATH: Refer to the description of the XAI inbound service and the above service script for more information.

Defining Forms Rules

Forms processing is a core function for a tax authority. When forms are processed, the system needs to verify that the information is correct and update or create the appropriate taxpayer details and transactions.

Form rules provide business users with the ability to configure processing rules for a form type.

Understanding Form Rule Administration

This section describes concepts and common tasks related form rule administration.

About Form Rules

A form rule is combination of configuration data and processing logic that applies a business rule. The configuration that controls the form rule logic is defined on the form rule business object. The form rule BO has an associated **Apply Rule** algorithm to execute the logic of the rule.

When forms are defined, each form section and line must reference a business name that is unique for that form type. As form changes are introduced, these business names remain constant.

Many form types within a given set of forms also have common information such as taxpayer identification, income and credit lines and so on. The validation and processing rules are typically the same for these common components.

Form rules may be designed to reference section and line business names rather than specific form lines. If a section / line exists in the form from one year to the next, its rules can be reused. Form lines that are common across form types can utilize the same rules provided the business names are the same.

FASTPATH:
Refer to *Designing Your Form Rules and Groups* for information about designing your rules.

About Form Rule Groups

A form rule group is a uniquely named group of rules. You can predefine a set of rules common to a particular form section or set of form lines that can be selected and associated with a form type. For example, predefined rule groups can be used to verify that all taxpayer identification details have been filled in on a form or complete the actions required when a form is posted.

Form rule groups have an associated reference form type. Reference form types are used to determine the section and line business names that may be used by rules in this group to reference the form data. The sections and line names defined in the reference form type must be common to all form types that use this rule group.

Form rule groups are also used to define the form rules for a form type. A form type can define one or more form rule groups to be executed during certain steps in the form lifecycle (defined by a rule event). Sequence numbers are used so that multiple form rule groups executed for the same rule event are done in an appropriate order. Note that the system looks to the specific form type for the form being processed to determine which rules to execute, not the reference form type on the rule group. This means that the rules to be executed can be tailored to the different form types within a broader category of forms.

FASTPATH:
Refer to *The Big Picture of Rule Processing* for more information about processing different rule events.

About Exception Categories

An exception category is a broad categorization of exceptions that can be reported by form validation rules. An exception category must be specified on a form exception.

Understanding Rule Processing

As a form transitions through the states in its lifecycle, various rules need to be executed. The following sections describe the way in which the base system processes rules.

Apply Rules Overview

The following section highlights the logic in the base algorithm type Apply Form Rules (*C1-FRM-APPRL*). It has been designed to call the algorithms plugged into the Apply Rule plug-in spot for each rule linked to the form type for a given rule event. This algorithm type should be plugged into the **Business Object Status - Enter** plug-in spot for each state that requires rules to be executed.

At a high level, the base algorithm follows these steps

- Read the form data and store it in memory
- Find the form rule groups linked to the input form type and rule event. For each group in sequence order, retrieve its **Active** rules in sequence order.
- For each rule,
  - Execute its Apply Rule algorithm
  - Check the returned value of Rule Action. If the action is **Terminate**, terminate overall processing; otherwise continue on to the next rule.
- When processing is complete,
  - Update the form using the data updated in memory by the rule algorithms
  - If exception processing applies (for validation rules) and the exception list is populated, compare the current list of exceptions to the existing exceptions for the form, if any. Any exceptions that are no longer in the current list are closed. Add any newly-reported exceptions to the form exception table.

NOTE:
No updates. The individual apply rule algorithms should not do any updates to the form data in the database for performance reasons. These algorithms simply update the internal form data area and exception information in memory

with new values. The Apply Form Rule BO enter plug-in is responsible for updating the form and creating or closing form exceptions.

Validation Rules

The following sections highlight unique functionality for validation type form rules.

Verifying Form Data Using Form Rules

Validation rules determine if the information supplied on the form can be processed. This usually includes checking that required information is supplied and validating that the data is in the correct formats. Validation rules are also used to identify whether the taxpayer related to the form already exists in the system. Validation rules are responsible for reporting any issues on a form that may require correction.

Most forms have a lifecycle that includes a validation step. The base package provides a sample tax form **C1-ParentTaxForm** that has a **Validate** status. This status has an enter-plug in that uses the base *C1-FRM-APPRL* algorithm type to execute rules for the **Validation** rule event and process any exceptions reported.

Reporting Exceptions

Algorithms that perform validation rules are responsible for reporting any issues as a form exception. Form exceptions details must include the form rule group and rule that detected the issue, an exception category and an exception class. The base package includes exception class values of **Notification**, **Waiting for Information** and **Suspense**. Your implementation can add further classes as appropriate for your business rules.

Stopping Form Processing When There Are Issues

A form can suspend if there are errors that a tax authority user needs to review or fix.

If the form is missing key information, the form can go into a 'waiting' state until the tax authority receives the information from the taxpayer.

The exception class attribute can be used to determine what state a form should move to if there are open issues after validation. The base package algorithm types Tax Form - Transition on Exception (*C1-FRE-TROEX*) and Registration Form - Transition on Exception (*C1-PRF-TROEX*) are designed to transition a form to a waiting state if open exceptions of class **Waiting for Information** exist or to a suspended state if there are open exceptions of the class **Suspense**. The algorithms are plugged into the respective base form business objects as **Business Object Status - Enter** plug-ins to the Validate states after the**Apply Form Rules** algorithm.

Executing Validation Rules 'On Demand'

There are cases where a user may be entering data or correcting data in a form and may want to check the form's validity. The product provides a service that can execute validation rules and return the list of possible exceptions for display to a user. This functionality has been implemented in the base Tax Form and Registration Form parent business objects. When the status is one that allows editing of the form, when the user is editing the form a **Check Form** button is available.

FASTPATH: Refer to *Validating Forms* for more information on how the form business objects perform validation. Refer to *Web Self Service Rules* for information on executing on demand validation from web self service applications.

Processing Rules

Any rules executed after the Validate state are considered "processing" rules, meaning the algorithms are responsible for causing something to occur. The following sections highlight unique functionality for processing type form rules.

Processing Form Data Using Form Rules

Once a form's data has been verified, it may be posted into the system. A posted form may subsequently be adjusted to correct information, transferred to another obligation or account or reversed altogether. At each of these steps in the lifecycle, other actions need to take place. The system may need to create taxpayers, accounts and obligations, create financial details, create overpayment processes or possibly reverse the effect of previous updates.

The base package **Apply Form Rules** algorithm type (*C1-FRM-APPRL*) is designed to be used on any state that requires rules processing. To use this algorithm type to execute processing rules, you need to define a rule event applicable to that state and plug in an algorithm configured to execute rules for that event. The base package includes the following pre-configured rule events and associated algorithms: **Suspend, Waiting for Information, Ready for Posting, Post, Cancel, Adjust, Transfer** and **Reverse**. The base package business objects **C1-ParentTaxForm** and **C1-ParentRegistrationForm** include appropriate algorithms for all the listed rule events as Enter plug-ins for the corresponding states.

Processing Rules Create Other Objects

Algorithms that perform processing rules are responsible for any data updates that affect other objects in the system such as accounts, obligations, adjustments and others. As such, they are also responsible for creating form log entries that link those objects to the form being processed. Refer to the base algorithm **Create Assessment From Form Line** (*C1-FR-CRASMT*) for an example of a rule algorithm that creates an assessment adjustment and its associated log entry.

Processing Rules Do Not Report Exceptions

In a typical form lifecycle, the actions that take place when a form is posted, adjusted, transferred or reversed are interrelated. If one of these actions is not successful, an error should be reported and the form should remain in the same state as before the updates took place. For this reason, the system does not support exception handling after processing rules are executed. Any issues that are encountered should be reported using standard error handling.

Web Self Service Rules

Many tax authorities provide web self service applications that allow a taxpayer to file forms online. These applications may require form rules that differ from the rules applied when forms are uploaded and processed in the system. The following sections highlight unique functionality for form rules invoked from web self service.

Form Validation

Implementations may choose to offer the ability for the taxpayer to "Check the Form" as it is being filled in. There are some types of validation that a tax authority may not want to execute when a taxpayer requests on demand validation. The product provides the following support for web self service based validation:

- A rule event flag of **WSS Validate** is provided when configuring form type rules. This allows an implementation to configure the validation rules that are appropriate for checking a form filled in online by a taxpayer.
- A special business service called **Apply WSS Validation Rules** (C1-ApplyWSSValidation) is provided. An integration with a WSS system can call this service passing the form data. The service executes the rules linked to the form type via the **WSS Validate** rule event and returns any exceptions found. It also returns an indication if any of the form data has been changed as a result of "auto-correct" functionality in any of the rules.

Copy Details From Previous Form

Implementations may choose to offer the ability for the taxpayer to pre-populate a new form based on details from a previous filing of the same form type. The type of information that should be copied may differ for different form types. The product provides the following support for this function:

- A rule event flag of **Copy Previous Form** is provided when configuring form type rules. This allows an implementation to configure the rules that govern the information to be transferred from a previous form of this type.

- A special business service called **Copy From Previous Form** (C1-CopyFromPreviousForm) is provided. An integration with a WSS system can call this service passing the WSS form data. The service executes the rules linked to the form type via the **Copy From Previous Form** rule event and returns an indication if any of the form data has been changed as a result of logic in any of the rules.

Pre-populate Form Details

Implementations may choose to automatically pre-populate a new form based on known information about the taxpayer. A common example is demographic information such as names and addresses. The type of information that should be retrieved may differ for different form types. The product provides the following support for this function:

- A rule event flag of **Pre-Populate Form** is provided when configuring form type rules. This allows an implementation to configure the rules that govern the taxpayer information to be retrieved and populated in a form of this type.
- A special business service called **Pre-populate Taxpayer Information** (C1-GetTaxpayerInfoForm) is provided. An integration with a WSS system can call this service passing the WSS form data. The service executes the rules linked to the form type via the **Pre-Populate Form** rule event and returns any exceptions found. It also returns an indication if any of the form data has been changed as a result of logic in any of the rules.

Pre-Processing Rules

Each tax form defines different information which may be used to identify a taxpayer, account and tax role. The form rule infrastructure allows an implementation to configure the appropriate rules to determine and capture these key IDs on the form. These types of rules are typically executed as part of form validation.

For reasons of efficiency and scalability, it is preferable for some of this key information to be identified before the form is created in the system. The product provides the following support to allow the same rules to be used in both situations:

- A rule event flag of **Pre-processing** is provided when configuring tax form type rules. This allows an implementation to configure the same rules used to identify taxpayer information during form validation for the pre-processing step.
- The base package **Tax Form — Apply Pre-processing Rules** algorithm type (*C1-TF-APRERL*) is provided to apply the rules plugged in on the pre-processing event. The base package business object **C1-ParentTaxForm** is configured with this algorithm. Refer to the algorithm type description for more information on how these rules are applied during pre-processing.

Setting Up Exception Categories

When a form's data is validated the system may identify errors which it stores as exceptions. You can use exception categories to group these exceptions. The exceptions for the forms can then be viewed on the Exceptions tab of the form's maintenance portal. To maintain an existing Exception Category, select **Admin** > **Exception Category**.

The topics in this section describe the base-package zones that appear on the Exception Category portal.

Exception Category List

The Exception Category *List zone* lists every Exception Category. The following functions are available:

Click the *broadcast* icon to open other zones that contain more information about the adjacent Exception Category.

The standard actions of **Edit** and **Delete**are available for each Exception Category.

Click the **Add** link in the zone's title bar to add a new Exception Category.

Exception Category

The Exception Category zone contains display-only information about an Exception Category. This zone appears when an Exception Category has been broadcast from the Exception Category List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Setting Up Form Rule Groups

Form rules are logically grouped together in a form rule group. The rules are executed in the following order: Each rule group linked to the form type is executed in sequential order. The rules in each group are executed in sequential order.

To set up a form rule group, open **Admin** > **Form Rule Group**.

Form Rule Group Query

Use the query portal to search for an existing form rule group. Once a form rule group is selected, you are brought to the maintenance portal to view and maintain the selected record.

You can also click the Add link in the query zone's title bar to add a new form rule group.

Form Rule Group Portal

This portal appears when a form rule has been selected from the Form Rule Group Search results.

The topics in this section describe the base-package zones that appear on this portal.

Actions

This is a standard actions zone. The **Edit, Delete** and **Duplicate** actions are available.

Form Rule Group

The Form Rule Group zone contains display-only information about a form rule group. This zone appears when a form rule group has been selected from the Form Rule Group Search results, or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Follow this link to open the data dictionary where you can view the tables that reference *CI_FORM_RULE_GRP*.

Form Rules List

The Form Rule *List zone* provides a summarized view of all form rules for a form rule group. A row is displayed for every form rule linked to the form rule group. The rules are shown in sequential order. The list includes the form rule information and a hyperlink to the rule's maintenance portal.

The standard actions of **Edit, Delete** and **Duplicate** are available for each form rule.

Click the **Add** link in the zone's title bar to add a new form rule.

Form Types

This zone displays all form types that reference the form rule group. This zone only appears if a form rule group exists in the portal context. The list includes the name of the form type and a link to the form type's maintenance portal.

Setting Up Form Rules

A form rule is designed to implement one specific rule used in processing a form. Examples of form rules include taxpayer existence rules, form line validation, calculation and auto-correction rules, tolerance checking, and posting logic.

To set up a form rule, open **Admin** > **Form Rule**.

Form Rule Query

Use the query portal to search for an existing form rule. Once a form rule is selected, you are brought to the maintenance portal to view and maintain the selected record.

You can also click the Add link in the query zone's title bar to add a new form rule.

Form Rule Portal

This portal appears when a form rule has been selected from the Form Rule Search results.

> **NOTE:** When the Form Rule portal is used the context-sensitive Rules on Group zone appears in the dashboard. This zone lists the other form rules in the same group as the rule in context. From this dashboard zone you can add a new form rule to the group, or go to the maintenance portal for the other rules in the group

The topics in this section describe the base-package zones that appear on the Form Rule portal.

Form Rule

The Form Rule zone contains display-only information about a form rule. This zone appears when a form rule has been selected from the Form Rule Search results, or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Follow this link to open the data dictionary where you can view the tables that reference *CI_FORM_RULE*.

Designing Your Form Rules and Groups

The base product provides a generic BO for Form Rule Group, **C1-FormRuleGroup**. Your implementation can add additional business rules to this BO as required.

The base product provides a parent BO for Form Rule, **C1-FormRule**. This BO defines the common elements for all form rules. It is not intended to be used stand-alone. Your implementation can include this BO in each rule BO and add the additional components as required.

The base product supplies a number of BOs that apply particular Form Rules. Refer to the business objects that reference the Form Rule maintenance object **C1-FORMRULE** for a complete list.

Your implementation can define additional form rule BOs as required. The following points highlight the important configuration for this business object:

- Create a new business object and include the **C1-FormRule** business object.
- Develop the appropriate rule processing algorithm to perform the rule logic.
- For any configuration required by the rule processing algorithm, consider whether it should be defined when configuring the form rule by a business user. If so, include the appropriate elements in the form rule business object's schema.
- For a rule that performs validation, consider whether the rule exception information, which includes the Exception Category should be defined when configuring the form rule by a business user. If so, include the appropriate elements in the form rule business object's schema. The base product provides the data area (**C1-ExceptionInformation**) that can simply be included in the business object schema.
- For the user interface, the business object **C1-FormRule** and the data area **C1-ExceptionInformation** both support UI Hints. Many base form rule business objects also support UI hints. However, some still use full UI maps. When creating a new custom form rule, it is recommended to use UI Hints for the new business object. For an example of a base form

rule business object that uses UI Hints and includes functionality for referencing a form section and line business name, refer to the Create Customer Contact business object (**C1-CreateCustomerContact**).

> **NOTE:** See below for information about base UI map fragments that are available for creating a full UI Map for display or maintenance of a form rule.

- Consider what logical grouping this rule belongs to. Note that a group of rules is always executed in the context of a single rule event. Rules should be grouped according to common actions that make take place for a particular event or set of events.

The following UI map fragments are available for use in creating full UI maps for form rule display and maintenance. However, with the use of UI Hints, it is not expected that they are needed.

- Map fragment to display the common elements for all form rules along with the actions: **C1-FormRuleDisplay**
- Map fragment to display the common exception details (for validation rules only): **C1-FormRuleExceptionDisplay**
- Common display service script to plug in on the rule BO to retrieve the form rule details: **C1-FRGenDisp**
- Map fragment to maintain the common elements for all form rules: **C1-FormRuleMaint**
- Map fragment to maintain the common exception details (for validation rules only): **C1-FormRuleExceptionMaint**

The topics in this section describe some of the base rules that may be used by your implementation. Click *here* for a complete list of the apply rule algorithms provided by the system. A corresponding business object exists for each one.

Using Conditional Validation Rules

The base product provides a form rule that performs validation based on form line configuration. The rule Form Line Configuration Validation (**C1-ChkReqSectionsLines**) checks for form sections, groups and lines that are marked as required. It also checks for valid values in form lines configured as foreign key references, lookups or extendable lookups. However, there are many business rules with validation that is conditional based on the values of other form lines in the form. The base product provides a Form Rule BO that is designed handle a large range of conditional validation, **C1-CondElementValidation**.

The **Conditional Element Validation** BO allows a business user to define a series of conditions that apply to sections and lines of a form. The conditions are defined as basic mathematical expressions that have a result of true or false. Your implementation should consider using this rule BO when defining a rule that validates a form line value in relation to other supporting lines on the form.

The following topics highlight some of the available features for conditional expressions. Other mathematical operators and functions are supported but these are not normally used for calculations that are common to forms validation.

Variables

Variable identifiers must be a character between a-z except x. Variable x is always used to refer to the form line that this rule applies to. Variable identifiers are case sensitive.

Operators

The following types of expression operators are supported.

Mathematical Operators	Operators of *, /, %, +, - are allowed. Examples of expression using these operators are: • **x** = **a** + **b** + **c** where the value of **x** should equal the sum of the values **a**, **b** and **c** • **x** = **a** * **r** where **r** is a rate factor variable

Comparison Operators	Operators of =, != (not equal), <, >, <= and >= are allowed. Examples of expression using these operators are: • **x** > **a** where the value of **x** should be greater than the value of **a** • **x** != 0 where **x** must have a non-zero value
Grouping Operators	Parentheses may be used to formulate expressions with sub-computations. An example of an expression using grouping is: • **x** = (**a** + **b**) / **c** where the value of **x** should be equal to the result of adding values **a** and **b** then dividing by the value of **c**

Functions

The following examples show the use of the most common supported functions:

Ceiling	**x** = ceiling (**a*** **b**) where **x** should equal the result of multiplying the value of **a** by the value of **b** and rounding up to the nearest whole number
Floor	**x** = floor (**a*** **b**) where **x** should equal the result of multiplying the value of **a** by the value of **b** and rounding down to the nearest whole number
Round	**x** = round (**a*** **b**) where **x** should equal the result of multiplying the value of **a** by the value of **b** and rounding the nearest whole number. A result of 1.5 would round to 2 and a result of 1.4 would round to 1. To round to a decimal place, use **x** = round (**a*** **b**, **n**) where **n** is the number of decimal places. The default rounding behavior is to round .5 up (ROUND_HALF_UP). The syntax supports overriding this behavior, for example: **x** = round (**a*** **b**, **2**, **'ROUND_HALF_DOWN'**). The rounding modes supported are based on those supported for the BigDecimal java class.
Any	any [value in **a** | value !='] where **a** is a value from a repeating line and the condition is true if any of the values of **a** are not blank
All	all [value in **a** | value !='] where **a** is a value from a repeating line and the condition is true if none of the values of **a** are blank

Conditional Sections and Groups

The base product provides another form rule that performs conditional validation for Sections and Lines. The rule Check Conditionally Required Sections and Groups (**C1-CheckCondReqdSectionGroup**) checks whether or not a form section or group are required or must be empty based on a defined set of conditions. This rule can be used in conjunction with the **Conditional Element Validation** rule described above.

FASTPATH: Refer to the Apply Rule algorithm (*C1-CRQ-APRL*) description for more information.

Using the OPA Validation Form Rule

The base product provides a Form Rule BO that is designed to handle a large range of conditional validation, **C1–OpaValidation**.

The BO allows a business user to specify the OPA rulebase that implements validations and calculations that apply to the form data. The form rule also defines how to interpret the outcome of the OPA rulebase invocation. You should consider using this rule BO when significant part of form data validations is suitable to be implemented using OPA. In this scenario, your implementation should generate an OPA rulebase data model for the Form Type and develop the actual OPA rulebase prior to configuring the form rule.

FASTPATH: Refer to *Generating an OPA Rulebase Data Model for a Form Type* for specific details about data model generation. Refer to *Oracle Policy Automation Integration* for more details about OPA.

Rule Details

The search for the OPA Rulebase name derives the results from the OPA instance that participates in the integration. Make sure your rulebase is deployed on the appropriate determinations server.

Rule Outcome Details

Your implementation can define fine-grained rule outcome **interpretation**. The rulebase output includes two numeric indicators: error severity and rule outcome. You may associate the values of these indicators with appropriate **Exception Classes** and **Rule Actions**. The configuration effort should be tightly coordinated with the rulebase author.

NOTE: We recommend establishing a set of values for **Error Severity** and **Rule Outcome** indicators and using them for the OPA-based form validation. Then use OPA Integration Configuration to define a default rule outcome mapping. These default configurations are copied to the newly created Form Rule and can be edited afterwards..

FASTPATH: Refer to *Configuring the Shared Data Model Integration* for the OPA integration configuration details.

Exception Information

The outcome of the rule can vary because the rulebase performs complicated business logic and multiple validations. The rule may also report multiple exceptions. Nevertheless your implementation can define a single default **Exception Class** and **Rule Action**.

Additional Notes on OPA Rulebase

Implement complicated tax policies and laws. OPA provides a platform for turning the laws and instructions into executable modules. Business analyst may use an original tax documents as a source for the policy and implement it. A majority of validations and calculations that can be performed on the actual form data, without additional database interactions, could be implemented with OPA.

Validate the entire form with OPA. The entire form is passed to the OPA Rule and it is expected to perform multiple validations and calculations and return the modified form and the set of exceptions. OPA webservice call is relatively expensive performance-wise, therefore it make sense to consolidate as much business logic as possible into one OPA rulebase.

Writing OPA Rulebase with minimal knowledge of the base product. The base product provides the integration mechanism that supports the data exchange with OPA. Thus, the OPA Rulebase author works exclusively on the OPA module.

Multiple OPA Rulebases can be written with same data model. The data model is generated once and handed over to the OPA Rule author(s). It can be used in various OPA Rules linked to the same form type.

Share OPA Rulebases across the enterprise. The integration with PSRM Self Service supports import of the form type definition and it uses OPA as a form validation engine. The rulebase data model can be generated in either product for the same form type, and the OPA rulebase based on this model can be used by both products.

Base Rules that Determine Master Data for Tax Forms

The base product provides several rules that attempt to determine master data that may already exist in the system for a tax form being filed. This section describes the functionality of these rules at a high level and highlights any potential dependency between rules. In every case the business object is provided along with a link to the Apply Rule algorithm where the detailed description provides more details. Note that some rules may also be used for registration forms. Refer

to the separate registration form section for details. In all cases, the rules are expected to be plugged in as a **validation** rule event.

- Determine Tax Form Filing Period (**C1-DetermineTaxFormFilingPer**). This rule determines the filing period for the tax form using valid filing calendars on the tax type or valid filing periods on the form type along with form dates to identify the appropriate filing period. The filing period is a key piece of information for further validations of the tax form and the taxpayer. This rule or a similar one that works based on the business rules of the particular tax form type should be one of the early validation rules.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-FR-DETFPE*) description for more information.

- Check Taxpayer Existence (**C1-CheckTaxpayerExistence**). This rule uses the person ID and optionally the taxpayer name to identify a taxpayer (person). If the form type supports a secondary taxpayer, the rule supports secondary taxpayer identification as well. If no taxpayer is identified, it issues an error if the tax type indicates that pre-registration is required. Otherwise, the assumption is that the taxpayer will be created at posting time. Note that if a form uses a tax role external ID and does not supply any other taxpayer identification, then this rule is not needed. The Check Pre-registered Account and Tax Role rule can also populate the taxpayer's Person ID based on the tax role.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-FR-CHTXEX*) description for more information.

- Account and Tax Role Determination rules. The product provides more than one rule that attempts to determine the account and tax role based on different types of data that may be present on the form.
  - Check Pre-registered Account and Tax Role (**C1-CheckPreregTaxRoleAccount**). This rule is used for tax types that require pre-registration before filing a tax form. It also caters for forms that use a Tax Role External ID as a key identifier. It supports situations where the form does not include other fields for identifying the taxpayer. It also caters for situations where the filing period has not been identified by a previous rule. This rule can populate the filing period based on the determined tax role.

    FASTPATH: Refer to the Apply Rule algorithm (*C1-FR-PRTRAC*) description for more information.

  - Check Account and Tax Role Existence (**C1-AccountTaxRoleCheck**). This rule caters for tax types that may not require pre-registration. It assumes that the filing period for the form has already been identified.
    - If the taxpayer id is not populated, it does not process further. The assumption in this case is that the form allows "auto-registration" and that the person, account and tax role will be added later. Note that it does not check for pre-registration in this scenario because it assumes that a rule that has attempted to identify a taxpayer has already issued an exception for pre-registration tax types.
    - If the taxpayer is populated, it attempts to find the account and tax role for the form. In each case, if more than one is found based on the rules, an exception is created. If no record is found, then it only issues an error for tax types where pre-registration is required.

    FASTPATH: Refer to the Apply Rule algorithm (*C1-ATR-EXIST*) description for more information.

- Check Filing Period Obligation (**C1-CheckFilingObligationExist**). This rule tries to find an existing non-canceled obligation for the account, filing period (filing calendar and end date) and tax role identified for the form. If an appropriate record is found, the ID is populated into the record. If no records are found, no exception is created. The assumption is that even for pre-registered tax types, it is valid for the obligation to have not yet been created when the tax form is received.

Base Rules that Determine Master Data for Registration Forms

The base product provides rules that attempt to determine master data that may already exist in the system for a registration form being filed. This section describes the functionality of these rules at a high level. The business object is provided along with a link to the Apply Rule algorithm where the detailed description provides more details. In all cases, the rules are expected to be plugged in as a **validation** rule event.

- Check Taxpayer Existence (**C1-CheckTaxpayerExistence**). This rule uses the person ID and optionally the taxpayer name to determine if the taxpayer (person) is already known in the system (for updates to existing registrations). No error is issued if no taxpayer is found. The assumption is that the taxpayer will be created at posting time.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-FR-CHTXEX*) description for more information.

Base Rules that Create Master Data for Tax Forms

The base product provides several rules that create key master data such as person, account and tax role. These are all **Posting** rules that should be executed when transitioning the form to posted after it has been fully validated. This section describes the functionality of these rules at a high level and highlights any potential dependency between rules. In every case the business object is provided along with a link to the Apply Rule algorithm where the detailed description provides more details. Note that some rules may also be used for registration forms. Refer to the separate registration form section for details.

- Create Taxpayer (**C1-CreateTaxpayerFromForm**). This rule checks whether the form already indicates the Person ID for the primary taxpayer. If not, it creates a person using appropriate information from the form. If the form includes secondary taxpayer information and does not have a Person ID for the secondary taxpayer, it also creates a person for the secondary taxpayer.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-TXP-CRE*) description for more information.

- Create Account (**C1-CreateAccount**). This rule checks whether the form already indicates the Account ID. If not, it creates an account using the primary taxpayer as the main taxpayer for the account. If the form also identifies a secondary taxpayer, that person is linked as an additional financially responsible person for the account.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-CREACCTFF*) description for more information.

- Create Tax Role (**C1-CreateTaxRoleFromTaxForm**). This rule is provided to create a tax role for the current tax form being filed using the tax form's account and filing calendar, the tax form type's tax type. The rule caters for a tax role start date to be defined on the form. The rule creates a tax role with limited information and expects to determine the tax type based on the tax form type. It is not available for creating tax roles from registration forms.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-FR-CTRFTF*) description for more information.

- Create Filing Period Obligation (**C1-CreateFPObligationFormRule**) This rule creates an obligation for the tax form if one has not already been identified. It assumes that the Account and Tax Role for the form are already identified or have been created. It also assumes that the form's Filing Period has been identified.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-CRE-FPOBL*) description for more information.

Base Rules that Create Master Data for Registration Forms

The base product provides several rules that create key master data such as person and account for a registration form. These are all **Posting** rules that should be executed when transitioning the form to posted after it has been fully validated. This section describes the functionality of these rules at a high level and highlights any potential dependency between rules. In every case the business object is provided along with a link to the Apply Rule algorithm where the detailed description provides more details.

- Create Taxpayer (**C1-CreateTaxpayerFromForm**). This rule checks whether the form already indicates the Person ID for the primary taxpayer. If not, it creates a person using appropriate information from the form.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-TXP-CRE*) description for more information.

- Create Account (**C1-CreateAccount**). This rule checks whether the form already indicates the Account ID. If not, it creates an account using the primary taxpayer as the main taxpayer for the account.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-CREACCTFF*) description for more information.

Base Rules that Pre-populate Form Data

The base product provides a number of rules that attempt to pre-populate a new form with data that already exists in the system for the taxpayer.

These rules are designed to support forms created by online interaction with external applications such as web self service. They are invoked as a stand alone action and return updated form data. They are expected to be plugged in on specific rule events that match those actions.

NOTE: The product provides business services to support invoking these rules as a stand alone process. Refer to *Web Self Service Rules* for more information.

This section describes the functionality of these rules at a high level. In every case the business object is provided along with a link to the Apply Rule algorithm where the detailed description provides more information.

- Copy Previous Tax Form (**C1-CopyPreviousTaxForm**). This rule attempts to find a previously posted tax form linked to a given taxpayer ID and copies specific lines from that form to the current form. The rule searches for forms for which the taxpayer was either the primary or secondary filer. If more than one form is found, the most recently posted form is used. This rule should be configured for the **copy previous form** rule event.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-CPYTXFORM*) description for more information.

- Copy Previous Registration Form (**C1-CopyPreviousRegForm**). This rule attempts to find a previously posted registration form linked to a given taxpayer ID and copies specific lines from that form to the current form. If more than one form is found, the most recently posted form is used. This rule should be configured for the **copy previous form** rule event.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-CPYRGFORM*) description for more information.

- Pre-populate Demographic Data (**C1-PrepopulateDemographicInfo**). This rule retrieves name and address details for a taxpayer and transfers them to the current form being processed. It should be configured for the **pre-populate form** rule event.

FASTPATH: Refer to the Apply Rule algorithm (*C1-PRPFORM*) description for more information.

Payment Related Rules

The base product provides several rules to manage payments related to a tax form. This section describes the functionality provided for processing payments with forms.

Payments and Forms Overview

The rules provided by the product cater for different ways of processing payments.

- Payment may be received before the form is processed. This may occur when an annual filer is required to pay quarterly estimated tax payments during the filing year prior to filing. This may also occur when a payment is received with the form but is separated for processing and is posted prior to processing and posting the form. The system provides payment transfer rules that attempt to identify existing payments for the taxpayer and link them to the form.
- Many implementations that receive payments with the tax form do not separate the payment for processing but rather create the payment as part of the form processing. The base product provides the posting rule Create Payment to perform this logic. Creating the payment at posting time satisfies most scenarios. However, what happens when the form suspends or must wait for information or gets canceled prior to posting? Payments received with forms must be immediately captured in the system, regardless of what happens to the form. If a form suspends or waits for information or gets canceled, the associated payment should be created in the system anyway. If the obligation is already identified when the form suspends or waits, the payment will be applied to the obligation. Otherwise, the payment will be created for either an excess credit obligation (if the system is configured to do so and an account is identified on the form) or the suspense obligation (from the related tender controls' tender source). When the form subsequently posts, the suspended payment will be transferred to the obligation identified on the form.

Payment Rule Details

The following points describe the base payment rules at a high level.

- Create Payment (**C1-CreatePayment**). This rule creates a frozen payment for a tax form when the form indicates a payment amount. It should be plugged in for the **posting**, **suspense**, **waiting for information** and **canceled** rule events. As described in the overview, the rule's algorithm posts the payment to an excess credit obligation or a suspense obligation if the form's obligation or account has not been determined.

  NOTE: Because a payment may be created before the form is posted, the rule checks whether a payment exists for a form before creating one. If a payment has been created via prior form processing but is linked to an excess credit obligation or to a suspense obligation, the related rule Transfer Payment to Form's Obligation is responsible for moving the payment appropriately. If a payment has been created outside of form processing that should be redirected to the form, the related rule Transfer Payment Using Form References is responsible for identifying and moving the payment. The transfer rules should be configured in sequence ahead of the Create Payment rule on the **posting** rule event.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-CPAPRL*) description for more information.

- Transfer Payments to Form’s Obligation (**C1-TransferPmtToFormObligation**). This rule is provided to transfer an existing payment currently posted to either an excess credit obligation or a suspense obligation to the obligation that is identified on the tax form. This rule should be plugged into the **posting** rule event. This rule is designed to redirect payments that fall into the following categories:
  - Payments that were created when the form suspended or waited for information.
  - Payments from a previous ‘transfer to’ form that were transferred to a suspense obligation.

- Payments that were processed before the form was processed using a set of distribution rules referencing document locator number, taxpayer ID, tax type and revenue period.

  NOTE: The logic to transfer payments processed before the form is optional and is only executed if the related distribution rule characteristic types are populated on the rule. Since the logic is tightly linked to a specific distribution rule configuration, it is recommended that those rule details be left blank and the 'Transfer Payments Using Form References' rule be used to identify and move payments processed outside form processing.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-TPFO-APRL*) description for more information.

- Transfer Payments Using Form References (**C1-TransferPmtUsingFormRef**). This rule is provided to transfer an existing payment that was created prior to form processing and is currently posted to either an excess credit obligation or a suspense obligation to the obligation that is identified on the tax form. This rule should be plugged into the **posting** rule event. The rule's algorithm is designed to identify payments that should be redirected to the form by matching characteristic values on the payments to payment reference details on the form. The rule supports the following sources of payment reference information on the form:
  - Document Locator Number
  - Taxpayer ID Number
  - Tax Type
  - Revenue Period
  - Form Line

  NOTE: This rule is recommended for transferring payments created outside form processing. It provides a more flexible means of identifying related payments than the Transfer Payments to Form's Obligation rule and is designed to work with payments that have been created via the payment event upload process with the related payment references attached. Refer to *Interfacing Payments Using Distribution Rules* for more information on payment event upload.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-TPFR-APRL*) description for more information.

- Move Payment to Suspense (**C1-TransferPmtToSuspense**). This rule is provided to transfer any existing payments for tax forms to a suspense obligation. This rule should be plugged in as **transfer** and **canceled** rule events. Note that the rule is needed in the canceled rule event to cater for forms that may have gone into suspense or waiting for information where the account or obligation had already been known.

  FASTPATH: Refer to the Apply Rule algorithm (*C1-TPS-APRL*) description for more information.

Invoking a System Service

The base product provides a form rule that allows you to invoke a system service. The rule C1-InvokeSystemService (**C1-InvokeSystemService**) can invoke either a Service Script, Business Service or Business Object.

The input for the system service can come from the form lines (including collections of form lines) or constant values mapped to the various input elements of the service. The output from the service can be mapped back to form lines.

FASTPATH: Refer to the Apply Rule algorithm (*C1-ISS-APRL*) description for more information.

Defining Calculation Engine Options

Revenue authorities need to perform a variety of calculations as part of core business processing. A primary example is calculating billable amounts based on the assessed value of assets.

The calculation engine provide business users with the ability to define a wide variety of calculations using a combination of calculation rules and eligibility criteria.

Understanding Calculation Rule Administration

This section describes concepts and common tasks related to calculation rule administration.

About The Calculation Engine

The calculation engine uses a defined calculation processing interface designed to support calculations for a wide variety of purposes. While it is not confined to calculations using in billing, it is a primary tool for calculating bills and the interface closely mirrors the bill data structure.

The key elements in the calculation processor API are:

- A collection of value details that can be pre-populated and added to by calculation rules. These value details form the basis of many computations performed by the rules.
- A collection of calculation lines which define calculated amounts and other attributes that control how these amounts contribute to the calculation. Calculation lines are the primary results of the computations performed by the rules

FASTPATH:
Refer to *Designing Your Calculation Rules and Groups* for information about the calculation processor interface and further details for designing your rules.

About Calculation Rules

A calculation rule is combination of configuration data and processing logic that applies a rule to compute a value. The configuration that controls the calculation rule logic is defined on the calculation rule business object. The calculation rule BO has an associated **Apply Calculation Rule** algorithm to execute the logic of the rule.

. The most common form of calculation rule will:

- Read from the calculation processor data accumulated by prior rules in order to perform a specific computation, with additional input from external values or factors
- Take the results of the computation and add new calculation lines or value details to the calculation processor data according to instructions in the rule's configuration

A calculation rule may have associated eligibility criteria that control the conditions under which the rule is applied.

FASTPATH:
Refer to *Designing Your Calculation Rules and Groups* for information about designing your rules.

Refer to *About Eligibility Criteria* for information about configuring eligibility criteria.

About Eligibility Criteria

An eligibility criteria rule is a combination of configuration data and processing logic that evaluates conditions to determine if a calculation rule should be applied or not. The configuration that controls the eligibility logic is defined on the eligibility criteria business object. The eligibility criteria BO has an associated **Apply Calculation Rule Eligibility** algorithm to execute the logic of the evaluation.

The eligibility criteria rule algorithm is designed to indicate whether the criteria evaluate to **True**, **False** or **Insufficient Data**. A result of **Insufficient Data** indicates that some or all of information required to evaluate the criteria was not available.

The eligibility criteria BO includes configuration to indicate what action to take for each of the possible evaluation results. The available actions are **Apply Rule**, **Do Not Apply Rule**, **Check Next Condition** or **Terminate Calculation**. A result of **Insufficient Data** has an additional action option of **Error** which will cause the calculation processor to terminate calculation and report an exception.

FASTPATH:
Refer to *Designing Your Calculation Rules and Groups* for information about designing eligibility criteria for your rules.

About Calculation Line Category Types and Values

Calculation line category types are used to establish connections between calculation rules. Calculation rules can specify a member category and value to which they belong. When this same category and value are referenced as a 'Target Category' by other rules, the rule logic will reference the calculation lines created by rules that belong to the category and value.

For example, calculation rules that compute amounts based on asset value that are distributed to the applicable city for the asset may have a value of 'Assessable Value', 'City Revenue'. A subsequent calculation rule that summarizes the overall revenue to be disbursed to the city will reference category line type and value combination as a target category.

About Calculation Groups

A calculation group is a uniquely named group of rules. You can define a calculation group with a set of rules that represent a specific version of a calculation. That calculation group can then be linked to a calculation control together with the date on which that version of the calculation comes into effect.

FASTPATH:
Refer to *The Big Picture of Calculation Rule Processing* for more information about processing calculation rule groups.

About Calculation Controls

A calculation control defines a calculation for a specific purpose. They are used to link system objects to applicable calculation rules. For example, asset based tax types may define valid billing calculation controls which are in turn assigned to the associated tax roles for that tax type. The billing process can then reference the tax role's calculation control to apply the correct set of calculation rules when generating bills.

A calculation control maintains an effective-dated link to a calculation group that defines a calculation control version. New versions are created when something about the rules changes and prior versions need to be kept for historical recalculations.

The Big Picture of Calculation Rule Processing

When a process in the system needs to perform a calculation, it invokes the Calculation Control processor, passing the appropriate version of the calculation control. This process invokes the Calculation Group processor which is responsible for executing the calculation rules.

At a high level, the Calculation Group processor follows these steps for each calculation rule in sequence for the calculation group

- Fetch each of the rule's Eligibility Criteria and execute its Apply Criteria algorithm
- Check the returned action value,
  - If the action is **Terminate** or **Error**, terminate overall processing
  - If the action is **Check Next Condition**, continue on to the next set of criteria
  - If the action is **Do Not Apply Rule**, continue on to the next calculation rule
  - If the action is **Apply Rule**, execute the Apply Calculation Rule algorithm for the rule
- After applying a calculation rule, check the rule action flag. If the action is **Terminate** , terminate overall processing

When errors occur in processing, it is usually necessary to retain the interim calculation details in order to diagnose the problem . The calculation group processor handles errors in two ways:

- Calculation rules and eligibility criteria have the option of recording an exception in the calculation processor data error instead of issuing standard errors.
- Errors issued by lower level logic are trapped by the Calculation Control processor and converted to an exception message in the output data.

In both circumstances, higher level logic is responsible for detecting and reporting calculation exceptions as appropriate.

Setting Up Calculation Groups

Calculation rules are logically grouped together in a calculation group. The rules in each group are executed in sequential order.

To set up a calculation group, open **Admin Menu** > **Calculation Group**.

Calculation Group Query

Use the query portal to search for an existing calculation group. Once a calculation group is selected, you are brought to the maintenance portal to view and maintain the selected record.

You can also click the Add link in the query zone's title bar to add a new calculation group.

Calculation Group Portal

This portal appears when a calculation group has been selected from the Calculation Group Search results.

The topics in this section describe the base-package zones that appear on this portal.

Calculation Group

The Calculation Group zone contains display-only information about a calculation group. This zone appears when a calculation group has been selected from the Calculation Group Search results, or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_CALC_GRP*.

Calculation Rules List

The Calculation Rule *List zone* provides a summarized view of all calculation rules for a calculation group. A row is displayed for every calculation rule linked to the calculation group. The rules are shown in sequential order. The list includes the calculation rule information and a hyperlink to the rule's maintenance portal.

Click the **Add** link in the zone's title bar to add a new calculation rule.

Click the **Resequence Rules** link in the zone's title bar to change the execution sequence of the calculation rules within the group.

Calculation Control List

The Calculation Control *List zone* provides a summarized view of all calculation controls that reference this calculation group. A row is displayed for every calculation control linked to the calculation group as a calculation control version. The control versions are shown in effective date / calculation control order. The list includes the calculation control information and a hyperlink to the control’s maintenance portal.

Setting Up Calculation Rules

A calculation rule is designed to implement one specific rule that creates one or more calculation lines or details that comprise part of an overall calculation. Examples of calculation rules include rules that apply a rate to an asset value to calculate a specific charge, rules that create billable charges from externally supplied values, and rules that summarize other calculation lines.

To set up a calculation rule, open **Admin Menu** > **Calculation Rule**.

Calculation Rule Query

Use the query portal to search for an existing calculation rule. Once a calculation rule is selected, you are brought to the maintenance portal to view and maintain the selected record.

You can also click the Add link in the query zone's title bar to add a new calculation rule.

Calculation Rule Portal

This portal appears when a calculation rule has been selected from the Calculation Rule Search results.

The topics in this section describe the base-package zones that appear on this portal.

Calculation Rule

The Calculation Rule zone contains display-only information about a calculation rule. This zone appears when a calculation rule has been selected from the Calculation Rule Search results, or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_CALC_RULE* .

Eligibility Criteria List

The Eligibility Criteria *List zone* provides a summarized view of all eligibility criteria for a calculation rule. Calculation rule eligibility criteria are user-definable conditions that could cause a given calculation rule to be applied or skipped. A row is displayed for every set of eligibility criteria linked to the calculation rule. The criteria are shown in sequential order. The list includes the eligibility criteria information and a hyperlink to the Eligibility Criteria maintenance portal.

Click the **Add** link in the zone's title bar to add a new set of eligibility criteria.

Calculation Rule Eligibility Criteria Portal

This portal appears when a set of calculation rule eligibility criteria has been selected from the Calculation Rule Eligibility Criteria list zone.

The topics in this section describe the base-package zones that appear on this portal.

Calculation Rule Eligibility Criteria

The Calculation Rule Eligibility Criteria zone contains display-only information about a set of eligibility criteria. This zone appears via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_CALC_RULE_CRT* .

Setting Up Calculation Line Categories

Some calculation rules may reference the results of previous rules in their calculation logic. You can define calculation line category types and values to categorize calculation rules. Rules can then be configured as members of a specific category so their resulting calculation lines can be easily identified by subsequent rules. To maintain an existing Calculation Line Category Type, select **Admin Menu** > **Calculation Line Category Type**.

The topics in this section describe the base-package zones that appear on the Calculation Line Category Type portal.

Calculation Line Category Type List

The Calculation Line Category Type *List zone* lists every Calculation Line Category Type. The following functions are available:

Click the *broadcast* icon to open other zones that contain more information about the adjacent Calculation Line Category Type.

The standard actions of **Edit**, **Duplicate** and **Delete** are available for each Calculation Line Category Type.

Click the **Add** link in the zone's title bar to add a new Calculation Line Category Type and Category Values.

Calculation Line Category Type

The Calculation Line Category Type zone contains display-only information about a Calculation Line Category Type and its Category Values. This zone appears when an Calculation Line Category Type has been broadcast from the Calculation Line Category Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_CL_CAT_TYPE*.

Setting Up Calculation Controls

A calculation control defines a group of calculation rules for a specific purpose, such as creating a bill. Calculation controls support the creation of different versions of a calculation over time by maintaining an effective dated list of the calculation groups that define the rules.

To set up a calculation control, open **Admin Menu** > **Calculation Control**.

Calculation Control Query

Use the query portal to search for an existing calculation control. Once a calculation control is selected, you are brought to the maintenance portal to view and maintain the selected record.

You can also click the Add link in the query zone's title bar to add a new calculation control.

Calculation Control Portal

This portal appears when a calculation control has been selected from the Calculation Control Search results.

The topics in this section describe the base-package zones that appear on this portal.

Calculation Control

The Calculation Control zone contains display-only information about a calculation control. This zone appears when a calculation control has been selected from the Calculation Control Search results, or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_CALC_CTRL*.

An Overview Of Factors

The primary purpose of the calculation engine is to support the calculation of an obligation’s charges. One of the most common rules for calculating a charge is to apply a rate to a fixed or assessed value. While it is possible to specify the rate directly on the rule, it is more flexible to have the rule reference a factor whose values can be maintained independently.

A factor defines a centrally stored set of values for use in calculations and other processes. A factor can have different values depending upon some definable attribute of a system object, such as a district associated with an address.

You can use factors to define any of the following types of values:

- A monetary amount. This would typically be used to define fixed charges such as fees.
- A number. This would typically be used to define charges per unit, such as five cents per square foot.
- A percentage. This would typically be used for tax rates and exemption percentages.

As a general guideline, you would use a factor when any of the following situations exist:

- The amount being charged is dependent on some characteristic of a related attribute. For example, if charges levied for distribution to schools differ from one district to another, you would use a factor to define variable charges for each district.

- The same charge exists in many calculations. For example, if there are several calculation controls that all include a fixed handling charge, it would make sense to use a factor to levy this charge rather than specify the same value on multiple calculation rules.
- The amount being charged is dictated by some external organization and therefore can change independently from the calculation rule.

The following sections provide a description of how factors are structured and details on how to configure and maintain factors.

The Structure Of A Factor

All factors have the capability of having different values depending on some characteristic of an associated object such as an asset, or the asset billing address. For example, a factor used to levy a waste disposal fee would have a different rate depending on the waste management district associated with the asset's address. Factors share a common structure, made up of the following tables:

- A **factor** contains descriptive information and attributes that control how the factor may be used in the system.
- A **factor characteristic value** defines each instance of a characteristic for which there is a unique value for a charge. In the waste management district example, a factor characteristic value would exist for each district that levied a waste management fee.
- Each factor characteristic may have many **factor values** over time. To continue the example, waste management fees may vary from one revenue year to another.

NOTE:
Some factors don't need a characteristic. There are factors whose value does not differ based on a characteristic. For example, the values of a factor that levies a state wide asset related charge will not vary because of a specific asset attribute. However, because of the relational design of the system, every factor value must reference both a factor and a characteristic value in the database. The base product provides two factor business objects to support the different situations. The Simple Factor BO flattens the characteristic type and value to base values of 'Not Applicable', so that only the factor details and effective values need to be entered. The Characteristic Based Factor BO supports the maintenance of the complete factor, factor characteristic values and factor values relationship.

FASTPATH:
For more information about setting up characteristics, see *Setting Up Characteristic Types & Their Values*.

Deriving Factor Characteristic Values

The Structure Of A Factor section described how factor values can vary according to an attribute of another object. This section describes how the system determines which characteristic value is applicable when fetching a factor value for calculations.

When you set up a factor to use a characteristic, you also need to configure the algorithm that can derive its appropriate characteristic value from a given source. The Determine Characteristic plug-in spot provides the ability to pass in a list of maintenance objects and their prime keys in addition to the required characteristic type. This allows the algorithm to apply business rules based on knowledge of the internal MO relationships, to find the correct source of the value.

The base product supplies a number of algorithms that may be used by your implementation to derive factor values from the main master data objects, including asset, asset billing address, tax role and account. These algorithms recognize the relationships between those objects and the key bill objects of tax role and obligation. Click *here* for a complete list of the determine characteristic value algorithms provided by the system.

NOTE:

In some circumstances, the invoking logic may already have access to the correct characteristic value. The factor value retrieval process allows for a specific characteristic value to be passed in, in which case, the determine characteristic value algorithm is not used.

Factors And Distribution Codes

Another aspect to consider when defining factors is the associated GL distribution codes. Factors allow you to associate a specific distribution code to the charge that is defined by that factor. For factors whose values vary by a characteristic value, the system allows you to define a unique distribution code to each characteristic value / factor value combination.

For example, if you need to calculate charges that are distributed to different school districts and each school district contribution is calculated at a different rate, you can define a separate distribution code for each district and factor value. Calculation rules can then override the rule level distribution code with the one specific to the factor value used in computing the calculation value.

Refer to *Using The Apply Rate To Base Value Rule* for an example of how calculation rule logic can apply factor value specific distribution codes.

Setting Up Factors

To set up a factor, open **Admin Menu** > **Factor**.

Factor Query

Use the query portal to search for an existing factor. Once a factor is selected, you are brought to the maintenance portal to view and maintain the selected record.

You can also click the Add link in the query zone's title bar to add a new factor.

Factor Portal

This portal appears when a factor has been selected from the Factor Search results.

The topics in this section describe the base-package zones that appear on this portal.

Factor

The Factor zone contains display-only information about a factor. This zone appears when a factor has been selected from the Factor Search results, or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_FACTOR*.

Factor Characteristic Values

The Factor Characteristic Values *List zone* appears only if the factor displayed has values that vary by the values of a attribute represented by a characteristic type. A row is displayed for every characteristic value for the factor’s characteristic type that governs a factor value. The list includes the characteristic description, the distribution code applicable to amounts based on this factor and characteristic value combination and details of the value currently in effect.

Click the *broadcast* icon to open the factor values zones to view and maintain the values for the adjacent Factor / Characteristic Value combination.

Factor Values

The Factor Values *List zone* provides a history of all the effective dated values for this factor and the broadcast characteristic value, if applicable. The values are shown in descending order by effective date. The list includes a hyperlink on the effective date field that navigates to the factor value's maintenance portal.

The standard actions of **Edit** and **Delete** are available for each Factor Value.

Click the **Add** link in the zone's title bar to add a new Factor Value.

Factor Value Portal

This portal appears when an effective dated value has been selected from the Factor Values list zone.

The topics in this section describe the base-package zones that appear on this portal.

Factor Value

The Factor Value zone contains display-only information about a specific effective dated factor value. This zone appears via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_FACTOR_VALUE* .

Designing Your Calculation Rules and Groups

This section provides an overview of how to create and maintain calculation rules used with the calculation engine. Initial sections describe base objects and reusable components that may be used in many rules. Later sections of this document provide information on some of the key calculation rules provided with the base product.

Calculation Data

The calculation rules are intended to operate on the internal calculation data area, both to reference previously populated details and to add new calculation details. Refer to the base data area **C1-CalcEngineProcessorData** for information on the details passed to the processor.

In addition to the information defined in this data area, the calculation engine expects the following inputs:

- **Calculation Control Version** identifies the set of calculation rules to be executed for this calculation
- **Calculation Object** is the system object which is the subject of the calculation, such as a bill.

> **NOTE:**
> The calculation object is provided as a read-only reference for calculation rule logic. The calculation engine does not support updates to the object as a result of calculation rules.

For an example of how to invoke the calculation processor, refer to the base algorithm that generates bill details: *C1-TB-GN-CLC*.

Base Calculation Objects

There are a number of base calculation engine objects that can be used by your implementation as the basis for new calculation rules.

The base product provides a generic BO for Calculation Group, **C1-CalcGroup**. Your implementation can add additional business rules to this BO as required.

The base product provides a parent BO for Calculation Rule, **C1-GenericCalcRule**. This BO defines the common elements for all calculation rules. It is not intended to be used stand-alone. Your implementation can include this BO in each rule BO and add the additional components as required.

The base product supplies a number of BOs that apply particular Calculation Rules, some of which are described in later sections. Refer to the business objects that reference the Calculation Rule maintenance object **C1-CALC-RULE** for a complete list.

The base product provides a parent BO for Calculation Rule Eligibility Criteria, **C1-GenericCalcRuleElCrt**. This BO defines the common elements for all eligibility criteria objects. It is not intended to be used stand-alone. Your implementation can include this BO in each eligibility criteria BO and add the additional components as required.

The base product supplies a BO that applies eligibility criteria using a flexible expression evaluator, which is described in a later section. Refer to the business objects that reference the Calculation Rule Eligibility Criteria maintenance object **C1-CALC-R-EL** for a complete list.

Your implementation can define additional calculation rule and eligibility criteria BOs as required. The following points highlight the important configuration for new business objects for these maintenance objects:

- Create a new business object and include the appropriate parent business object.
- Develop the appropriate processing algorithm to perform the logic for the BO.
- For any configuration required by the processing algorithm, consider whether it should be defined by a business user when configuring the rule or criteria. If so, include the appropriate elements in the business object's schema.

In addition to the BOs listed above, the base product provides a number of reusable components that map common rule configuration elements that may be used when developing new rules. The following topics highlight some of the base components that may be used by your implementation.

Common Variables

The two main calculation rule and eligibility criteria BOs provided in base use conditional expressions in their rule logic. These expressions are supported in turn by a common set of variable elements that are defined in a data area to allow reuse across rules.

The following topics highlight some of the available features for using conditional variables.

Variable Definition

The Calculation Engine Variable List DA incorporates the following elements:

- **Variable** is the unique identifier for the variable. Variable identifiers must be single letter from a to z.
- **Variable Type** defines the type of variable to be used. Valid types are **Calculation Line**, **Characteristic**, **Constant**, **Factor** and **Value Detail**
- **Value Class** defines the type of value this variable represents. Valid types are **Alphanumeric**, **Money**, **Number** and **Percentage**
- **Variable Details** are additional details need to derive the variable value. These are described in the section below.

- **Value Required** indicates whether a value should exist for the variable. If a value is required and the value cannot be determined, the calculation processor will report an exception; if not, the value will be treated as zero or blank in the expression, as applicable.

Additional Variable Details

Most variable types require additional configuration details, as follows:

Calculation Line	Enter the category types and values that identify the calculation line. Multiple categories may be entered; the variable value will then be the sum of the values of all targeted lines. • **Calculation Line Category Type** is the category type of the targeted calculation line or lines • **Calculation Line Category Value** is the category value of the targeted calculation line or lines.
Characteristic	Enter the following details that identify the characteristic value: • **Calculation Characteristic Entity** is the source entity for the characteristic value. Valid entities are: **Account**, **Address**, **Asset**, **Characteristic Collection** and **Tax Role** • **Characteristic Type** is the type of characteristic from which the variable value is derived. • **Effective Date Source** is the source of the effective date to use when fetching the characteristic value. Valid values are: **Calculation Period Start Date** , **Calculation Period End Date**, **Revenue Period Start Date** and **Revenue Period End Date**
Constant	Specify the constant value to be used in the expression
Factor	Enter the following details that identify the factor value: • **Factor** is the factor from which the variable value is derived. • **Effective Date Source** is the source of the effective date to use when fetching the factor value. Valid values are: **Calculation Period Start Date**, **Calculation Period End Date**, **Revenue Period Start Date** and **Revenue Period End Date**
Value Detail	Specify the value detail type whose value is to be used in the expression

Deriving Variable Values

With the exception of factors and characteristics, the calculation processor derives variable values from details within the calculation data area maintained in memory. The following highlights important details about the logic used to derive the values for certain variable types.

Calculation Line	The calculation processor uses common logic to identify all calculation lines that are members of the target categories and return the summarized value. The same logic is used by base rules for summarizing calculation lines.
Characteristic	The following rules apply when determining the characteristic value: • If the source is **Characteristic Collection**, the processor will look only within the internal calculation data characteristic collection for the value

	• If the source is one of the valid entities, the processor will derive the entity ID from the obligation passed to the internal calculation data area. If the source is **Tax Role**, the processor assumes that the obligation is linked to a tax role. If the source is **Asset**, the processor assumes that the obligation's tax role is linked to an asset. Note that an entity of **Address** is assumed to be an asset billing address.
Factor	If the variable type is factor and the factor values vary by a characteristic type, the calculation processor assumes that the characteristic values supplied to the internal data area take precedence over the factor determine characteristic logic. If a value for the factor's characteristic type exists in the internal collection, that value will be used by the factor value processor to derive the value.

Using Conditional Expressions

The base product makes use of common logic that evaluates basic mathematical expressions. This logic can be used to compute values that form part of the calculation or to evaluate conditions to determine whether to apply calculation rules.

The following topics highlight some of the available features for expressions. Other mathematical operators and functions are supported but these are not normally used for standard revenue calculations or simple conditions.

Variables

Variable identifiers must be a character between a-z. Variable identifiers are case sensitive.

Operators

The following types of expression operators are supported.

Mathematical Operators	Operators of *, /, +, - are allowed. Examples of expressions using these operators are: • **x** = **a** + **b** + **c** where the value of **x** should equal the sum of the values **a**, **b** and **c** • **x** = **a** * **r** where **r** is a rate factor variable
Comparison Operators	Operators of =, != (not equal), <, >, <= and >= are allowed. Examples of expressions using these operators are: • **x** > **a** where the value of **x** should be greater than the value of **a** • **x** != 0 where **x** must have a non-zero value
Grouping Operators	Parentheses may be used to formulate expressions with sub-computations. An example of an expression using grouping is: • **x** = (**a** + **b**) / **c** where the value of **x** should be equal to the result of adding values **a** and **b** then dividing by the value of **c**

Functions

The following examples show the use of the most common supported functions:

Ceiling	**x** = ceiling (**a*** **b**) where **x** should equal the result of multiplying the value of **a** by the value of **b** and rounding up to the nearest whole number

Floor	**x** = floor (**a*** **b**) where **x** should equal the result of multiplying the value of **a** by the value of **b** and rounding down to the nearest whole number
Round	**x** = round (**a*** **b**) where **x** should equal the result of multiplying the value of **a** by the value of **b** and rounding the nearest whole number. A result of 1.5 would round to 2 and a result of 1.4 would round to 1.
Any	any [value in **a** | value !=''] where **a** is a value from a repeating line and the condition is true if any of the values of **a** are not blank
All	all [value in **a** | value !=''] where **a** is a value from a repeating line and the condition is true if none of the values of **a** are blank

The system provides a base calculation rule BO and a base calculation rule eligibility criteria BO that make use of conditional expressions to support a wide variety of computations and eligibility rules. These BOs make use of reusable variable definitions that are mapped to standard elements in the calculation processor data area.

FASTPATH:
Refer to *Common Variables* for information about using common variable definitions.

Common Elements

Several of the base product calculation rules use similar elements to govern how a calculation line affects a specific calculation. These elements are defined in data areas to allow reuse across rules.

The Calculation Rule Print Details DA incorporates the following elements:

- **Print Option** indicates whether to always print this calculation line, print only if the value is not zero or never to print.
- **Description On Bill** is the text to print on a bill for this calculation line.

The Calculation Rule Rounding and Precision DA incorporates the following elements:

- **Rounding Method** indicates whether to use a rounding method of ‘up’, ‘down’ or ‘nearest’ when rounding the resulting calculation value.
- **Precision** is the decimal precision to which the resulting calculation value is rounded.

The Calculation Rule Member Category List DA maps the member calculation line category type and value collection of a calculation rule. Most rules will incorporate this configuration as a means of categorizing the resulting lines.

The Calculation Rule Target Category List DA maps the target calculation line category type and value collection of a calculation rule. Rules whose processing logic is dependent on the results of other calculation rules will incorporate this configuration as a means of identifying the required lines.

There are a number of other common elements that are common to rules configuration that are not defined in data areas, as follows:

- **Create Bill Line** indicates whether the resulting calculation line needs to be captured on the associated bill.
- **Include In Total** indicates whether the resulting calculation value contributes to the overall bill total. Calculation lines of this type are regarded as having a financial impact and must have an associated distribution code.
- **Distribution Code** is the distribution code that is associated with the resulting calculation line. The logic that processes the result of the calculation will use this distribution code to record the financial effect of this calculation line.

NOTE: The distribution code associated with the calculation line may be overridden by the distribution code configured on the factor used to compute the line value.
Refer to *Factors And Distribution Codes* for more information on assigning distribution codes to specific factor values.

The base product includes common processing logic to validate these configuration elements and to utilize them in rule processing. Refer to the base product calculation rules for examples.

Using The Apply Rate To Base Value Rule

The base product provides a Calculation Rule BO that is designed handle a large range of common calculations, **C1-ApplyRateToBaseValue**.

The **Apply Rate To Base Value** BO allows a business user to define a an expression that computes a base value and a specific rate to be applied to that value. The rule produces a calculation line whose result is computed by multiplying the rate by the base value and which captures details about the rate and base value that can be used in later rules.

The following topics highlight some of the available features for this rule.

Variables

The variables to be used in the base value computation expression are defined using a common data area. Refer to *Common Variables* for more details.

Base Value Formula

The formula for computing the base value to be used in calculating this line is defined as a mathematical expression. Refer to *Using Conditional Expressions* for more details.

Rate Details

The details of the source of the rate for the computation are defined in a base data area, **C1–CalcRuleRateData** . The following section provides details of the available rate types:

Constant	The rate to be applied may be a constant, in which case the following details are required: • **Value Class** is the type of value represented by the rate. • **Constant Value** is the rate value to be used.
Factor	The rate to be applied may be a factor, in which case the following details are required: • **Value Class** is the type of value represented by the rate. • **Value Required** indicates whether it is an error if the factor value cannot be determined. • **Factor** is the factor from which the rate value is derived. • **Effective Date Source** is the source of the effective date to use when fetching the factor value. Valid values are: **Calculation Period Start Date**, **Calculation Period End Date**, **Revenue Period Start Date** and **Revenue Period End Date**
Value Detail	The rate to be applied may be a value detail, in which case the following details are required: • **Value Class** is the type of value represented by the rate. • **Value Required** indicates whether it is an error if the rate value cannot be determined. • **Value Detail Type** is the detail type within the calculation data from which the rate value is derived.

Additional Rule Configuration

The rule includes other common configuration options governing how the calculation line is treated. Refer to *Common Elements* for more details.

Defining The Rate Source

This section highlights additional considerations when configuring the rate source. For a full description of the rule logic, refer to *C1-CR-APRTBS* .

- If the rate source is a factor, the distribution code for this calculation line will be derived from the distribution code on the factor value, if applicable. You may wish to consider using a factor to define rates for the types of charges that are disbursed to different entities depending on some system attribute such as an address. For example, asset based revenue collected to fund schools may be distributed to different school districts depending on the related billing address. Rather than have a separate rule for each possible distribution code, the factor for those amounts can be configured to have a different rate value and distribution code based on district
- In addition, if the rate source is a factor, the rule retains the characteristic type and value governing the factor value on the calculation line, if applicable. Choose a factor for the rate if you want to capture that information associated bill lines or later GL distributions.
- Some calculation rules may not apply depending on whether a system attribute applies. For example, revenue levied to fund special programs such as parking control may only apply to certain locations. Rather than control this by applying eligibility criteria to the rule, you may wish to configure the rate as a factor and indicate that it is not an error if no value is found. If the attribute governing the rate does not apply, the factor value will be zero and the calculation line result will also be zero. This behavior can be used in conjunction with the ability to configure zero value not to be printed to have later processing ignore these lines. Similarly reasoning may apply to calculation lines based on value details that may or may not be present in all cases.

Defining Penalty and Interest Options

Penalty and Interest (P&I) is the commonly used term to describe a wide range of penalty, interest and fee liabilities. These charges are usually imposed by legislation.

- A penalty is a liability imposed for noncompliance with tax law. Revenue authorities can file penalties against taxpayers for "failure to file," "failure to pay," "substantial understatement," and so on
- Interest compensates the government for cost of money over time
- Fees are imposed to reimburse revenue authorities for their cost of doing business. For example, revenue authorities may incur fees for sending certified mail or for handling defective checks and will pass those fees onto the taxpayers

P&I may be triggered in any of the following ways:

- Event driven, for example, reversing a payment due to non-sufficient funds will impose a fee. These types of transactions are simply one-off adjustments that are created by an appropriate algorithm when the event occurs
- User triggered, for example, auditors may impose an inadequate record-keeping penalty their discretion. The amount may be predefined or determined by the auditor. These types of transactions are created manually or may be created as part of a business process defined by your implementation.
- Ongoing, system-generated charges based on predefined configuration rules. The remainder of this chapter focuses on these types of charges.

The Big Picture of Credit Allocation

Before explaining penalty and interest logic, another important concept called credit allocation must be introduced. The following sections provide more information.

Credit Allocation

Credit allocation is the process of taking credits within an obligation and applying business rules to allocate them against tax, penalty, interest and fees.

Credit allocation sequences specify an order to apply the credit against liability types. This is usually very specific. For example, you could set up the credit allocation sequence to allocate credits in the following order:

1. Defective check fee
2. Failure to pay penalty
3. Interest
4. Failure to pay penalty
5. Tax
6. Outsource collection agency fee

They may also differ based on the type of credit. For example,

- Withholding credit may be allocated differently than a payment
- Payment received before the due date may be allocated differently than a late payment
- Individual payments may have unique priorities dictated by a court order or overridden by a user

The following sections provide more information about credit allocation.

Credit Allocation Is Dynamic

The term "dynamic" is used to describe credit allocation because the system does not store the matching of credits to debits in the database. Rather, the system applies the credit allocation rules real-time when a request for the detailed balance of an obligation is performed.

Debt Categories and their Priorities

In order to be able to apply credits to debits at the granular level shown above, each financial transaction whose amount is a debit (amount is greater than or equal to zero) must be assigned a debt category

- For adjustments that are debits, the debt category is defined on the *adjustment type*
- For bill segments, the debt category is defined on the *obligation type*
- For payments that are debits, for example "negative" payments used to refund money via direct deposit, the base product provides an FT freeze algorithm called *C1-CFTZ-RPDC* to plug into the Account Type that populates the debt category.

Debt categories may also be linked to credit financial transactions. The base algorithm that allocates credits to debits uses the debt category on credit financial transactions as a prioritization. See *Determine Balance Details Algorithm* for more information.

The debt category priority defines the order in which credits may be applied to debits.

- The default debt category priority is defined on the *obligation type*

- If a certain type of credit adjustment, for example a withholding credit dictates a different priority than the default, define the override debt category priority on the *adjustment type*.
- A *financial transaction* could reference a debt category priority directly for unusual situations where a payment may require a special debt category priority

Determine Balance Details Algorithm

The dynamic credit allocation is performed by an algorithm plugged into the **Determine Balance Details** plug-in spot on the *obligation type*. The determine balance details algorithm is used throughout the base P&I calculation algorithm but may also be called by other processes to get a balance broken out by assessment / debt category.

The following information highlights the logic in the base algorithm *C1-PS-DB-STD*.

The algorithm may receive specific FTs in which case it will only use those FTs. Otherwise, it retrieves the FTs for the obligation.

A special plug-in spot **Retrieve FT List** on *obligation type* is called to retrieve the FTs for an obligation.

NOTE:
Base plug-in. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.

NOTE:
Debt Category / Assessment on Credits. This algorithm assumes that if a credit financial transaction references an assessment and/or a debt category that this information is used to prioritize the application of the credit, not restrict its application. This ensures that the results do not include one assessment (or debt category) with an overall debit balance and another assessment (or debt category) with an overall credit balance.

The algorithm processes credits in order from oldest to newest. For each credit found,

- If it references a debt category or assessment (group FT ID) or both, the credit is allocated first to debits with a matching debt category and / or assessment whose effective date is *on or before* the credit's effective date.
- If credit is still remaining, the credit is allocated to debits whose effective date is *on or before* the credit's effective date using the credit allocation rules for the appropriate *debt category priority* for this credit.
- If credit is still remaining, the credit is allocated to debits with a matching debt category and/or assessment whose effective date is *after* the credit's effective date.
- If credit is still remaining, the credit is allocated to debits whose effective date is *after* the credit's effective date using the credit allocation rules for the appropriate *debt category priority* for this credit.

The algorithm returns a detailed list of FTs including which credits were applied to which debits.

NOTE:
FT Details. The details of the FTs for the obligation and how the credits are allocated to the debits is not hard-coded but rather is defined in a data area supplied to the Determine Detailed Balance plug-in spot. The base algorithm uses the data area **C1-PI-MainFtInfo**. However, if your implementation requires different information to be supplied for each FT, you may introduce your own data area and an appropriate determine detailed balance algorithm to populate the details accordingly.

Credit Allocation Zones

The base product provides zones on 360 degree view (on the Financial tab) and on control central (on the Account Information and Taxpayer Information tabs) to show the results of credit allocation for the account or taxpayer's current balance.

FASTPATH:
Refer to *Credit Allocation Zone*for details.

The Big Picture of Penalty and Interest

The following sections describe topics related to penalty and interest calculations.

P&I is Calculated for an Obligation's Assessments

The system creates, stores, and maintains tax liability *assessments*. These assessments may incur P&I over time. When more than one assessment exists for an obligation, the type of assessment may control P&I rates and rules. For example, if the taxpayer is being audited, harsher penalty rates and rules are used.

As described in *Credit Allocation* the base product determine detailed balance algorithm allocates credits for an obligation across assessments such that an obligation with multiple assessments would not incur P&I on one assessment while another assessment is in credit. As a result, the P&I calculation algorithm is invoked for an obligation and it always calculates penalty and interest for all assessments for the obligation.

P&I Rules for a P&I Control Define the Calculation

For each obligation type where ongoing, system generated penalty and interest rules apply, you must create a P&I control with its collection of P&I Rules that define the distinct penalty, interest charge or fee.

Each P&I rule controls the actual calculation and allows a user to configure information such as the basis of the charge, the rate used to apply the charge and other controls such as whether there is a maximum amount that the overall calculations may not exceed.

P&I rules to apply to an obligation or configuration related to existing rules may change over time, based on legislation changes or business rule changes. When this occurs, a new P&I control with its new set of rules must be created. The obligation type includes an effective dated link to the P&I controls that govern its P&I charges.

FASTPATH:
Refer to *Apply P&I Rules for Each Time Period* for information about how P&I rule calculations are applied during the Calculate P&I process.

FASTPATH:
Refer to *Designing Your P&I Control and P&I Rules* for information about designing your rules.

P&I Calculation Algorithm is the Engine

An algorithm plugged into the **P&I Calculation** plug-in spot on the *obligation type* is responsible for calculating / forecasting penalty and interest for an obligation.

NOTE:
Configuration Requirements. The base product P&I calculation algorithm relies on many other algorithms plugged into obligation type for it to work properly. In addition, it expects effective P&I controls with at least one P&I rule to exist for the obligation type. Refer to *Setting Up Penalty and Interest* for more information.

Calculation Overview

The following sections highlight the logic in the base algorithm *C1-PI-CALC*. It has been designed to call many other algorithm plug-in spots to perform key steps in the calculation. The goal is for your implementation to use the base product P&I calculation algorithm and implement your organizations specific rules by plugging in appropriate algorithms in the various plug-in spots called by the base algorithm. However if the logic in the base algorithm does not satisfy your business requirements, you may introduce your own, using this algorithm as a sample.

At a high level, the base algorithm follows these steps

- Determine whether or not this obligation is *eligible* for P&I calculations.
- For eligible obligations
  - Determine *discrete time periods* and perform any other pre-processing needed for the calculations.
  - For each time period, apply the P&I rules. Calculations are performed in memory.
  - Post processing, including canceling and creating the P&I adjustments if the algorithm is called with a P&I Calculate / Update action.
- Update the obligation's calculate to date

The algorithm may be called with an action of **P&I Calculate/Update, P&I Standard Forecast** or **P&I Detailed Forecast**. When calling the algorithm with a "forecast" action, the calling program may provide specific FTs in which case it will only use those FTs. Otherwise, it retrieves the FTs for the obligation.

A special plug-in spot **Retrieve FT List** on *obligation type* is called to retrieve the FTs for an obligation.

NOTE:
Base plug-in. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.

Financial Transaction Details

The list of the FTs for the obligation includes detail for each FT that is needed by the penalty and interest calculation. This list of details is not hard-coded but rather is defined in a data area supplied to the P&I Calculation plug-in spot and to the Retrieve FT List plug-in spot. The base algorithm uses the data area **C1-PI-MainFtInfo**.

Besides the details of the FTs passed back and forth to services that invoke this plug-in spot, the base P&I calculation algorithm uses data internally that must be passed to the various plug-in spots it invokes. The base algorithms use the data area **C1-PI-InternalCalculationInfo**. The data area has the following information:

- A calculation periods collection. This includes start and end dates along with the P&I rules in effect for those dates.
- Existing FT collection. This includes all the FTs that exist for the obligation and is used to compare to the P&I charges being calculated in the current execution to determine if any changes are needed to historical periods.
- Running charges collection. This is the list of charges that are populated by the P&I rule algorithms that calculate the charges. The amounts in this collection are captured with detailed precision to minimize ongoing rounding discrepancies.
- Working financial transaction collection. This collection represents the new list of FTs that are a result of the current P&I calculation. When the service is invoked with an "update" action, this is the list that will be used when creating the actual FTs at the end of the process. If the service is invoked with a "forecast" action, this is the list of FTs that is used

to pass out to the calling program. The definition of this list matches the definition of the list of FTs in the P&I Main FT Info data area. This list also includes a collection of detailed P&I calculation info that may be populated by P&I rule algorithms when invoked with a "forecast" action. Refer to *P&I Calculation Details* for more information.

- Waiver information collection. This list contains detailed information for any active waiver that exists for the obligation.

NOTE:
If your implementation requires additional information to be passed around to the various P&I calculation plug-in spots that support the internal P&I information, you may extend the base data area to define the additional elements needed. Alternatively, you may introduce your own data area. The appropriate decision for your implementation will depend on the type of additional information needed. For example, if your implementation requires some addition information about the taxpayer or the obligation to help determine rule eligibility, for example, then extending the base data area is the correct solution. However, if you require different or additional data within one of the existing groups in the base data area, it may be more correct to introduce a new custom data area.

Eligibility

There are some types of taxpayers that may be exempt from penalty and interest. Examples of such taxpayers include other government agencies and non-profit organizations.

The base product provides an *obligation type* plug-in spot **P&I Eligibility** where an implementation may plug in algorithms that check an obligation's eligibility for penalty and interest. The P&I calculation algorithm provided with the base product calls the P&I eligibility plug-ins prior to performing any penalty or interest calculations. If the algorithms indicate that the obligation is ineligible, no calculations are performed.

NOTE:
Base plug-in. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.

Recalculate Every Time

Various events may cause the system to recalculate historic penalty and interest:

- Back-dated payment
- Waive existing penalty or interest
- Change to the obligation's override filing due date
- Canceling an assessment

For normal requests from the system to "bring P&I up to date", where historical calculations are not affected, the system still recalculates the P&I from the beginning every time.

One reason for this logic is to ensure that P&I is always accurate. It could be that something has changed in the system that does affect historical calculations and a request to recalculate historical P&I was not performed. The next time P&I runs, recalculating from the beginning ensures that the latest calculation reflects the correct charge.

Another important reason to recalculate P&I from the beginning every time P&I is brought up to date is to avoid rounding issues that may occur over time.

Consider the following example.

- A monthly penalty amount for a delinquent taxpayer is 34.3444
- If the system calculates, rounds and posts, each month ignoring the running total, the penalty after 2 months is
  - Month 1 calculation: 34.3444, rounded to 34.34
  - Month 2 calculation: 34.3444, rounded to 34.34

    - Total: 68.68
- If instead the system keeps track of the running total and creates the adjustment based on the latest running total, the calculation is as follows:
    - Month 1 calculation: 34.3444, rounded to 34.34
    - Month 2 calculation: 34.3444 + 34.3444 = 68.6888 less amount already posted (34.34): 34.3488, rounded to 34.35
    - Total: 68.69

Over time these rounding differences add up. To avoid that the system calculates from the beginning every time P&I is calculated and the running total is kept throughout the calculations.

Calculate For Discrete Time Periods

There are many discrete time periods for which P&I must be calculated:

- Every date for which a credit financial transaction exists (because the calculations are based on an outstanding balance, which is affected by each credit).
- Any effective dated change in the P&I Control linked to the obligation
- Any accrual day of the month. This is necessary if you have a monthly charge that should accrue on a given day of the month and the charge includes other charges in its calculation basis. For example, if penalty accrues on the first day of the month and includes interest in its calculation basis, you must stop and calculate interest and then the penalty on the accrual day of the month so that your calculation basis is accurate.
- Effective dates of any active waivers. If any assessments for the obligation have a waiver that is effective dated, the system should stop and calculated up to that date and then after that date for the waived amount to be accurate.
- More… Your implementation may identify other events in the system that affect P&I calculations. For example, if a bankruptcy is logged in the system as a case, P&I should be calculated up to the bankruptcy start date and then skipped until the bankruptcy end date

The base product P&I calculation algorithm relies on *P&I pre-processing* algorithms to build this list of dates. Once the list is built, the P&I calculation algorithm *applies P&I rules for each time period*.

Pre-Processing

When preparing to calculate penalty and interest for an obligation, the P&I calculation plug-in must gather some information that is needed throughout the processing. For example:

- The P&I controls and P&I rules in effect for the full calculation period.
- Information about waivers that are in effect for the obligation's assessments.
- Identifying the dates during the full P&I calculation period that affect the calculation such that the process should stop and calculate P&I up to that date.
- Determining whether some P&I rules are not applicable for an obligation or one of its assessments. For example, a failure to file penalty is only applicable for obligations where the taxpayer did not file the return on time; and perhaps only applies to the original return and not any amendments.
- Determining whether some P&I rules are only applicable during certain date ranges. For example, if a taxpayer has extended their filing date, perhaps the failure to file penalty is only applicable after the extended filing date but the failure to pay penalty is applicable starting from the original payment due date.

The system provides two plug-in spots to use for building up all this information.

- An *obligation type* plug-in spot **P&I pre-processing** is used to define dates and retrieve and configure information that is related to all P&I rules for the obligation type. For example, dates are built for all credit financial transactions for the obligation.

NOTE:
Base plug-in. Click *here* to see the algorithm types available for this system event.

- A P&I Rule plug-in spot **Rule Pre-processing** is used to define dates and retrieve and configure information that is specific to a given P&I rule. For example, a rule that is for the Failure to File penalty has a pre-processing algorithm to determine if the taxpayer failed to file on time.

NOTE:
Base plug-in. Click *here* to see the algorithm types available for this system event.

These algorithms populate information in the P&I Internal Calculation Info data area (**C1-PI-InternalCalculationInfo**) for use by subsequent algorithms in the process.

The following sections highlight additional details related to the responsibility of pre-processing algorithms.

Build P&I Controls and Call Rule Pre-processing Plug-ins

The base product provides an algorithm that should be the first pre-processing algorithm plugged in on your obligation types. It builds the initial date ranges for the P&I calculation, builds the list of P&I Controls and P&I Rules that are in effect for the full date range and, for each P&I rule, it calls the Rule pre-processing algorithms, if any exist.

For more information, refer to the algorithm type *C1-PI-PR-PIC*.

Marking Rules as Not Applicable Based on Periods

Although the initial pre-processing algorithm builds a list of all the P&I rules that are in effect for the full P&I calculation period for this obligation, there may be P&I rules that don't apply for the obligation or rules that should only apply for certain time periods. For example:

- The failure to file penalty should only apply if the taxpayer did not file the tax return by the due date.
- A collection fee that is based on the outstanding balance of the tax should only apply if the taxpayer was selected for overdue processing and should only apply to the time period on or after the creation date of the overdue process
- For a taxpayer that filed for bankruptcy, P&I Rules should not be applied during specific bankruptcy dates.

To mark P&I rules as not applicable for certain time periods (or for all the time periods built for the calculations) P&I pre-processing algorithms on the obligation type or rule pre-processing algorithms on the P&I rule should find the P&I rule in the calculation periods collection in the P&I - Internal Calculation Info data area and mark it as not applicable. Refer to the base product rule pre-processing algorithm Determine Failure to File Applicability *C1-PI-RA-DFF* for an example of this type of logic.

Marking Rules as Not Applicable for One or More Assessments

There may be P&I rules that only apply to a subset of the assessments for an obligation for one or more time periods. For example:

- The failure to file penalty may apply only to the original assessment and not to amendments
- Different failure to pay penalty rules may exist for the original assessment and for amendments
- For a taxpayer that filed for bankruptcy, P&I Rules should not be applied during specific bankruptcy dates.

To mark P&I rules as only applicable for certain assessments in a given time period, P&I pre-processing algorithms on the obligation type or rule pre-processing algorithms on the P&I rule should find the P&I rule in the calculation periods collection in the P&I - Internal Calculation Info data area and indicate the assessments that are not applicable. Refer to the

base product rule pre-processing algorithm Determine Failure to File Applicability *C1-PI-RA-DFF* for an example of this type of logic.

Determine if Active Waivers Exist

The base product provides a plug-in *C1-PI-PR-WVR* to retrieve details about waivers that exist for any of the obligation's assessments. This information is used by any subsequent algorithm that may need information about the waivers.

Apply P&I Rules for Each Time Period

Once the discrete time periods for P&I calculation are determined, the base P&I calculation algorithm needs to determine the balance by debt category for the time period in question and call the P&I rule algorithms.

Balance By Debt Category During P&I Calculation

To calculate the balance by debt category, *Determine Balance Details* algorithm is used. However, because the P&I calculation algorithm is recalculating P&I from the beginning every time and needs the balance recalculated for each period, it needs to be explicit about which financial transactions are used in the balance calculation. For example:

- When calculating the balance as of a given date, credits effective on that date should be ignored because the system is trying to find the balance as of that date prior to applying the credit. However all debits on or before the given date should be considered.
- Existing P&I transactions should not be factored into the calculation, only the ones created by this P&I run.
- Existing *waiver* transactions should not be factored into the calculation. However, waiver transactions corresponding to the P&I transactions calculated in the current run must be considered.

To ensure that the appropriate financial transactions are used to calculate the balance for each time period, a special plug-in spot on the *obligation type* is used: **P&I Prepare Periodic Balance**. This plug-in is responsible for calling the **Determine Detailed Balance** plug-in passing the appropriate financial transactions. Note that this plug-in spot receives an indication as to whether it's the **Initial**, **Interim** or **Final** call to get the balance details. This information allows the plug-in to do extra steps at the beginning or at the end.

NOTE:
Base plug-in. Click *here* to see the detailed description for the base algorithm type available for this system event and for more information about the behavior of this plug-in spot.

NOTE:
Adjustment Category. The base plug-in for the Prepare Periodic Balance relies on the adjustment type category values of **Penalty and Interest** and **Waiver** to identify adjustments that should not be factored in during the **Initial** call to the algorithm. Care should be taken to only configure *adjustment types* with the Penalty and Interest category if they are adjustment types created through the P&I rules driven P&I calculation.

Once the balance is available for each time period, for each assessment linked to the obligation, the P&I calculation algorithm invokes the rule processing algorithm for each P&I rule in effect for the obligation type's P&I control during this time period.

P&I Rules Calculate the Charge

The actual calculation of each P&I rule's charge is done in the **Rule Processing** algorithm plugged into the business object for the P&I rule. Configuration that the rule processing algorithm needs to successfully calculate the charge for each period is often captured on the P&I rule when defining it.

All logic related to calculating the charge for the P&I rule, including determining if and how much of the charge is waived, must be done by a Rule Processing algorithm.

The following sections describe the responsibilities of algorithms of this type.

NOTE:
Base plug-in. Click *here* to see the algorithm types available for this system event.

Calculation Basis

In many cases the P&I charges are calculated as a percentage of outstanding debt, referred to as the calculation basis. The calculation basis may simply be the amount of unpaid tax or it may be the amount of unpaid tax plus other unpaid charges, such as unpaid penalty or unpaid interest.

The calculation basis can change over time based on changes to the legislation and recalculation of historic info should use the calculation basis in effect at the time of the charge. A change in calculation basis requires a new P&I control and a corresponding new set of rules to be created and linked to the obligation type for the correct effective date.

The base product P&I rule business objects allow the user setting up the P&I rule to configure one or more debt categories that are used as the calculation basis. The balance by debt category is calculated prior to the call to the P&I rules and is passed in using the working FT collection.

Adjustment / Debt Category Configuration

When the penalty or interest charge is posted to the system to affect the taxpayer's balance, an adjustment is used. The adjustment type is defined on the P&I rule.

Each penalty and interest charge is identified by a debt category and this debt category is important for P&I calculation. Because adjustment type references a debt category, the P&I rules supplied with the base product do not capture the debt category explicitly. They derive the penalty or interest rule's debt category from its adjustment type.

NOTE:
No Duplication of Debt Categories. The base algorithms for calculating P&I expect that no two P&I rules for a P&I control refer to the same debt category (via its adjustment type).

Calculating New Charges and Canceling Incorrect Charges

The Rule Processing algorithm is responsible for calculating the appropriate charge for the current time period. However, because P&I is recalculated from the beginning every time P&I is called for an obligation, it's possible for the calculated charge for this time period already exists in the database.

Once the new charge is calculated and added to the running FT collection, the algorithm should perform logic to align existing and running charges and update the working FT collection appropriately. The base product logic does the following:

- When the current calculation matches the existing P&I charge in the database, the existing charge is added to the working FT collection.
- When the current calculation is more than the existing P&I charge in the database, the existing charge is included in the working FT collection and a new entry for the incremental increase is added to the collection.
- When the current calculation is less than the existing P&I charge in the database, the existing charge is marked to cancel in the working FT collection and a new charge for the new amount is added to the collection. In other words, the base algorithms do not create negative P&I charges.

There are situations where a P&I charge is calculated and after that charge was created, something occurs to cause this P&I charge to no longer be applicable for the taxpayer or for the time period or for the assessment. For example, perhaps a backdated payment is entered and the calculation basis for this time period is now zero. In this case although no new calculation occurs, existing charges must still be marked to cancel. To do this, the algorithm should perform the logic to

align existing and running charges whenever it detects that no charge is required. In this case, the running charges will have no entries for the time period / assessment so any existing charges get marked to cancel in the working FT collection.

Use Rates To Define the Penalty or Interest Rate

There are two ways that the actual percentage may be applied to the calculation basis: using a rate schedule or using a rate factor.

- Use a rate factor if the calculation is a simple percentage applied to the calculation basis. The rate factor can contain an effective dated list of percentage rates. Using this method, the appropriate rate factor is defined when configuring the P&I rule and the rule processing algorithm is responsible for retrieving the rate factor value and performing the calculation.
- Use a rate schedule if the calculation is more complicated and you would like to take advantage of the calculation logic built into the various types of rate components for a rate. For example, if your charge has a maximum amount that can be charged (for example, a penalty that is 2.5% of the outstanding tax up to a maximum 25% of the outstanding tax), this can be configured easily using the **Maximum** rate component type. Using this method requires the rule processing algorithm to set up all the amounts that the rate schedule requires to successfully apply the rate. For the current example, it must supply the outstanding tax amount that is the basis of calculation and the maximum amount allowed. Then it should call the rate application service. The P&I rule defines the rate schedule, rate quantity identifier (RQI) for passing in the calculation basis and any other information needed to supply to the rate application service. In this example, the Not to Exceed percentage and an RQI for passing to rates the calculated Not to Exceed amount.

NOTE:
Rate Schedule vs. Rate Factor. The simple percentage calculation may also be performed using rates. However, it requires an administrative user to configure a rate schedule, rate version and a rate component in addition to the rate factor. Designing the algorithm to apply the rate factor directly saves the need for extraneous rates configuration.

Waiver Processing

As charges are being calculated for each period, rule processing algorithms must also determine whether or not these charges should be waived and enter appropriate entries in the working FT collection to represent the waived amounts.

The base product provides a separate algorithm for each *supported waiver type* in the system that should be plugged into any P&I rule whose charge may be waived. Each algorithm does the following:

- Determine if there is a waiver in effect for the current debt category / assessment. This information is in the Waiver information collection in the P&I - Internal Calculation Info data area assuming that the pre-processing algorithm to *Determine if Active Waivers Exist* is plugged in.
- The algorithm then does the appropriate logic to determine whether the amount should be waived based on the logic for the type of waiver.
- If the amount should be waived, an entry is added to the working FT collection. This ensures that subsequent balance calculations for this debt category do not include the amount that is waived.

No adjustments are created or canceled at this time. Post processing algorithms are responsible for that logic.

Sample P&I Rule Processing Logic

The following points highlight typical processing for a P&I rule processing algorithm that calculates a penalty or interest charge.

- The algorithm should first check whether the charge is applicable for the current period and for the current assessment. This information is populated in the base internalPenaltyAndInterestDataArea by a P&I pre-processing algorithm that may determine that this charge is only applicable for certain time periods and / or for certain assessments. If it's not applicable, the algorithm checks to see if existing charges need to be cleaned up using the 'align existing and running charges' logic (see below).
- If the charge is applicable, then the algorithm should apply the charge as per the business rules.

- If the P&I calculation is called with the P&I Detailed Forecast action, the algorithm should populate appropriate *calculation details* in the *calculation info* collection.
- The algorithm should include a step to *Align Existing and Running Charges*, which should compare the existing charges in the database (from the previous P&I update) to the current running P&I collection.
  - If the total of the current running charges is more than the existing charges a new charge should be added to the working FT collection for the difference.
  - If the total of the current running charges is less than the existing charges, the base recommendation is for the algorithm to mark the appropriate existing charges as "canceled" in the working FT collection by populating the Cancel Reason from the P&I Rule and to add a new entry for the new smaller amount.
  - If the P&I calculation is called with the P&I Detailed Forecast action, the calculation details from the running charges should be added to the working FT collection.

NOTE:
No updates. The rules processing algorithms provided in the base product do not do any updates to the database for new charges or cancellation of existing charges. These algorithms simply update the internal P&I information with new charges calculated and indicating any charge that should be canceled. Post processing algorithms are responsible for creating / cancelling financial transactions if Calculate P&I is called with the Calculate / Update action.

NOTE:
The base algorithms rely on data provided in the base P&I Main FT Info data area (**C1-PI-MainFtInfo**) and the base P&I internal calculation info data area (**C1-PI-InternalCalculationInfo**).

Post Processing

The system provides an *obligation type* plug-in spot **P&I post-processing** to perform any steps that need to occur at the end of all the P&I calculations.

In the base P&I calculations, post processing algorithms are used to do the actual creation and cancellations of penalty and interest adjustment and waiver adjustments in the system as determined by the rule processing algorithms. This is only applicable when the P&I algorithm is called with a **P&I Calculate / Update** action.

NOTE:
Base plug-in. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.

Final Updates

When penalty and interest is updated for an obligation, it is updated with a Calculation Through Date. This information is captured so that users reviewing the detailed balance for an obligation knows how recently the P&I calculation has occurred.

The balance details are calculated one more time to produce the final results for output.

Forecasting Penalty and Interest

Your implementation may include business processes that require forecasting of an obligation's balance to a current or future date without posting the P&I transactions:

- Sending a bill may include amount to pay if late, for example:

    - If you pay by January 1, please pay $2000
    - If you pay by January 15, please pay $2020
    - Etc,
- Sending a collection notice may include "please pay X amount by Y date" where the X amount is the forecasted balance on that date, which P&I included.
- If a payment is received at an account or taxpayer level where the taxpayer has several unpaid obligations, the payment algorithm that determines how to distribute the amount across obligations. When determining how much to direct to each obligation, the algorithm should forecast P&I to the payment event's effective date so that an accurate picture of the balance of each obligation is known.
- *Proposing scheduled payments* for a pay plan should include logic to forecast P&I to the future so that the scheduled payments cover P&I charges that will continue to accrue

The P&I calculation algorithm may be called to forecast. When forecasting, the algorithm perform all the same calculations, but does not store or cancel any adjustments to affect the obligation's balance.

> **FASTPATH:**
> The credit allocation zones on 360 degree view (on the Financial tab) and on control central (on the Account Information and Taxpayer Information tabs) allow a user to forecast P&I for a current or future date. Refer to *Credit Allocation Zone* for more details.

A service that calls P&I calculation with a "forecast" action may optionally provide financial transactions to use. If financial transactions are not provided, the algorithm retrieves the FTs currently linked to the obligation and forecasts P&I to the input date. If FTs are provided, the algorithm uses them in the P&I calculations. Supplying FTs allows a calling program to forecast the P&I with a "what if" scenario, for example "what if the taxpayer makes a payment on date X?". This is useful when proposing scheduled payments for a payment plan.

P&I Calculation Details

The product provides a page where a user can view the details of the penalty and interest calculation for a given obligation. However, because the calculation of each penalty or interest transaction is governed by the algorithm linked the P&I rule, the algorithm is responsible for supplying the details shown on this page. this section provides more information on how to configure the system to provide P&I details.

> **FASTPATH:**
> Refer to *Detailed P&I View* for more information about the page and its behavior.

Details Captured for Each P&I Transaction

The working FT section of the internal P&I data area used during the penalty and interest calculation include a collection of one or more *calculation info* strings that can be populated with the details related to the calculation of the charge. This information is passed out to the calling program using the main P&I data area.

The P&I Rules Define the Details

Because each P&I charge is calculated by an algorithm, it's the algorithm's responsibility to provide the details of the calculation.

The base product algorithms populate the detail based on their specific calculations. Click *here* to see the algorithm types provided by the base product and view their description details for more information.

If your implementation defines custom P&I rule algorithm to support your specific calculations and your users may wish to view the details of the P&I calculation using the Detailed P&I View page, you should populate one or more *calculation info* strings in the P&I data areas appropriately.

Details Provided During Forecast Only

The base product does not store the calculation details with the adjustments created for penalty and interest. The details are only provided by the base product algorithms when the Calculate P&I service is called with the **P&I Detailed Forecast** action.

P&I and Cash Accounting

It is common for tax authority to practice cash accounting for certain situations. For example, perhaps your implementation is a state revenue agency collects sales tax revenue on behalf of counties in your state. You may only distribute the revenue to the counties after the payment is made and not at the time of posting the assessment.

> **FASTPATH:**
> Refer to *Payables Cash Accounting* for general information about cash accounting functionality.

When dynamic credit allocation is practiced, where amounts are directed specifically to tax, penalty, interest and fees in a specific order, the allocation of credits to the various debt categories must be performed before any updates to the general ledger can be made as a result of cash accounting.

The base product provides an *obligation type* plug-in spot **Cash Accounting True Up** where an implementation may plug-in the algorithm that makes all necessary adjustments to the general ledger to transfer amounts from "holding" general ledger accounts to true payable accounts.

This algorithm is executed by the Calculate P&I service provided with the product when invoked with an "update" action. The service determines if the obligation type supports the P&I plug-in and if so, executes it. If the obligation type has a Cash Accounting True Up algorithm, it is then called, regardless of whether the obligation type supports P&I.

It means that any update to the system that impacts a taxpayer's financials where either P&I or Cash Accounting may be affected, the Calculate P&I service should be called. The business service is **C1-CalculatePenaltyAndInterest**.

> **NOTE:**
> **Base plug-ins**. Click *here* to see the algorithm types available for this system event and for more information about the behavior of this plug-in spot.

When Is P&I Updated?

There is no hard coded logic in the system to invoke the penalty and interest calculation. All requests to bring penalty and interest up to date are executed using plug-in logic. The base product provides logic to forecast P&I or bring P&I up to date when certain events occur. Your implementation may introduce new events that should cause P&I to be recalculated.

The following events in the system cause P&I to be brought up to date

- When a *tax form* posts or is reversed, transferred or adjusted, using an appropriate Form Rule. Basically any state transition of a form that causes adjustments to be created should include a rule to bring P&I up to date.
- When a payment is frozen or canceled, assuming that an appropriate plug-in is entered on the *account type*
- When certain types of adjustments are frozen or canceled, assuming that an appropriate plug-in is entered on the *adjustment type*. Refer to *Adjustments and Updating P&I* for guidelines related to configuring adjustments to update penalty and interest.
- When the *effective date* of a frozen payment is changed

- If your *obligation* is governed by the **C1-FilingPeriodObligation** business object, a post processing plug-in recalculates P&I if the override due date changes.
- When a *waiver* is activated or canceled
- An *overdue event* algorithm to calculate P&I is provided

A user may also request that P&I is brought up to date using the Credit Allocation zones on the *360 Degree View - Financial Information* portal and on Control Central on both the *Account Information* portal and the *Taxpayer Information* portal.

C1-CALPI - Bring P&I Up to Date

Besides the events in the system that may cause a recalculation of P&I, the system also provides a background process *C1-CALPI* to periodically bring P&I up to date for all obligations eligible for P&I processing. This is used as a "fall back" step to cater for obligations that may not be getting actively reviewed by another process.

The background process looks for all non-canceled non-closed obligations and invokes the calculate P&I service, which then invokes the appropriate P&I calculation algorithm for the obligation, if one is plugged in on the obligation type. Because it is executed for all the obligations, it should be scheduled infrequently, for example once a month.

Adjustments and Updating P&I

The base product provides adjustment type plug-ins to bring P&I up to date when an adjustment is frozen or canceled. Implementers should carefully consider which adjustment types require these algorithms.

- Certain adjustments are created from the P&I calculation, for example the penalty and interest charges and waiver charges. For these types of adjustments, the algorithms to recalculate penalty and interest when freezing or cancelling should not be plugged in on the adjustment type.
- Certain adjustments where P&I should be brought up to date are part of a business scenario where several adjustments are created for various charges. For example, when a tax form is processed, adjustments may be created for the tax assessment due and for the withholding credit and for refundable tax credits. The system should wait until all the adjustments are created before bringing P&I up to date, otherwise a lot of unnecessary calculations will occur. These types of adjustments should not reference the algorithms to recalculate penalty and interest when the adjustment freezes or is canceled.

The algorithms should be used for adjustments like manual penalties where penalty and interest is affected and the adjustment is not created as part of a greater process. The assumption is that an adjustment type would either have both algorithms or neither algorithm. In other words, if the creation of a given kind of adjustment affects penalty and interest, then cancelling that type of an adjustment should also affect penalty and interest.

Also note that when an assessment adjustment is canceled, all related penalty and interest adjustments should be canceled as well. The P&I calculation does not cater for cleaning up penalty and interest for canceled assessments.

NOTE:
Special service. When cancelling an assessment adjustment, the business service **C1-CancelAssessmentAdj** should be used. This will clean up penalty and interest adjustments for the canceled assessment.

Waivers

Waivers provide the ability to forgive or waive certain penalties, interest or fees. Sometimes waivers are referred to as abatements. You can waive a full amount or a partial amount (flat rates or percentages) or waive charges during a certain time period.

What is Waived?

A waiver is created for a specific assessment and a specific debt category for that assessment. For example, interest for the obligation's original assessment may be waived or the failure to pay penalty for the amendment may be waived.

Supported Types of Waivers

The base product provides business objects and appropriate algorithms out of the box that support the following types of waivers:

- One-time waivers. Waivers of this type are used to waive charges for a given assessment / debt category up to a specific amount.
- Effective dated waivers. Waivers of this type are used to waive charges for a given assessment / debt category that occur on or after a given start date. Waiver of this type may optionally specify an end date to waive charges for a specific period.
- Ongoing waivers. Waivers of this type are used to waive all charges for a given assessment / debt category.

Waivers vs. Exemption

A waiver is treated differently from an exemption in the base product algorithms. The assumption is that when an obligation is exempt from penalty and interest, calculations should not even be performed. Refer to *Eligibility* for more information.

For a waiver, the base product calculates the penalty or interest charge as normal and then creates appropriate waiver adjustments to offset the waived amounts. This allows an implementation to keep track of the amount of penalty and interest that has been waived.

Waivers and P&I Calculation

In order for waivers to affect P&I calculation, appropriate algorithms must be plugged in. The following points highlight the algorithms that are required to support waiver functionality:

- Information about existing waivers should be retrieved by a P&I pre-processing algorithm for use by the P&I rule processing algorithms. Refer to *Determine if Active Waivers Exist* for more information.
- If your implementation supports effective date waivers, the P&I pre-processing algorithm **C1-PI-PR-WDT** Adjust Calculation Periods for Effective Waivers should be plugged into any obligation type that supports P&I processing with waivers.
- Every P&I rule that calculates a charge that may be waived should include appropriate *rule processing waiver* algorithms plugged into the P&I Rule BO to adjust calculated charges in the internal P&I information data area based on existing waivers. Algorithms are provided to support one-time waivers, ongoing waivers and effective dated waivers. The base product P&I rule BOs are configured with the waiver algorithms already plugged in.
- *P&I post processing* algorithms **C1-PI-PS-WV1** Process One-time Waivers, **C1-PI-PS-WV2** Process Ongoing Waivers and **C1-PI-PS-WV3** Process Effective Dated Waivers are provide to create or cancel waiver financial transactions when calling P&I with an "update" action. These algorithms should be plugged into any obligation type that supports P&I processing for waivers.

NOTE:
No excess waiver. The base product algorithms assume that when a waived penalty or interest charge is later modified to cause the original amount to be less than the waiver, the waiver amount must also be adjusted accordingly. A waiver credit should never be in excess of the debt it's waiving.

Designing Your Waiver Options

The base product provides admin and transaction business object pairs for one-time waivers (**C1-WaiverTypeOneTime** and **C1-OneTimeWaiver**), ongoing waivers (**C1-WaiverTypeOngoing** and **C1-OngoingWaiver**) and effective dated waivers (**C1-WaiverTypeEffectiveDated** and **C1-EffectiveDatedWaiver**). Your implementation can add additional business rules to these BOs as required. If your implementation has waiver rules that aren't satisfied by one of the above business objects, you may create your own using the above as samples.

Designing Your P&I Control and P&I Rules

The base product provides a BO for P&I Control **C1-StandardPIControl**. Your implementation can add additional business rules to this BO as required. If your implementation has radically different requirements for your P&I controls, you can create a different business objects with their own business rules.

The base product supplies two BOs for P&I Rules.

- **C1-MonthlyChargePIRule** - this BO includes an algorithm that calculates the monthly charge with a Not to Exceed limit, using a rate schedule.
- **C1-SimpleCalculationPIRule** - this BO includes an algorithm that calculates a simple charge applying a rate factor to the outstanding calculation basis amount.

Your implementation can define add additional business rules to these BOs as required. If your implementation's P&I rules are not satisfied by one of the above business objects, you may create your own using the above as samples. The following points highlight the important configuration for this business object:

- Develop the appropriate rule processing algorithm to calculate the charge correctly.
- If *waivers* are applicable for the P&I rule's debt category, be sure to plug in appropriate rule processing algorithms to handle waiving the P&I rule's charge
- For any configuration required by the rule processing algorithm, consider whether it should be defined when configuring the P&I rule by a business user. If so, include the appropriate elements in the P&I rule business object's schema.
- Determine whether any P&I Rule *Pre-processing* algorithms are applicable for this type of rule.

Setting Up Penalty and Interest Options

The topics in this section describe how to set up the system to enable penalty and interest calculations.

Setting Up Account Types

In order for penalty and interest to be brought up to date when a payment is frozen or canceled, configure the account types with the following algorithms:

- System Event: **Payment Freeze**, Algorithm **C1-PI-PAYFRZ**
- System Event: **Payment Cancellation**, Algorithm **C1-PI-PAYCAN**

Setting Up Debt Categories

Define *debt categories* for the following:

- One for each separate penalty or interest charge that is calculated by a system P&I rule.

- One for any other type of debt that is not calculated by P&I calculations, but is used in the calculation basis for one of the P&I rules.
- One for any other category of debts. For example, overpayments. When an obligation is overpaid, at some point the *overpayment* amount is reduced by one or more methods, such as minimum amount write down, carry forward to a future obligation, refund, etc. The adjustments created to reduce an overpayment are debits and therefore require a debt category. The suggestion is to create a special "Overpayment" debt category for these types of debts.

Setting Up Debt Category Priorities

Define appropriate as *debt category priorities* required by your implementation's business rules. Refer to *Debt Categories and their Priorities* for more information.

Setting Up Adjustment Types

Adjustment types are needed for posting P&I charges.

- A separate adjustment type must be created for each debt category that is part of the P&I calculation.
- Each adjustment type created should use the **Penalty & Interest** adjustment type category.

Adjustment types are needed for posting waivers.

- A separate adjustment types must be created for each debt category whose P&I charges may get waived.
- Each adjustment type should refer to the **Waiver** adjustment type category.
- Each adjustment type should define the **C1-WAIVR** characteristic type as a valid template characteristic. This is used to reference the waiver that caused the adjustment to be created.

An adjustment type is needed for transferring cash accounting amounts from a "holding" general ledger account to the true "payable" account.

For any adjustment that is a manual penalty and should cause P&I to be recalculated, configure an adjustment freeze algorithm and corresponding adjustment cancellation algorithms to bring P&I up to date. The product provides the adjustment freeze algorithm *C1-ADF-CALPI* and the adjustment cancellation algorithm *C1-ADC-CALPI* to use.

Setting Up Adjustment Cancel Reasons

Define appropriate *adjustment cancel reasons* to use when cancelling P&I adjustments and based on recalculation and cancel reasons to use when cancelling waiver adjustments.

Setting Up Rate Factors

Create appropriate *rate factors* that define the percentage to use when calculating your various P&I charges.

- If you are defining P&I rules using the base BO **C1-SimpleCalculationPIRule**, the P&I rule requires a rate factor to use when applying the charge.
- If you are defining P&I rules using the base BO **C1-MonthlyChargePIRule**, the P&I rule expects to use a Rate Schedule. You may choose to define rate factors for configuring the charges used in the specific rate components defined in this rate schedule.

Setting Up Rate Quantity Indicators

Create appropriate *RQIs* required for your P&I rules. If you are defining P&I rules using the base BO **C1-MonthlyChargePIRule**, you need an RQI for the following information to pass into rate application:

- The calculation basis amount
- The not to exceed amount

Setting Up Rate Schedules

Create appropriate *rate schedules* and their components to calculate the charges appropriately.

If you are defining P&I rules using the base BO **C1-MonthlyChargePIRule**, you need a rate schedule with rate components that calculate the charge by applying an appropriate percentage to the calculation basis passed in using the RQI defined above. If a Not to Exceed amount is applicable, there should also be a maximum rate component that adjusts the calculated charge based on the Not to Exceed amount.

The following are some additional notes related to the setup of this rate:

- The charges are not expected to prorate for short or long periods. To accomplish this, an appropriate frequency must be configured for the rate schedule. Because the P&I rule is expecting to apply monthly charges, the frequency may be set to have 1 period annually and 365 days for the minimum and maximum offset. Refer to the demonstration data for an example.
- The individual rate components should all be set as follows:
  - FCPO is checked
  - The Result Type is **Charge**
  - Rounding Precision is set to the maximum allowed to ensure that the maximum calculation precision is returned.
  - Create Bill Line is checked
  - FCPO Retention Rule is set to **Retain amount on bill line**
  - To support *calculation details*, appropriate description on bill values should be populated and the Print flag checked.

Setting Up P&I Control

A **P&I Control** is created to hold all the rules that work together to calculate automated / ongoing penalty and interest. The P&I control includes a list of **P&I Rules** that make up the individual calculations.

To set up P&I Control, select **Admin** > **P&I Control**.

The topics in this section describe the base-package zones that appear on the P&I Control portal.

P&I Control List

The P&I Control List zone lists every P&I Control. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent P&I Control.
- Click the **Add** link in the zone's title bar to add a new P&I Control.

Actions

This is a standard actions zone. The **Edit, Delete** and **Duplicate** actions are available.

P&I Control

The P&I Control zone contains display-only information about a P&I Control. This zone appears when a P&I Control has been broadcast from the P&I Control List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_PI_CTRL*.

P&I Control Obligation Types

This zone lists obligation types currently linked to the broadcast P&I control.

P&I Rules

This zone lists the P&I rules associated with the broadcast P&I control. Click on a P&I rule in the list to view its details in the *P&I rule portal*.

If the P&I control is in **pending** status, Edit and Delete actions are available for each P&I rule. In addition you may add another P&I rule using the **Add** link in the zone's title bar.

P&I Control Log

This is a standard *log zone*.

Setting Up P&I Rules

This portal is provided to view and maintain details of a given P&I rule. This portal is not available from a menu. You navigate to this portal by drilling into a specific P&I rule from the *P&I control* portal.

The topics in this section describe the base-package zones that appear on the P&I Rule portal.

Actions

This is a standard actions zone. The **Edit** and **Delete** actions are available.

P&I Rule

The P&I Rule zone contains display-only information about a P&I rule.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_PI_RULE*.

Setting Up Obligation Types

Each obligation type where penalty and interest charges are applicable must be configured appropriately:

- Define the default *debt category priority*.
- It should include appropriate P&I controls that define the P&I rules that are in effect
- It should include appropriate P&I calculation algorithms. The following provides a list of the plug-in spots that must are required for P&I calculations. Unless noted, base algorithms are provided. If the functionality provided in the base algorithms does not satisfy your implementation's business rules, you may define your own:
  - P&I Calculation
  - Determine Balance Details
  - Retrieve FT Details
  - P&I Prepare Periodic Balance

- P&I Pre-processing
- P&I Post Processing - algorithms are provided for all algorithm types except for the *cash accounting* algorithm type. That one needs to be configured with the appropriate adjustment type.

- In addition to the required algorithms above, if your implementation's business rules include P&I Eligibility requirements, provide appropriate algorithms.

Setting Up Waiver Types

To open the Waiver Type zone, select **Admin** > **Waiver Type**.

Waiver Type List

The Waiver Type List zone lists every waiver type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent waiver type.
- Click the **Add** link in the zone's title bar to add a new waiver type.

Waiver Type

The Waiver Type zone contains display-only information about a Waiver Type. This zone appears when a Waiver Type has been broadcast from the Waiver Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_WAIVER_TYPE*.

Waiver Type Log

This is a standard *log zone*.

Defining Asset Options

Assets and valuations are central objects for information that’s used in billing taxes..

This chapter describes options related to assets, asset ownership and valuations. The following sections describe how to set up the tables that control this functionality.

The Big Picture of Assets

Asset records store data related to assets/property that may be subject to billing. Besides information about the asset itself, the following information are also captured:

- Billable address associated with the asset. For real property assets, this is the location of the asset. For other types of assets such as vehicles and boats, the address may be related to the address of the main taxpayer for the asset.
- One or more external identifiers for the asset.
- Current taxpayer who is responsible for paying taxes that billed for the asset.
- Persons related to the property besides the taxpayer.
- Parent assets. This applies to cooperatives, where there is a main/parent asset that gets billed on behalf of the child assets/units that belong to the cooperative.

The following sections provide more information.

The Asset Model

Asset records exist for the primary purpose of billing taxes.

The base product has the following assumptions for configuring the Asset and the related entities:

- For the asset to be billable, it needs to be linked to a tax role. The tax role is created and stays with the asset for its billable life. The base product supplies asset-based tax roles, including a specific one for real property tax roles. Refer to the **C1–TaxRoleRealProperty** and **C1–TaxRoleAsset** base business objects for more information.
- The tax role's related account and person are created for the asset/property and are not real persons or businesses. This person/account is different from the owner(s) of the property, which do get captured as persons/businesses, but are linked to the asset through ownership history records. The special account and persons (for billing purposes) can be set up using the **C1–BillAssetAccount** and **C1–BillAssetPerson** business objects that the base product provides. Refer to these business objects for more details.
- The tax role's obligations are maintained automatically as the tax role is created and when the tax role's start or end date changes. Refer to*Tax Roles Can Maintain Obligations* for more information.
  The base product provides a business object for obligations linked to tax roles that are billed. Refer to the **C1–BilledObligation** business object for more details.

Asset External Identifiers

An asset may have one or more external identifiers. Some types of identifiers have simple values. Other types could specify a value with multiple components — e.g. property identifiers that specify "square, suffix, lot".

An asset external identifier type references a type which controls how the asset identifier value is validated and processed.

The asset's type defines the valid external identifier types that can be specified for that type of asset.

Asset Addresses

Many assets are billed based on attributes related to their location.

- For real property assets, the billing address is usually the property's address, which is static.
- For vehicles, the billing address changes as the vehicle's location changes

Some assets may not require a billing address.

Asset records in the system can include a collection of billing addresses. This is an effective-dated collection, to allow for changes over time.

The asset's tax role can also capture a collection of addresses. This can be used for any miscellaneous addresses, if needed.

Owners of the asset are captured as persons linked to assets. If these person records specify addresses, those can also be used for sending information to specific owners.

Asset Ownership

An asset can be associated with one or more owners. Owners are set up as persons linked to the asset through an effective-dated Asset Ownership history record. One of these owners is designated as the primary and each owner can be designated a percentage of ownership.

When an asset/property is sold, changes in the ownership are reported by an external system, which results in corresponding changes to the ownership history information.

Billing an Asset

The product supports two models for tracking debt and associating a taxpayer to an asset:

- Asset-based model where the tax role is created and stays with the asset for its billable life. The tax role's account and person are created for the property and do not represent real persons or businesses. The owners of the property are captured as person records but are linked directly to the asset using an effective-dated ownership history record.
- Standard "account" model where the taxpayer is linked to an account and the account is linked to a tax role (that links to an asset) on down to the financial transactions. When ownership changes, the tax role is end dated and the account is responsible for the debt incurred while it was the owner of the asset. I.e., for the debt incurred during the tax roles' effective dates. The new owner gets a new tax role.

NOTE:
The second option described above is not a common scenario for real property taxes. While the data model supports it, out-of-the-box algorithms to set up the relationships for ownership changes (in this scenario) are not supplied. Your implementation will need to provide them.

Refer to *The Big Picture of Bills* for more information on billing.

Related Persons

One or more persons aside from the owner(s) can be linked to the asset. For instance, a real property asset may be associated with a facilities manager.

Refer to the inline help on *Asset — Main* for details on how to these related persons are linked to the asset.

Cooperatives

A cooperative operates for the benefit of its members on a not-for-profit basis in order to provide the goods and services members need at the lowest practical cost. Members/shareholders own the cooperative and participate equally in the governance of the cooperative.

For assets that are part of a cooperative, a parent asset is linked to child assets. The parent asset receives the bill, which is calculated based on the number of units. Valuation records containing information needed for billing are linked to the parent asset. The billing system may or may not store specific valuation information for the child assets units.

If a cooperative is dissolved or converted (e.g. to a condominium), the parent asset is end-dated and the individual units/assets become billable.

The Asset object in the system allows for parent/child asset relationships that cooperative and cooperative unit assets need. The supplied **C1–RealPropertyAsset** base business object supports the ability to define an asset as either a cooperative or a unit in the cooperative using the Special Role lookup.

The Big Picture of Valuation

Valuation is an appraisal or estimation of an asset’s value as of a given period of time.

For real property, in particular, valuations provide the assessment value for a specific revenue year. The property’s value is assessed based on a number of key factors like the property’s use, age, square footage, amenities, current market conditions, etc.

Valuations are initiated for any of the following reasons:

- New property

- Changes to existing property — e.g. construction/improvement, splits/merges, demolition, etc.
- Ongoing/periodic valuation
- Property is sold and/or changes ownership

Valuation information is typically maintained at an external system and any information that's needed for billing is interfaced to the billing system. Within a specific revenue period, one or more valuations may exist for the asset, depending on changes that occur for that asset.

The following sections provide more information.

Valuation

A valuation record captures the details of an asset's assessed value for a specific revenue period. Changes to the asset itself or to the asset's ownership within a specific revenue period typically results in the creation of additional valuations for that period. Such valuations, in turn, feed into billing — e.g. for generating supplemental bills. The system supports multiple valuations for the asset and for the same revenue period.

The valuation record can specify the reason for creating that valuation, as well as the external source that sent the information.

A valuation's lifecycle is simple. Once the valuation is linked to a valid asset in the system, it persists in the Active state and stays there unless there is a reason to manually cancel the valuation. The base product supplies the **C1–Valuation** business object, which has this lifecycle.

Valuation Details

The bulk of the information in valuations are in the valuation details. A valuation detail could specify a simple number, a percentage or a monetary amount. For real property valuations, for instance, a valuation could contain a large volume of details about the property's physical attributes (square footage, number of units etc.) and miscellaneous charges for the property.

Each valuation detail references a value detail type, which determines whether or not the supplied value is valid. It also determines whether or not a specific type of detail can be specified multiple times within the same valuation.

The valuation type controls the value detail types that are valid for a type of valuation. When adding a valuation record, the value detail types are filtered to only those that are valid for the selected valuation type.

The base package provides the **C1–ValueDetailType** and **C1–ValuationType** business objects that support the above functionality. Refer to these business objects for more details.

Billing Valuation Details

A valuation detail's type controls whether or not the detail is billable. When a value detail type is configured to create bill charges, the description that appears for the resulting bill charge and the distribution code to use for that charge can also be specified.

When a valuation goes to the Active state, it is considered billable. Billing calculation rules could pull in the billable details of the asset's active valuations for the specific revenue period being billed.

Refer to *The Big Picture of Bills* for more information on billing.

Uploading Valuations

Valuation data is commonly maintained in an external system. For instance, real property valuations can come from mass appraisal systems that gather data for the purposes of determining property value and market analysis.

With any type of asset (e.g. real property, personal property, vehicle, etc.), valuations contain a collection of valuation details, most of which are used in bill calculations.

The following sections describe concepts about uploading valuations into the system.

Direct Upload of Valuations

Valuation uploads tend to be high volume and each uploaded valuation record can contain a large number of details. For instance, real property valuations could have very detailed information about the land, improvements, exemptions, etc.

However, valuation upload processing is simpler than most upload processes in the system. In a lot of the cases, valuation upload is just a two-step process: determine the asset and add the valuation record with its details. Aside from checking that a valuation's related asset exists, there is not much else to validate during the upload process. The assumption is that the main system of record (i.e. the external system that interfaces valuation data) has the responsibility of ensuring that valuation data is valid prior to the upload.

Valuation record structures also tend to be static and hardly change from time to time.

It is for the above-mentioned reasons that the base product does not provide a separate 'staging' object for uploading valuations. The supplied **C1–Valuation** base business object is designed for use in upload processes that load records directly into the Valuation table through a series of BO adds.

NOTE: The upload records should go through BO processing, to make sure that all BO rules, specially the pre-processing step of determining the asset, are executed.

Determining the Asset

A valuation exists for a specific asset. When valuations are uploaded from an external system, it's common for these records to specify the related asset's external identifier. Such records will need to go through the process of finding the related Assets in the system using the supplied external identifiers.

The **C1–Valuation** base business object has pre-processing logic to determine a valuation's related asset. If it is unable to do so, it will put the valuation into the Error state.

Reprocessing Valuations in Error

There are two common reasons for valuations to go into error:

- The related asset exists in the system, but the supplied external identifier is invalid/incorrect. This will usually require a user to investigate and fix the issue. In exceptional cases where there is a general issue with a whole batch of uploaded valuations, the batch might have to be re-uploaded and the existing valuations in error are canceled.
- The related asset does not yet exist in the system. This can happen when asset information is uploaded/entered into the system separately and the valuation information happens to get uploaded first. The **C1–Valuation** base business object has logic to monitor valuations in error, in case information about the related assets become available in the system.

Setting Up Asset Options

This section describes tables that must be set up before you can define assets and valuations.

Setting Up Asset External ID Types

Asset External ID Type controls how a specific type of asset external identifier is structured and processed.

To set up an Asset External ID Type, select **Admin** > **Asset External ID Type**.

The topics in this section describe the base-package zones that appear on the Asset External ID Type portal.

Asset External ID Type List

The Asset External ID Type *List zone* lists every asset external ID type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent asset external ID type.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each asset external ID type.

Click the **Add** link in the zone's title bar to add a new asset external ID type.

Asset External ID Type

The Asset External ID Type zone contains display-only information about an Asset External ID Type. This zone appears when an Asset External ID Type has been broadcast from the Asset External ID Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_ASSET_EXT_ID_TYPE*.

Setting Up Asset Types

Asset Types contain the rules that control how a specific type of asset is processed.

To set up an Asset Type, select **Admin** > **Asset Type**.

The topics in this section describe the base-package zones that appear on the Asset Type portal.

Asset Type List

The Asset Type *List zone* lists every asset type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent asset type.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each asset type.

Click the **Add** link in the zone's title bar to add a new asset type.

Asset Type

The Asset Type zone contains display-only information about an Asset Type. This zone appears when an Asset Type has been broadcast from the Asset Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_ASSET_TYPE*.

Setting Up Value Detail Types

Value Detail Types contain the rules that control how valuation details are processed. To set up a Value Detail Type, open **Admin** > **Value Detail Type**.

Value Detail Type Query

Use the *query portal* to search for an existing value detail type. Once a value detail type is selected, you are brought to the maintenance portal to view and maintain the selected record.

Value Detail Type - Main

This portal appears when a value detail type has been selected from the Value Detail Type Query portal.

The topics in this section describe the base-package zone that appears on this portal.

Value Detail Type

The Value Detail Type zone contains display-only information about selected value detail type.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_VAL_DTL_TYPE*.

Setting Up Valuation Categories

Valuation categories allow for classification of valuation types into broad categories — e.g. fixed assessment, exemption, etc.

If valuation categories apply, identify these categories and configure them as Valuation Category extendable lookup values.

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Valuation Category** extendable lookup business object.
- The list of existing valuation categories are displayed in a standard *List zone*.
- Choose an existing valuation category to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new valuation category.

Setting Up Valuation Types

Valuation Types contain the rules that control how a specific type of valuation is processed.

To set up a Valuation Type, select **Admin** > **Valuation Type**.

The topics in this section describe the base-package zones that appear on the Valuation Type portal.

Valuation Type List

The Valuation Type *List zone* lists every valuation type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent valuation type.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each valuation type.

Click the **Add** link in the zone's title bar to add a new valuation type.

Valuation Type

The Valuation Type zone contains display-only information about a Valuation Type. This zone appears when a Valuation Type has been broadcast from the Valuation Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_VALTN_TYPE*.

Setting Up Valuation Reasons

Identify the various reasons for creating a valuation and configure those reasons as Valuation Reason extendable lookup values.

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Valuation Reason** extendable lookup business object.
- The list of existing valuation reasons are displayed in a standard *List zone*.
- Choose an existing valuation reason to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new valuation reason.

Setting Up Valuation External Sources

Identify the various sources for valuations and configure them as Valuation External Source extendable lookup values.

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Valuation External Source** extendable lookup business object.
- The list of existing valuation external sources are displayed in a standard *List zone*.
- Choose an existing valuation external source to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new valuation external source.

Defining Overpayment Processing Options

An overpayment occurs when the payment(s) exceeds the liability in an obligation, causing the obligation's balance to become a credit. Not every obligation that is in credit will get processed by an overpayment process. This will typically depend on the tax type and the authority's rules.

The Big Picture of Overpayments

For return-based taxes, such as individual income tax, a credit balance will be considered an overpayment only once a return is filed. Any payments or credits received in advance of a tax return are not considered overpayments until the tax form is processed, and an assessment is created. If a tax return is not filed, the obligation will be in a credit balance until the tax authority reviews it.

For billing-based taxes, different rules may apply to determine if an obligation is overpaid.

The following are common scenarios that would result in an overpayment:

- A majority of taxpayers receive refunds for their individual income tax filing because employer withholding tends to exceed the probable liability.
- Recalculation of tax, penalty, interest or fees that results in a reduced liability.

Not all tax types have overpayments. Assessments for sales tax and withholding tax are seldom overpaid because the taxpayer pays for an activity that has already happened. If an overpayment results, it is usually due to a math error on the form.

The valid overpayment types for a given tax type must be configured. This list may be configured on both the overpayment process type page (list of tax types for which the overpayment process type is valid) and on the tax type page (list of valid overpayment process types). Also note that the system provides a “usage” flag that may be used for any functionality where a default overpayment process type should be used for a given scenario. Refer to *Setting up Tax Types* for more information.

An Overpayment Process Can be Created Automatically or Manually

An overpayment process can be created in a variety of ways:

- As a result of posting a return. A form rule related to the posting system event could be used to create an overpayment process if the form reports a refund. The base product provides a tax form posting form rule to create an overpayment. Refer to the business object **C1-CreateOverpayment** for details.
- An account monitor rule can be designed to create an overpayment process when the obligation's balance is a credit and a return has already been filed. The base-package provides the algorithm **Initiate Overpayment Process** (*C1-CC-INITOP*) that can be plugged in on the Collection Class Overdue Rules. For more information on how account monitor rules can be configured for overpayment, see *Overdue Rules Are Embodied In Algorithms*.
- An overpayment process can be created manually by selecting **Menu** > **Accounting** > **Overpayment Process**.
- Implementations may supply algorithms to create overpayments when other events occur.

An Overpayment is Typically Reviewed

When an overpayment is identified, it typically goes through a review process, which may include a combination of automated checks and user review and/or approval.

Examples of review activities include:

- Processing Rules - these can include checking for a valid mailing address, verifying bank account details.
- Compliance Rules - these include specific criteria defined by the tax authority for overpayments that require additional review.
- Minimum Balance - the overpayment amount is compared against a minimum threshold amount to determine whether the overpayment should be processed.
- Risk-based thresholds and overrides - if the overpayment amount is greater than a predefined maximum threshold, it may require special handling and additional approval.
- Suppression - an overpayment may be suspended or put on hold if an account is under investigation for other debt or another reason.
- Separation of Duty - the tax officer approving the refund must be different from the tax officer who changed the account's bank information.

The review rules may differ with each tax authority and tax type. However, the end result is the same: to determine whether the overpayment can be processed further.

Not all Overpayments Result in a Refund

Before an overpayment is refunded to the taxpayer, some or all of the overpaid amount may be offset against other existing debt, carried forward to a future period, and/or contributed to designated charitable funds or organizations.

Minimum Amount Write Off

Implementations may opt to write off (sometimes called write down) credit amounts that are within a certain threshold, defined on the overpayment process type.

Refer to the base business objects for algorithms supplied to write off small credit amounts.

Offset

When an overpayment is offset, the credit is used to extinguish other debts. The order of allocation of overpayment amount to debt depends on the tax authority's rules. Typically, the credit is applied in the following order:

- Within the same assessment
- Other assessments within the obligation
- Other obligations under the same account
- Other accounts for the taxpayer

In some cases, a tax authority may also allow offsetting against debt from other agencies. This type of debt is called external debt.

Where offset is possible, it is done before attempting to contribute, carry forward or refund. Offset is not allowed on future obligations, but a carry forward is done instead.

Refer to the base business objects for algorithms supplied to offset credit to other obligations.

Calculating Interest

Before any other action is taken, it might be required to calculate interest on the overpayment amount. The calculation rules will differ by tax authority and by tax types. In addition, the decision of whether to calculate interest before or after offsetting other debt may differ based on an implementation’s business rules.

Refer to the base business objects for algorithms supplied to calculate interest.

Carry Forward

Taxpayers may opt to pay an amount of an overpayment to a future period. This is known as carry forward. This is common to individual income tax filing, where the taxpayer can indicate on the form a designated amount that will go to the next filing period (next tax year).

A tax authority's rules may designate certain tax types to only allow overpayments to be carried forward. Some common examples include excise or sales and use taxes. In these cases, the entire overpayment amount is carried forward.

Note that the base form rule currently supplied to create an overpayment does not support supplying carry forward information to the overpayment process. In addition, the Standard Overpayment Process business object does not currently support carry forward.

Contributions

Most tax forms provide an option to contribute to a charitable fund/organization. The taxpayer indicates a specific amount to contribute to each selected fund/organization. The contribution is made only if an overpayment exists.

Note that the base form rule currently supplied to create an overpayment does not support supplying contribution election information to the overpayment process .In addition, the Standard Overpayment Process business object does not currently support contributions.

Refunds

Refunds result after attempts to offset, contribute and/or carry forward. The credit amount is given back to the taxpayer in the form of a paper check or a direct deposit. The taxpayer could either authorize a one-time direct deposit by putting bank account information on the tax return or indicate a recurring direct deposit for all refunds. In the case of a recurring direct deposit, the bank account information stored for the taxpayer on the *account* will be used.

Configuration on the overpayment process type indicates the mechanism for issuing a direct deposit. The options are Bank Event (recommended) and "credit" payment that triggers an ACH staging record. The credit payment is legacy functionality and not recommended for new releases.

FASTPATH: Refer to *The Big Picture of Bank Events* for more information.

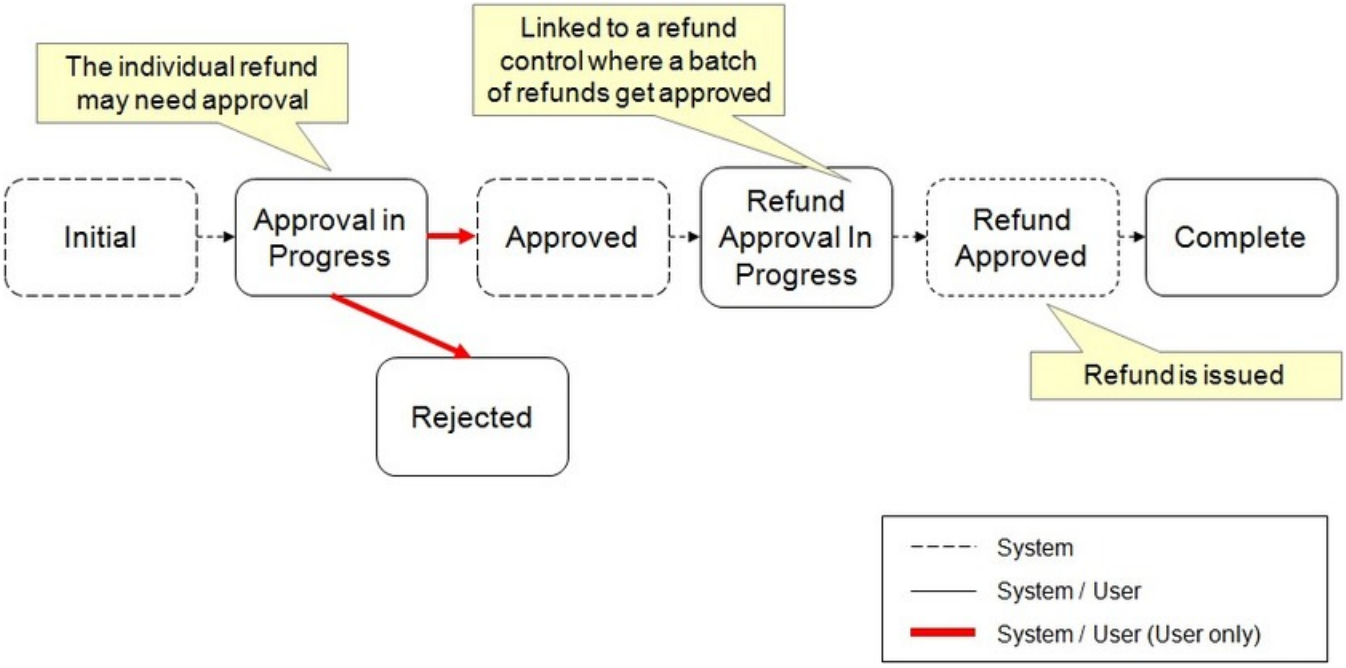
Standard Overpayment Process

The base product includes the base business object **C1-OvrpyProcStandard**, which is designed to cater for most overpayment process. Further details in this section are applicable to this business object.

NOTE: The product also provides a more specific business object that is not recommended for future use but is still supported for upgrade purposes. Some of the logic in this section applies to this legacy business object, but not all. Refer to *Individual Taxpayer Overpayment Process* for more information.

The Overpayment Process Lifecycle

The lifecycle of the overpayment process depends upon the configuration of the associated business object. The Standard Overpayment Process BO (**C1-OvrpyProcStandard**) has a lifecycle that is expected to be used by most implementations. The lifecycle looks very complicated when viewing all the valid state transitions. The following diagram highlights the typical "positive" flow. Refer to the business object — summary tab for this business object for the full lifecycle diagram.



- After the overpayment is created in the Initial state and found to be valid, it transitions to Approval in Progress to assess if any approvals are needed.
- The threshold amounts and approval roles are defined on the overpayment type. One or more approvers may be required. A user can Approve or Reject the overpayment.

> **NOTE:** Refer to *Overpayment Process Approval* for more information.

- Once all the required approvals have been obtained, certain actions will take place such as offset.
- Assuming there is still an amount to refund, the record transitions to the Refund Approval in Progress state where it waits to be linked to a refund control.

> **NOTE:** Refer to *The Big Picture of Refund Control* for more information.

- Once the refund control is approved, a background process transitions the overpayment to Refund Approved, where the refund is issued and finally the status is Complete.

The following points highlight additional detail about the lifecycle:

- Validation issues:
  - After the overpayment is created, it executes overpayment validation plug-ins defined on the overpayment process type. If any issues are found, they are captured and the status goes to Issues Detected. From there a user may resolve the issue and reprocess or may Reject the record.
  - An addition validation check may be performed after it is clear that there is an amount to refund. The refund approval in progress state is configured to call refund validation algorithms on the overpayment process type. This allows for checking for valid bank information, for example. If any issues are found at this stage, the overpayment transitions to Issues Detected. Otherwise, it waits to be linked to a refund control.
  - The refund approved state once again calls the refund validation plug-ins on the overpayment process type. This is to cater for the possibility that a taxpayer has updated their banking information while the refund was awaiting refund control approval. If any issues are found at this stage, the overpayment transitions to Issues Detected. Otherwise, the refund is issued appropriately.

- Several conditions are checked from any state where the overpayment process may transition from one where it was sitting and waiting for some action to occur. These include On Hold, Issues Detected, Approval in Progress and Refund Approval in Progress.
  - The overpayment itself is running algorithms that may reduce the credit. If any of these algorithms reduce the credit to zero, the status transitions to **Complete**.
    - Write off a small amount
    - Offset the credit to debt on another obligation
    - Issue the Refund
  - The obligation's balance may have changed independent of the overpayment process. This condition is checked from any state where the overpayment process may transition from one where it was sitting and waiting for some action to occur. The action taken depends on the status and the change in the balance:
    - If the balance change is detected during the transition out of On Hold or in Issues Detected, if the balance is no longer credit, the process completes. Otherwise, the new balance is checked again against the minimum write off. If it's greater than that threshold, it continues to the approval step. (Otherwise it's written off).
    - The balance change may be detected during the approval process. Note that the user interface for the base Standard Overpayment Process BO displays a message if the obligation’s current balance differs from the balance captured by the overpayment. if the balance is no longer credit, the process completes. If the balance is below the minimum write off amount, the amount is written off. If the balance is less credit or if it is more credit, the action depends on if the process is in the middle of a multi-level approval process (controlled by configuration on the overpayment process type).
      - If there is a single approver or if the balance change is detected at the final approval of a multi-level approval, the process continues if the balance is less credit or is more credit, but still within the threshold band of the current approver. If the credit is more credit and pushes the amount into a higher threshold band, then the process requires additional approval based on the new threshold band.
      - If balance change is detected during a multi-level approval, where future approvers are needed, the process continues if the new balance is in the same threshold band as the previous balance. It means that the same approval hierarchy applies. However, if the new balance is in a different threshold band than the original amount, then the process adjusts the future approver list appropriate for the new balance.
    - If the balance change is detected during the refund approval process (after the refund control is approved), if the balance is no longer credit, the process completes. If the balance is below the minimum write off amount, the amount is written off. If the balance is still credit but is less credit than before (but still above the minimum write off amount), the assumption is that the amount is still valid and that the refund can be issued without further review. If the amount is a greater credit, it should be reviewed again by a user. It is routed back to approval in progress for the appropriate final threshold level.

    Any change detected during the lifecycle to the obligation's balance where it is brought to zero or is a debit amount, the BO transitions to Completed.
  - A suppression may have been logged for the obligation. After each transition that occurs after a waiting period, an algorithm checks if a suppression record exists for the obligation. If so, the process transitions to On Hold. In addition, implementations may introduce other conditions that cause the overpayment to transition to On Hold.
- If a process that initiated the overpayment (such as a tax form) is subsequently canceled, the overpayment may also be Canceled. This can happen even after the overpayment process is complete. Algorithms executed when entering the complete status may attempt to undo any actions that the overpayment did, such as cancel write-offs or offsets or attempt to cancel the refund, if possible.

Overpayment Process Validation

The overpayment process type includes two system events for validation algorithms: overpayment validation and refund validation. Overpayment validation should be used for checking conditions that are applicable for any overpayment process.

For example, verifying that the obligation has a credit balance. Refund validation should be used for validation that is only applicable if there is a refund to be issued, for example validating the bank information.

Having validation algorithm on the overpayment process type allows for different types of overpayment process to have different validation. For example, perhaps an obligation for a tax type where returns are filed must have a valid tax form posted prior to any overpayments being issued.

The base business object Standard Overpayment Process **C1-OvrpyProcStandard** calls the validation algorithms on the overpayment process type when checking the validity of the record at various state transitions.

Overpayment Process Approval

An overpayment process typically requires one or more levels of approval before any financial activity can take place.

An Overpayment Process Typically Requires Approval

If the overpayment process type defines an approval hierarchy, users will need to approve the overpayment process in order for the process to continue. When the overpayment process is in the **Approval in Progress** state, two action buttons will appear: **Approve** and **Reject**.

If the user chooses to reject the overpayment process, they will be prompted for a reject reason.

Approval Is Controlled By Its Type

The overpayment process type contains the rules that define if and how an overpayment process is approved. If an overpayment process type does not reference an approval details, the related overpayment processes do not require third-party approval before they proceed. If an overpayment process type references approval detail, the approval hierarchy defines if the overpayment process requires approval and who the authorized approvers are. For example, an overpayment process type can be configured with the following approval hierarchy:

- Overpayment Processes <= $10 do not require approval
- Overpayment Processes > $10 and <= $100 require the approval of a user that belongs to the "level 1 approvers role"
- Overpayment Processes > $100 requires the approval of a user that belongs to the "level 2 approvers role"

The overpayment process type includes a setting to indicate if the overpayment process requires **Single** approval or **Multiple** levels of approval. If there is an overpayment process for $200 and the overpayment process type is configured for **Single** approval, only one approval is needed by the "level 2 approvers role". If instead the overpayment process type for this record indicates **Multiple** levels of approval: first a user that belongs to the "level 1 approvers role" must approve the overpayment process; afterwards, the overpayment process must be approved by a user that belongs to the "level 2 approvers role".

NOTE: Separation of Duties. The base product logic includes validation that prevents a user from approving an overpayment process if that user was the one that created the record or if that user already approved a previous approval "level" (for approvals that define **Multiple** levels).

NOTE: Different Approval Logic. If an implementation has approval logic that is not based on threshold amount but on some other condition, the base Determine Approval algorithm on the Standard Overpayment Process business object would need to be inactivated and a different Determine Approval algorithm is required. If no configuration is required for the custom approval logic, configuring the overpayment process type using the base Standard Overpayment Process Type business object may still be possible. Simply leave the threshold details blank.

To Do Entries Are Created To Notify Approvers

When the overpayment process detects an approval is required, it notifies the first approver by creating a To Do entry. The To Do entry is created using the To Do type and To Do role defined on the overpayment process type. All users who belong to the approving To Do role can see the entry. When a user drills down on an overpayment approval To Do entry, the *overpayment process* portal is opened. This portal contains summary information about the overpayment process. This portal is also where the user approves or rejects the overpayment process.

When the user approves the overpayment process, the To Do entry is **Completed** and the overpayment process's log is updated. If there are no higher levels of approval required, the overpayment process will transition to the **Approved** state. If there are higher levels of approval required, a new To Do entry is created to the next To Do role in the approval hierarchy.

To Do entries can create email. A To Do entry can be configured to create an email message for every user in the To Do role to inform the user(s) of new overpayment processes requiring their attention. Refer to *To Do Entries May Be Routed Out Of The System* for the details.

Monitoring and Escalating Overpayment Approvals

The base-package is supplied with an algorithm that your implementation can use to monitor overpayment approval requests that have been waiting too long for approval. This algorithm can complete the current To Do entry and create a new one for a different role when the time-out threshold defined on the algorithm's parameters is exceeded. If you've configured the system to send email for approval, this algorithm can also send x reminder emails (where x is defined on the algorithm's parameters) before the approval request is escalated to the new To Do role. Refer to *C1-OP-CHKOTO* for more information about this algorithm. If you plan to enable this functionality, plug in your configured algorithm on the **Approval In Progress** state on the **C1-OvrpyProcStandard** business object.

Rejecting Transitions the Overpayment Process to a Final State

When an overpayment process is being approved, anyone with the right level of access can reject it. When an overpayment process is rejected, the following takes place:

- The user is prompted for a reject reason.
- The overpayment process's log is updated with the reject reason and the overpayment process is moved to the **Rejected** state.

Refer to *Common Overpayment Procedures* for more information.

Putting an Overpayment Process On Hold

An overpayment process may be put on hold for one or more reasons. The Standard Overpayment Process base business object supports putting an overpayment process on hold due to a Suppression of overpayments for the taxpayer. When the overpayment process is first created and when it transitions from any state where it may have been waiting for a time, an algorithm checks for suppression and if one is found, the overpayment transitions to On Hold, with “suppression” as the reason code. The base BO also supplies a monitor algorithm to check for the expiration of the suppression and will transition it out of On Hold accordingly. The algorithm will do this if the reason for being On Hold is “suppression”.

If an implementation has another condition that should cause the overpayment to be put on hold, the following should be done:

- Design an algorithm that detects the condition and plug that algorithm into the appropriate place in the lifecycle. If the condition is detected, transition the record to On Hold with an appropriate On Hold reason.
- Design a monitor algorithm for the On Hold state that checks if the condition still applies (based on the reason code). When the condition no longer applies, the algorithm should indicate that it should transition out of On Hold.

Retry Overpayment Process

The Standard Overpayment Process base business object supports a “hand shaking” process with the base Direct Deposit bank event business object to support retrying a rejected refund attempt. the following points highlight the supported process:

- If the overpayment process has a direct deposit refund method and is configured to create a bank event, the Refund Approved state will create a bank event. The bank event will refer to the overpayment process in its log as the “created by” process and the overpayment process log will indicate that it created the bank event.
- If the bank event is rejected, an algorithm will create a new overpayment to try to issue the refund again. Some configuration allows an implementation to control some of the business rules:
  - The overpayment process to create is configured on the bank event type. An implementation may choose to configure a simple overpayment process type that doesn’t include any rules for calculating interest or approval or performing offsets, etc.
  - The refund method to use is configured on the bank event type. Some implementations may revert to mailing a paper check if a bank direct deposit failed. Other implementations may want to try to issue a direct deposit to a different bank. Note that the product does not provide any mechanism for determining a different bank. If business rules require contacting the taxpayer or making other attempts to find a different bank, custom algorithms are required. If the retry refund method is also direct deposit, the “retry” overpayment process creates another bank event. Note that it’s possible that this bank event will also be rejected causing yet another “retry” overpayment process.
  - The maximum number of retries may be configured on the bank event type. This is mainly applicable for implementations that want to continue to try to issue bank deposits. The bank event rejection algorithm checks the maximum number before creating an overpayment. Each “retry” overpayment process indicates its “retry attempt number” which is used by the bank event algorithm to compare against the maximum.
- The “retry” overpayment process may not require an individual approval. However, it is still expected to be included in a Refund Control before issuing the refund.
- A “retry” overpayment process is stamped with the ID of the overpayment process that created the bank event. Note that if the original overpayment process is canceled, it will attempt to cancel any related “retry” overpayment processes. For example, if a tax form causes an overpayment to be created and then the overpayment creates a bank event that is extracted to the bank. If the bank event is rejected, a new overpayment process is created. If the tax form is reversed at this point, the overpayment process it created will be canceled. That in turn will attempt to cancel the Bank Event (which is not eligible for cancellation) and the related retry overpayment process.

FASTPATH: Refer to *Direct Deposit Bank Event Lifecycle* for more information.

Canceling an Overpayment Process

An overpayment process may be canceled from any non-interim state, including Completed. It is distinguished from Rejected which is expected to be used for a user’s decision to stop the overpayment process. Cancellation is meant for system cancellation, especially when initiated by a different source, such as the initiating process. For example, if a posted tax form creates an overpayment process, a reversal of the tax form should cancel the overpayment process.

NOTE: The business object does not have any restriction on allowing a user to cancel an overpayment process. The implementation should use appropriate security to limit which users are allowed to cancel an overpayment process manually, if any.

When an overpayment process is canceled, algorithms plugged in to the canceled state should attempt to undo actions that may have been triggered by the overpayment process. For example:

- If the amount was written off, the write off is canceled.

- If interest was calculated, it is removed.
- If a bank event is created, it is canceled. Note that if the bank event is in a state that doesn't support canceled (such as Accepted by the bank), then the overpayment will still be canceled, and a log will be written to indicate that the bank event could not be canceled.

Enabling the System to Use Standard Overpayment Process

To enable this functionality the following configuration tasks are needed:

- Determine if your implementation wants to define an overpayment source to indicate what caused the overpayment process to be created. This is an optional field and is defined using the extendable lookup **Overpayment Process Source**. The values are meant to record the reasons that the obligation is in credit, for example "overpayment" or "benefit payment" or "liability adjustment". Implementations that wish to use this field must provide appropriate logic to set the value, for example, using a pre-processing algorithm on the business object.
- Various adjustments are used for calculating interest, write off and offset for the overpayment process, if applicable based on business rules. For each of these actions, a suitable *adjustment type* is required.
  - If you wish to specify a minimum amount threshold for the overpayment process, you will need to define a non-calculated adjustment type for the minimum amount write-off.
  - If your implementation rules specify that interest should be calculated and the interest is calculated using a *rate*, you will need to define the following:
    - A calculated adjustment type for offset-able interest, or a calculated adjustment type for non offset-able interest.
    - An associated rate schedule that includes a *RQ rule* for calculating number of days
  - If your implementation rules specify that interest should be calculated and the interest is calculated using a *rate factor*, you will need to define the following:
    - A non-calculated adjustment type for offset-able interest, or a non-calculated adjustment type for non offset-able interest.
    - An associated rate factor.
  - If your implementation allows offset, then a non-calculated adjustment type needs to be defined for the offset.
  - To allow refunds via a check, an *A/P adjustment type* needs to be defined.
- Make sure the adjustment types are defined on an associated *adjustment profile* that is linked to any obligation types that are going to be covered by the overpayment process.
- To allow refunds via direct deposit define a bank event type to use to create the bank event that stages the direct deposit.

  NOTE: Implementations may also use 'negative payments' to implement a direct deposit if desired. To use this mechanism, a *distribution rule* needs to be defined. The distribution rule should be designed to "pay" a specific obligation.

- If approvals are required as part of the overpayment process, a To Do type is needed. The base product is supplied with a To Do type called *C1-OVAPP* that should be used as the basis for approval To Do type.

  In addition, your implementation should determine if the overpayment process should alert a user if it is in this state for too long. If so, an appropriate monitor algorithm should be configured. Refer to the detailed description of the Approval in Progress status in the metadata for this base business object for more information.
- If you wish to have a To Do created when issues are detected during the validation of the overpayment process, you will need a To Do type. Note that the base-package is supplied with a To Do type called *C1-OVISS* that should be used as a basis.
- For each To Do type that you wish to use, you will need appropriate To Do roles.

- The system has been currently configured to calculate non offset-able interest using a rate factor. If you wish to change this you will need to inactivate the base-package algorithm by adding an appropriate inactivation option to the business object. You will then need to plug in a different algorithm based on the logic you wish to implement.
- Review the overpayment and refund validation rules required for your overpayment processes to determine if existing algorithms are applicable or if additional algorithms are needed.

  NOTE: Base plug-ins. Click *here* to see the algorithms types available for the Overpayment Validation system event. Click *here* to see the algorithms types available for the Refund Validation system event.

- Define an overpayment process type for the business object **C1-OvrpyProcTypeAutoCredRef**.

  NOTE: **Retry overpayment process types**. If your implementation supports the ability to retry a refund attempt when a bank event is rejected, a “retry” overpayment process is created. The configuration of the “retry” overpayment process type will probably be simpler than the original overpayment process type due to the fact that at this point steps like offset and approval are no longer applicable.

Setting Up Overpayment Process Types

An Overpayment Process Type defines the configuration information that is common to overpayment processes of a given type. The type of information captured on the overpayment process type is governed by the overpayment process type's business object.

To set up an Overpayment Process Type, select **Admin** > **Overpayment Process Type**.

The topics in this section describe the base-package zones that appear on the Overpayment Process Type portal.

Overpayment Process Type - Main

An Overpayment Process Type defines the configuration information that is common to overpayment processes of a given type. The type of information captured on the overpayment process type is governed by the overpayment process type's business object.

To set up an Overpayment Process Type, select **Admin** > **Overpayment Process Type**.

The topics in this section describe the base-package zones that appear on the Overpayment Process Type portal.

Overpayment Process Type List

The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent overpayment process type.
- The standard actions of **Edit, Duplicate** and **Delete** are available for each overpayment process type.

Click the **Add** link in the zone's title bar to add a new overpayment process type.

Overpayment Process Type

The Overpayment Process Type zone contains display-only information about an Overpayment Process Type. This zone appears when an Overpayment Process Type has been broadcast from the Overpayment Process Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_OP_PROC_TYPE*.

Tax Types

The Tax Type zone displays the list of tax types for which this overpayment process type is valid. Click the Add/Edit button to maintain this list.

Overpayment Process Type - Log

Navigate to the Log tab to view the *logs* for an overpayment process type.

The Big Picture of Refund Control

Implementations typically need to review and approve a group of overpayments that are slated for refund to ensure that there are enough funds in the bank to cover the payments out to the taxpayers.

The product provides an object called Refund Control that allows for a set of overpayments to be grouped for a mass approval. The following topics provide more information about refund control records.

How Are Refund Controls Created?

The product provides two ways to create a refund control and link overpayments to the refund control

- A user may manually create a refund control and define criteria such as tax type, overpayment process type and maximum amount. (Note that the exact criteria is determined by the business object). The refund control is then "validated" where an algorithm uses the criteria to select overpayment processes and then becomes eligible for approval.
- A refund control and its overpayments are created via a web service. This mechanism is used if an implementation chooses to do some analysis in a separate analysis tool and selects a list of overpayments to refund in the external tool. The expectation in this case is that analysis tool produces a file and that an appropriate mechanism like Oracle Service Bus transforms the file and interfaces the information via a web service call.

The refund control type includes configuration to indicate whether criteria is provided or whether the explicit list of IDs are provided. Note that the product does not provide any user interface mechanism for defining overpayment IDs manually. The IDs Provided option is meant for the case where a web service call creates the refund control and its list of IDs.

Regardless of the mechanism for creating refund controls, the record is created in the **Pending** status. The base product attaches a deferred monitor to the pending state so that the validation / selection of the IDs occurs in batch allowing for large volumes. Depending on an implementation's business practice, this deferred monitor may be one to run often during the day.

Once the record is validated, it is routed for approval. Refer to *Refund Control Approval* for more information.

Overpayment Configuration for Refund Control

The refund control functionality requires that the overpayment is configured to use the base business object **C1-OvrpyProcStandard** (Standard Overpayment Process) whose lifecycle includes a **Refund Control Approval in Progress** state. If implementations choose to create a different overpayment process business object and wish to use the refund control, the lifecycle must follow the base BO's lifecycle.

Refund Control Approval

A refund control typically requires one or more levels of approval before any financial activity can take place. The refund control type defines an approval hierarchy, indicating which group of users is authorized to approve the refund control based on its total amount (sum of all the overpayment amounts). The refund control type may be configured to require

multiple levels of approval based on the total amount. Or it may indicate that a single group should approve where the group to approve can depend on the total amount. This is analogous to the approval functionality provided for an overpayment process. Refer to *Approval Is Controlled By Its Type* for more information.

If there is some amount that doesn't require approval, the refund control transitions directly to **Approved**. If one or more levels of approval are required, the record transitions to **Approval in Progress** and remains in this state until all approval occur. At any time, a user can choose to **Reject** the refund control at which point they may be prompted for a reject reason, based on the configuration. Once all approvals are done, the record transitions to **Approved**.

NOTE: Separation of Duties. The system includes validation to ensure that the user approving the refund control is not the same user that created the refund control and is not the same user that performed any previous approval.

To Do Entries are created to notify approvers. This analogous to the functionality provided for overpayments. Refer to *To Do Entries Are Created to Notify Approvers* for more information.

NOTE: Refund Control with No Overpayments. It is possible that after validating a refund control, it is found that no **Active** overpayments are linked to the refund control. In this case the record transitions to **Approval in Progress** so that a user can review the record and determine the cause. At that point the user can **Reject** the refund control.

Refunding Overpayments

Once a refund control is approved, its overpayments may be refunded. The approval step stamps the refund control with the batch job that is responsible for progressing the overpayments to issue the refunds. The batch job is taken from the refund control type. The current run number for that batch job is stamped as well. The base product provides a batch job (C1-RCPOR - Process Refund Control Overpayments) that is responsible for finding refund controls for the current run number and progressing all the overpayments with an **Active** link status to its next state.

NOTE: If the batch job determines that any of the overpayments are no longer in the appropriate state, the link status is updated to **Skipped** as an audit.

Configuring Refund Control Options

If your implementation supports refund controls, the following topics highlight configuration requirements.

In addition, your implementation should read the detailed descriptions for the base product business objects provided for Refund Control Type (**C1-RefundControlType**) and Refund Control (**C1-RefundControl**).

Setting Up Refund Control Types

A Refund Control Type defines the configuration information that is common to refund controls of a given type. The type of information captured on the refund control type is governed by the refund control type's business object.

To set up a Refund Control Type, select **Admin** > **Refund Control Type**.

The topics in this section describe the base-package zones that appear on the Refund Control Type portal.

Refund Control Type List

The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent refund control type.
- The standard actions of **Edit, Duplicate** and **Delete** are available for each refund control type.

Click the **Add** link in the zone's title bar to add a new refund control type.

Refund Control Type

The Refund Control Type zone contains display-only information about a refund control type. This zone appears when a refund control Type has been broadcast from the Refund Control Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_REFUND_CTRL_TYPE*.

Refund Control Batch Jobs

The following batch jobs must be scheduled as per your implementation's business rules:

- **C1-RFCMD** (Refund Control Monitor (Deferred)). This batch job selects refund control records that are **Pending** and validates them. For refund controls where criteria is provided this step selects the overpayment processes to include. For refund controls where IDs are provided, this step validates that the overpayments in the list are in an appropriate state. Once this batch job completes, the processed refund controls are ready for approval. Implementations should schedule this based on the business practice of the users that are creating the refund controls and the users that are expected to approve the refund controls. The assumption is that the approval should be done in a timely manner. So one option is to schedule this job on a frequent schedule, such as every 15 minutes. That way the approvals are processed quickly throughout the day.

  NOTE: Email routing. If your implementation plans to use email routing for the "refund control requires approval" To Do entry, then the background process **F1-TDERR** (To Do External Routing) must be scheduled after the monitor batch job with the same or similar frequency.

- **C1-RCPOR** (Process Refund Control Overpayments). This batch job selects refund controls that are stamped with this batch code and the current run number and processes the "active" overpayments such that the refund is issued. This batch job is creating financial transactions and the assumption is that implementations will run this in their nightly batch run.

  NOTE: The creation of the refund financial transaction is not the final step in issuing the refund. For refunds created via an A/P adjustment, the extract of A/P records to the external accounts payable system must also run. For refunds created via direct deposit, the appropriate batch jobs related to interfacing to the banks must also after the process to refund the overpayments is run.

Refer to *Batch Process Dependencies* for more information.

Implementing Web Service Options

If your implementation plans to use an external system to identify an explicit list of overpayments to include in a refund control, the product provides the following configuration to support it.

The XAI Inbound Service **C1-RefundControlUpload** provides the API for the service script **C1-RfCtlUpld**. This service script includes logic creating a refund control and linking a group of overpayments. Note that the script has been designed to be called iteratively for cases where a large file is received and the interface tool that processes the file can process it in chunks.

FASTPATH: Refer to the description of the XAI inbound service and the above service script for more information.

Individual Taxpayer Overpayment Process

The product provides a business object **C1-OvrpyProcAutoCredRef**, that is no longer recommended for use. It does not support refund control or suppression. It was designed to work with a legacy tax form BO that is no longer supported. It remains supported for upgrade purposes.

Note that its lifecycle differs from the Standard Overpayment Process. In addition to the lack of refund control and suppression support,

- It uses a canceled state for situations where a change in the obligation balance is detected.
- It has a special Minimum Write Off state.
- It has logic to support carry forward and contribution amounts but only if populated by a creation algorithm. A user was not able to populate the information manually.

Defining Bank Event Options

Bank events capture specific transaction information that is interfaced to financial institutions.

The following sections describe how to set up the tables that control this functionality.

The Big Picture of Bank Events

Bank events are used to interface transactions to financial institutions.

Current base functionality supports the use of bank events for processing direct deposits (refunds).

The following sections provide more information.

Direct Deposits Using Bank Events

The Bank Event object can be used for processing direct deposits or refunds.

Base-package overpayment processing functionality supports the ability to issue refunds using bank events. An Overpayment Process Type can be configured to create bank events, by specifying a Bank Event Type. Refund creation logic can then check that configuration to determine whether or not to create a bank event.

The base-supplied business object **C1-OvrpyProcStandard** includes refund processing using bank events, when applicable. Refer to this business object's description and the online help for Overpayment Processing for more details.

FASTPATH: Refer to *The Big Picture of Overpayments* for more details on overpayment processing.

A direct deposit bank event typically triggers the financial effect of the overpayment/refund on the related obligation's balance. An Adjustment can be created when the direct deposit is extracted or accepted, depending on the business rules.

Determining Bank Details

Each direct deposit bank event specifies the details of the bank account, to which funds will be sent. Current base logic assumes that the bank details are determined from the related overpayment process.

The **Bank Details Determination** algorithm on the Installation Record is used to retrieve the currently effective bank details that are used for the direct deposit. When called in 'Read' mode, this algorithm returns bank details such as Bank Account Number, Bank Routing Number, Account Name, Bank Account Type, etc.

The algorithm that is supplied with the base package assumes that the bank details are stored in *Account — Auto Pay*. For more information, go to *Installation Options - Algorithms* and scroll to the **Bank Details Determination** system event.

Direct Deposit Bank Event Lifecycle

The base product provides the **C1–DirectDepositBankEvent** business object, which supports the following lifecycle steps:

- A direct deposit bank event is created in a **Ready to Extract** state. When an overpayment process is at the point in its lifecycle where it's ready to issue the refund, it can create a bank event. When it does, it also populates the extract batch control (from the bank event's type) and the next run number on the bank event, so that it gets picked up the next time the bank event extract batch process runs.
- An extract batch process runs and picks up all bank events that are stamped with the extract's batch control code and the current run number. For each bank event, the **Bank Event Extract** algorithm (defined on the bank event's type) is executed, to map the bank event information into a corresponding transaction record in the extract file. When the bank event is processed successfully, the Extract Date/Time and Monitor Control Date are both set to the process date. The Monitor Control Date controls when the bank event transitions to the next state — in this case, to **Extracted**. Setting this date to the current processing date would cause the Bank Event Deferred Monitor (with Date) to pick up the bank event in the next run and perform the state transition accordingly

  NOTE: Refer to *Downloading Direct Deposits* for more details.

- An **Extracted** direct deposit bank event stays in that state until the financial institution accepts or rejects the transaction. The bank event can be monitored to do any necessary timeout processing or automatic transitions when a response is not received within a specified period of time. In addition, an adjustment (to affect the obligation's balance) can be created at this point, if business rules dictate that the balance is impacted upon extraction/download.

  NOTE: The base product provides a number of algorithms that are not plugged in on the base business object by default. Implementations will need to configure these algorithms based on their business rules. Refer to the detailed description of the **C1–DirectDepositBankEvent** business object for details on algorithms that can be plugged in on the **Extracted** state.

- When the financial institution accepts the direct deposit, the bank event can transition to **Accepted**. The assumption is that this transition is done from back end services because it involves processing responses from financial institutions. An adjustment (to affect the obligation's balance) can also be created at this point, if business rules dictate that the balance is impacted only after the direct deposit is accepted.

  NOTE: Since the base product does not provide logic for receiving bank responses, logic for transitioning to **Accepted** is assumed to be implementation responsibility.

  NOTE: Refer to the detailed description of the **C1–DirectDepositBankEvent** business object for details on the **Create Adjustment** algorithm that can be plugged in on the Accepted state.

- When the financial institution rejects the direct deposit, the bank event can transition to **Rejected**. The assumption is that this transition is done from back end services because it involves processing responses from financial institutions.

  NOTE: Since the base product does not provide logic for receiving bank responses, logic for transitioning to **Rejected** is assumed to be implementation responsibility.

- **Rejected** bank events are usually caused by invalid bank details. The base package supports the ability to reprocess a rejected direct deposit. An algorithm can be plugged in on this state, to create a new Overpayment Process. This is to allow for retry processing, which includes attempting to look for a new set of bank details. Another algorithm can also be

plugged in, to reset existing bank details so that it they are not used in future direct deposits. A base algorithm is plugged in on this state, for canceling any existing adjustment, i.e. created upon extraction.

NOTE: Refer to the detailed description of the **C1–DirectDepositBankEvent** business object for details on algorithms that can be plugged in on the **Rejected** state.

- In some exceptional cases, there may be a need to reject a previously accepted direct deposit. This is for cases where the financial institution encounters specific problems after accepting the transaction. The lifecycle allows for this transition.
- **Ready to Extract** and **Extracted** direct deposit bank events can be **Canceled**. If canceling from **Extracted** state, any existing adjustment is also canceled. The lifecycle supports system cancellation from a related process. The Standard Overpayment Process business object supports the ability to cancel a related bank event when the overpayment process is canceled. The **Allow System Cancel (C1AC)** status category value is used to determine which states allow for system cancellation. The **Ready to Extract** state is configured with this value. Implementations can add this value to other states (e.g. **Extracted**) as needed. Note that logic to alert a user about cancellation is not provided by base.

Downloading Direct Deposits

Direct deposit bank events are extracted/downloaded using a specific background process that picks up bank events that are ready for extraction and formats the direct deposit information into an output file.

This background process invokes the **Bank Event Extract** plug-in on the bank event type, to map and format each bank event's information into the output direct deposit record.

The base product provides a sample background process that downloads SEPA (Single Euro Payments Area) Credit Transfer transactions. A corresponding **Bank Event Extract** algorithm is also supplied. The following sections describe this process.

C1-SCTIE - Download SEPA Credit Transfer Instructions

This process reads all bank events marked with the **C1-SCTIE** batch control code and a given run number and creates the flat file that is passed to the SEPA clearing and settlements mechanism. Refer to *SEPA Credit Transfer Record Layouts* for details of the record layouts.

NOTE: You can rerun this process. You can reproduce the flat file at any time. Simply request this job and specify the run number associated with the historic run.

For each bank event, this process invokes the **Bank Event Extract** algorithm that is defined on the associated bank event type, to map and format the bank event information into the output credit transfer record. Click *here* to see the algorithm types available for this system event. The base product provides the *C1–SEPA-FCT* algorithm, which formats the credit transfer information using the ISO 20022 standard XML schema specifications.

If you require a different flat file format or if your mapping rules differ, you must create a customized extract program and/or a customized **Bank Event Extract** algorithm. The base programs may be used as a starting point.

Refer to *Batch Process Dependencies* for more information on when this process is run.

SEPA Credit Transfer

The SEPA (Single Euro Payments Areas) Credit Transfer (SCT) scheme allows an originator to initiate credit transfers to the beneficiary.

The direct participants are the following:

- Originator
- Originator's bank

- Beneficiary
- Beneficiary's bank

The originator and beneficiary must each hold an account with a payment service provider located within SEPA. The scope is limited to payments in Euro.

The indirect participants are the following:

- Clearing and Settlement Mechanisms (CSMs) such as an automated clearinghouse
- Intermediary Banks that offer intermediary services to originator and/or beneficiary banks

SEPA Credit Transfer Record Layouts

The topics in this section describe the layout of the records created by *C1-SCTIE - Download SEPA Credit Transfer Instructions*.

NOTE: The following record layouts are based on the CustomerCreditTransferInitiation message (pain.001.001.03) specifications, as described in the Payments Maintenance Message Definition Report in the ISO 20022 standards.

Group Header Record
The SEPA credit transfer flat file must have one record of this type.

Since this record includes the number of transactions processed, this record is written at the end of the file after all transaction records have been processed.

NOTE:
The base product provides a data area **C1-SEPAGroupHeader** that contains the group header record layout. All fields are alphanumeric.

The following table lists the fields that the **C1-SCTIE** extract is mapping. To see the rest of the fields, refer to the data area's schema definition.

Field Name	*Description*	*Source / Value*
MsgId	Message Identification	SEPA Master Configuration: generalMasterConfiguration/ messageIdentification
CreDtTm	Creation Date/Time	System Date/Time
NbOfTxs	Number of Transactions	Computed at the end of extract processing
InitgPty/Nm	Initiating Party -Name	SEPA Master Configuration: Derived from the Initiating Party (Person).

Payment Information Record
The SEPA credit transfer flat file must have one record of this type for every obligation. It includes one or more credit transfer transactions.

NOTE:
The base product provides a data area **C1-SEPACreditTxferPaymentInfo** that contains the payment information record layout. All fields are alphanumeric.

The following table lists the fields that the **C1-SCTIE** extract is mapping. To see the rest of the fields, refer to the data area's schema definition.

Field Name	*Description*	*Source / Value*
PmtInfId	Payment Information Identification	From 'Payment Information Identification' characteristic value on Obligation, where the characteristic type is defined in the SEPA

		Master Configuration. Obligation ID is taken from the Bank Event.
PmtMtd	Payment Method	'TRF'
PmtTpInf/SvcLvl/Cd	Service Level (Code)	'SEPA'
PmtTpInf/LclInstrm/Cd	Local Instrument (Code)	Blank.
ReqdExctnDt	Requested Collection Date	Payment Event.Effective Date
Dbtr/Nm	Debtor Name	SEPA Master Configuration: Derived from the Initiating Party (Person).
Dbtr/PstlAdr	Debtor Postal Address	SEPA Master Configuration: Derived from the Initiating Party (Person). If an address exists: StrtNm is mapped to Address1, PstCd is mapped to Postal (prefixed with State code, if applicable), TwnNm is mapped to City and Ctry is mapped to Country.
DbtrAcct/Id/IBAN	Debtor Account Identification	Bank Account.Account Number, where Bank Account is specified in the SEPA Master Configuration.
DbtrAgt/FinInstnId/BIC	Debtor Agent BIC	Bank Account.DFI ID. where Bank Account is specified in the SEPA Master Configuration.
CdtTrfTxInf/PmtId/EndToEndId	Credit Transfer Transaction: Payment Identification - End To End Identification	Bank Event ID
CdtTrfTxInf/PmtTpInf/SvcLvl/Cd	Credit Transfer Transaction: Service Level	'SEPA'
CdtTrfTxInf/Amt/InstdAmt	Credit Transfer Transaction: Instructed Amount	Bank Event.Amount
CdtTrfTxInf/CdtrAgt/FinInstnId/BIC	Credit Transfer Transaction: Creditor Agent's BIC	Bank Event.Bank Routing Number
CdtTrfTxInf/Cdtr/Nm	Credit Transfer Transaction: Creditor Name	Bank Event.Bank Account Name
CdtTrfTxInf/CdtrAcct/Id/IBAN	Credit Transfer Transaction: Creditor Account	Bank Event.Bank Account Number

Setting Up Bank Event Options

This section describes how to configure bank event types.

Setting Up Bank Event Types

Bank Event Types contain the rules that control how a specific type of bank event is processed.

To set up a Bank Event Type, select **Admin** > **Bank Event Type**.

The topics in this section describe the base-package zones that appear on the Bank Event Type portal.

Bank Event Type List

The Bank Event Type *List zone* lists every bank event type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent bank event type.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each bank event type.

Click the **Add** link in the zone's title bar to add a new bank event type.

Bank Event Type

The Bank Event Type zone contains display-only information about a Bank Event Type. This zone appears when a Bank Event Type has been broadcast from the Bank Event Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_BANK_EVENT_TYPE*.

Defining Overdue Processing and Collection Options

The system periodically monitors how much your taxpayers owe to ensure they haven't violated your collection rules. When a violation is detected, the system initiates the appropriate activities (e.g., letters, collection agency referrals, and eventually write off). The topics in this section describe how to configure the system to manage your overdue processing and collection requirements.

NOTE:
Collecting on unpaid debt. The overdue processing module has been designed to collect on virtually anything from an outstanding obligation to a specific financial transaction. You tell the system what you collect on by configuring the various overdue processing control tables.

CAUTION:
Straightforward rules = straightforward set up. Setting up this module is as challenging as your organization's collection rules. If you have simple rules, the set up process will be straightforward. If your rules are complicated (e.g., they differ based on the type of taxpayer, the age of debt, the type of tax, etc.), your setup process will be more challenging.

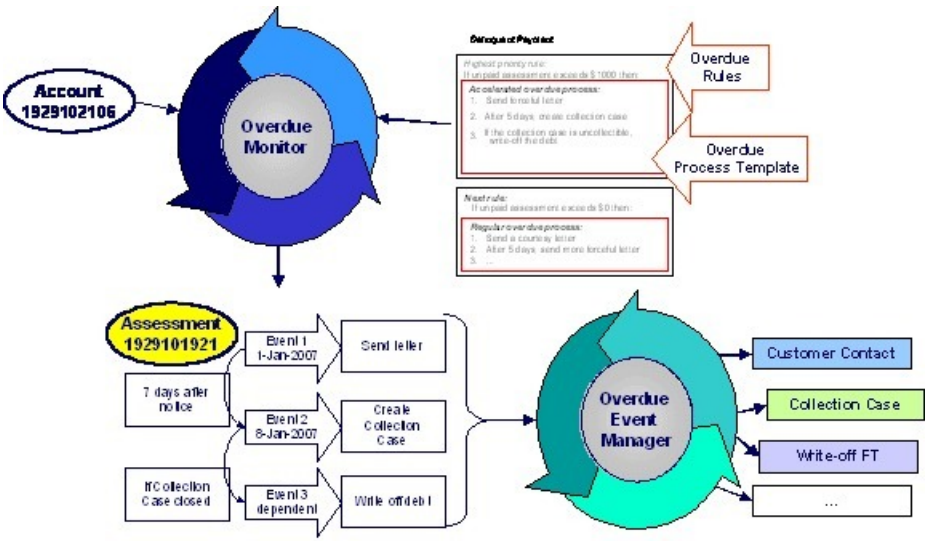
Note: The terms "customer" and "taxpayer" may be used interchangeably in this chapter.

Case Study - Collecting On Overdue Debt

The topic in this section introduces a case study that describes how overdue processing can be used to collect on overdue debt. This is just an example as virtually every aspect of overdue processing is configurable. Use this case study to familiarize yourself with the overdue processing core concepts.

Monitoring Overdue Debt

The following diagram illustrates the objects and processes involved with collecting overdue debt.



There are many important concepts illustrated above:

The Overdue Monitor checks if your accounts have debt that violates your overdue rules	The *Overdue Monitor* is a background process that periodically reviews your account's financial obligations. Note well: every account belongs to a collection class. Collection classes are monitored by the Overdue Monitor. This chapter describes the Overdue Monitor.
Overdue rules define when and how unpaid debt is collected	An account's *collection class overdue rules* have algorithms that monitor an account's financial obligations. These algorithms are invoked by the Overdue Monitor when it's *time to review* an account's obligations. These algorithms can contain any type of criteria. When you set up a monitoring algorithm, you define the type of overdue process that should be created when overdue debt is detected. You do this by defining the appropriate "overdue process template".
An overdue process template defines how to handle overdue debt	An *overdue process template* contains one or more *overdue event types*. These define the number and type of events that are created to prod the taxpayer to pay. For example, you might set up an overdue process template with event types to send a series of letters followed up by a call. The overdue process template has contains the rules defining *when events are activated*. The specific action that's performed by an overdue event is controlled by the **Activation** algorithm defined on its event type. Refer to *Overdue Event Type - Main* for a list of the various **Activation** algorithms delivered with the base product.
Multiple objects can be associated with a single process	The above diagram shows a single assessment linked to an overdue process. It should be noted that an overdue process is capable of referencing multiple assessments (or other objects). Note well: while a single overdue process can reference many overdue objects, all such objects must be of the same type. For example, you cannot commingle FTs and obligations under a single overdue process. The type of object managed by an overdue process is defined on its *overdue process template*.
If a taxpayer pays the debt, the overdue process is cancelled	If the overdue debt is paid, the *overdue process is canceled* real-time. You control if and how an overdue process is cancelled by setting up the appropriate rules on the *overdue process template*.
The Overdue Event Manager activates and triggers overdue events	The *Overdue Event Manager* is a background process that activates overdue events on the appropriate date. On this date, the event's **Activation** algorithm(s) are called.

	This Overdue Event Manager also has the responsibility of recursively activating later events that are dependent on the completion of earlier events.
Events can be activated real-time	*Overdue Process - Main* has a button that allows users to activate (and recursively trigger) overdue events online / real-time. This means you don't have to wait for a batch job to activate events.
Overdue events can wait for related activities to complete	As described above, an overdue event's **Activation** algorithm can create virtually any object. What wasn't explained is that the event can be set up to *wait* for the ancillary object to finish before it completes. For example, an event can create a To Do entry and wait for it to complete before the next event is triggered. You can introduce plug-ins to create and wait on virtually any object. While an overdue event is in the **Wait** state, the Overdue Event Manager monitors the state of the related object(s). When the related object completes, the event is transitioned to the Complete state (thus triggering dependent overdue events). Please see *Some Events Wait For Something Before Completing* for more information.

How Does The Overdue Monitor Work?

This section describes how the Overdue Monitor background process uses your overdue rules to collect overdue debt.

Recommendation. We suggest that you familiarize yourself with the concepts described in the *case study* before reading this section.

Different Overdue Rules For Different Taxpayers

The Overdue Monitor uses rules to control how it monitors an account's debt. The system allows you to define different rules for different combinations of collection class, division and currency code. For example,

- You may have different collection rules for different jurisdictions (i.e., divisions).
- You may have different collection rules for different taxpayer segments. You differentiate your taxpayers in respect of the overdue via the **collection class on the taxpayers' accounts**. An account's initial collection class is defaulted from its account type. You may override an account's collection class at will.
- You may have different criteria for every currency in which you work because the monitoring process always compares a taxpayer's debt against some value and this value must be denominated in the taxpayer's currency. A taxpayer's currency is defined using a **currency code on the account**.

Overdue Rules Are Embodied In Algorithms

Your organization's overdue rules are defined in algorithms plugged in on *Collection Class Overdue Rules* (in the **Overdue Monitor Rule** system event). When the Overdue Monitor analyzes an account, it uses the rules associated with the account's collection class, division and currency code. To analyze an account, it simply invokes these algorithms in sequence order, i.e., the lower the sequence, the higher its priority.

An **Overdue Monitor Rule** algorithm has two responsibilities:

- it determines if an account violates its overdue rules,
- if so, it creates one or more overdue processes using an *overdue process template*

NOTE:
Additional rules. Your implementation can have an **Overdue Monitor Rule** that caters for credit balances on obligations. For an example of an algorithm that creates an overpayment process for an obligation in credit, please refer to the base algorithm type *C1-CC-INITOP*.

When Is An Account Monitored?

The Overdue Monitor determines if an account violates your overdue rules. It can be run in one of two modes.

If the Overdue Monitor process is run with the 'Restrict by Periodic Review' parameter set to true (batch control **C1-ADMVP**), it will review all accounts that have not been reviewed for at least X days, where X is defined on the *Account Type - Controls* associated with the account's account type and division (in the field Min Compliance Review Freq (Days)).

If the Overdue Monitor process is run with the 'Restrict by Periodic Review' parameter left blank (batch control **C1-ADMOV**), it examines account debt 'on demand' by looking at a special table called Compliance Review Schedule, which contains one or more specific account IDs to be selected and the date on which each account should be reviewed. Processes can insert a record into this table if something happens to the account. Some examples of base processes that insert a row in this table include:

- FT freeze. A row is inserted for the account for the current date if the obligation's balance is considered overdue or for the payment due date plus the Compliance Review Grace Days specified on account type if the obligation's balance is not yet due.
- If a payment is canceled with a cancellation reason that indicates non-sufficient funds.

The role of the 'on demand' Overdue Monitor is to process the accounts for which some activity is known to have occurred as soon as possible after the activity that triggered the review. The recommendation is to run the monitor using batch control **C1-ADMOV** on a nightly basis.

The role of the 'periodic' Overdue Monitor is to ensure that all accounts are reviewed regularly, regardless of whether there has been specific activity. The times at which the monitor should be run in this mode (using batch control **C1-ADMVP**) will depend on your organization's business practice and the nature of your account types.

NOTE: Additional events. Your implementation can have other events trigger the analysis of an account by the Overdue Monitor. To do this, add logic to insert a row on the Compliance Review Schedule table (CI_ADM_RVW_SCH) when the event occurs, populating the account ID and an appropriate review date. Note that the Compliance Review Grace Days on the account type is available for use by any process when determining an appropriate review date.

Collection Class Defines If And How Accounts Are Monitored

As described above, every account references a collection class. The collection class defines if and how its accounts are monitored. There are the following options:

- The accounts are monitored by the Overdue Monitor (this is described in this chapter).
- The accounts are not monitored for overdue debt.

The Big Picture Of Overdue Processes

As described above, the Overdue Monitor subjects your accounts to overdue rules. If a rule is violated, an overdue process is created. The topics in this section provide background information about overdue processes.

How Are Overdue Processes Created?

As described *above*, the system creates an overdue process when an account violates your overdue rules. In addition, a user can manually create an overdue process at their discretion.

The Components Of An Overdue Process

The topics in this section describe the major components of an overdue process.

Overdue Objects

When an overdue process is created, the system links the overdue object(s) to the process. For example, if an overdue assessment FT is detected, the assessment FT is linked to the overdue process.

When you set up an *overdue process template*, you define the type of object it collects on by defining the *foreign key characteristic type* used to reference the object. For example, when you set up an overdue process template to collect on assessment FTs, you define a foreign key characteristic type that references the FT object.

Overdue Events

An overdue process has one or more overdue events. These events are the actions designed to encourage the taxpayer to pay. For example, you might set up overdue events that:

- Send letters (via the creation of a customer contact)
- Create To Do entries
- Impact the account's compliance rating
- Create a collection case to manage actions such as creating pay plans and referring debt to collection agencies
- … (the list is only limited by your imagination as algorithms are used to perform the event's actions)

You define the number and type of events by configuring *overdue process templates*. When the system creates an overdue process, it copies the events defined on the specified template.

It's important to note that all overdue events are created when the overdue process is created. A separate background process, the *Overdue Event Manager*, is responsible for activating, monitoring, and triggering overdue events. Activation of an event causes the system to do whatever the event indicates; for instance, send a letter, send a To Do entry to a user or write-off debt.

Overdue Log

Every overdue process has a log holding its history. Entries are added to the log when meaningful events occur, for example:

- When the process is created, a log entry is created to describe why the process was started.
- When an overdue event is activated, a log entry is created. These entries frequently contain a foreign key to the object that the event created so that users can easily drill down to the object from the log. For example, if an event creates a To Do entry, the To Do entry's foreign key is placed on the log and this allows a user to drill down on the log entry to see the To Do entry.
- When a process is canceled, a log entry is created to describe the circumstances of the cancellation (e.g., manual versus automated).
- Users can manually add log entries (you might want to think of these as "diary" entries) as desired.

Many of the base-product algorithms involved in overdue processing insert log entries so that a thorough audit trail is maintained. These algorithms have been designed to allow you to control the verbiage in each log entry by defining the desired message number using an algorithm parameter.

The log is viewable on the *Overdue Process - Log* page.

Experimenting With Alternative Overdue Process Templates

The system allows you to determine the efficacy of proposed overdue process templates using a small subset of taxpayers before implementing the templates on the entire taxpayer base. We use the term "champion / challenger" to reference this functionality.

We'll use an example to explain. Let's assume your prevailing overdue process template for individual taxpayers starts with a "gentle reminder" letter followed 10 days later by a letter threatening to place a lien to secure the debt if payment is not received. You may want to experiment with the impact of a change to this template. For example, you may want to change the "gentle reminder" to something more assertive and follow this up 5 days later with an even sterner warning. You can use the "champion / challenger" functionality to perform this experiment.

The following points describe how to implement "champion / challenger" functionality:

- Set up a "challenger" overdue process template for each template that you want to experiment with.
- Insert a new **Champion/Challenger** option on the **Overdue Processing***Feature Configuration* for every champion template. Each option's value defines:
  - the "champion" overdue process template code
  - the "challenger" overdue process template code
  - the percentage of the time the system should use the "challenger" template

    Keep in mind that you can only experiment with one challenger template per champion template.

After setting up the above, the *Overdue Rule Plug-In* will use the challenger template X% of the time rather than the champion template.

Overdue Process Information Is Overridable

- "Overdue process info" is the concatenated string of information that summarizes an overdue process throughout the user interface. The base-product logic constructs this string by concatenating the following information:
- The description of its overdue process template
- Its status
- For **active** processes, the number of days since it was created. For **inactive** processes, the number of days since it was inactivated.
- For **active** processes, the unpaid amount of the objects being collected

If you'd prefer a different info string, you can develop a new algorithm and plug-it in on your *overdue process templates*. This design allows some / all overdue process templates to have an override info string.

Original and Unpaid Amounts

There are two amounts associated with each overdue object linked to an overdue process: its Original Amount and its Unpaid Amount. These amounts are used throughout overdue processing.

You control how these amounts are calculated by defining the appropriate algorithm on your *overdue process templates*. For example, you can plug in a base-product algorithm (*C1-OBASM-AMT*) if you collect on overdue assessments or obligations. The base algorithm uses the **Obligation Type - Determine Detailed Balance** algorithm to calculate the amounts.

How Are Overdue Processes Cancelled?

A user may cancel an overdue process at their discretion, online / real-time using *Overdue Process - Main*.

The system will automatically cancel an overdue process when the object(s) associated with the overdue process are sufficiently paid. Exactly when the system checks if an overdue process should be cancelled is dependent on your organization's rules. If you plug in the base product Account Type - FT Freeze algorithm (*C1-CFTZ-CMRV*), an account's overdue processes will be reviewed for cancellation whenever a credit FT is frozen for the account.

Two algorithms plugged-in on the *overdue process template* handle the cancellation:

- The **Cancel Criteria** algorithm is responsible for determining if an overdue process should be canceled. Algorithms of this type analyze the outstanding debt on the objects linked to the overdue process and indicate whether a process can be cancelled.
- The **Cancel Logic** algorithm is responsible for actually canceling the process. The logic involved in cancellation can be quite sophisticated as canceling an overdue process can result in the cancellation of its pending events.

NOTE: Why two algorithms? The reason two algorithms are involved in cancellation is that we want the cancellation logic to be encapsulated in one place so it can be called during both manual and automated cancellation.

NOTE: Different logic for different templates. Because both the **Cancel Criteria** and **Cancel Logic** algorithms are plugged-in on the overdue process's template, you can have different cancellation criteria and logic for different templates.

Overdue Processes Are Created From Templates

As described above, you set up *overdue process templates* to define the types of events and when they are executed. When an overdue process is created, its events are created by copying the event types from an overdue process template. The remaining topics in this section provide background information to assist you in setting up your templates.

The Big Picture Of Overdue Events

This section describes the various types of overdue events and their lifecycle.

How Are Overdue Events Created?

Overdue events are created as follows:

- The *Overdue Monitor* invokes **Overdue Monitor Rules** to periodically check your accounts (refer to *Overdue Rules Are Embodied In Algorithms* for how this works). An **Overdue Monitor Rule** creates an overdue process when an account violates your overdue rules. The overdue process has one or more overdue event(s). The number and type of events is controlled by the overdue process template specified on the **Overdue Monitor Rule**.
- Users can create an overdue process manually on *Overdue Process - Main*. To do this, they specify an overdue process template. The number and type of overdue events is defaulted from the template.
- An overdue event may be manually added to an existing overdue process by a user on *Overdue Process - Events*.

NOTE: Bottom line. Most overdue events are created by the system when it creates an overdue process for delinquent debt. If you need to create an ad hoc overdue event, you can either create an overdue process whose template contains the desired event OR link the desired event to an existing process.

Overdue Events Can Do Many Things

An overdue event can perform a wide number of activities as the logic is embodied in an algorithm. The following points describe how this works:

- Every overdue event references an *overdue event type*.
- The overdue event type, in turn, references an **Event Activation** algorithm.
- The **Event Activation** algorithm is invoked when the event is *triggered*.

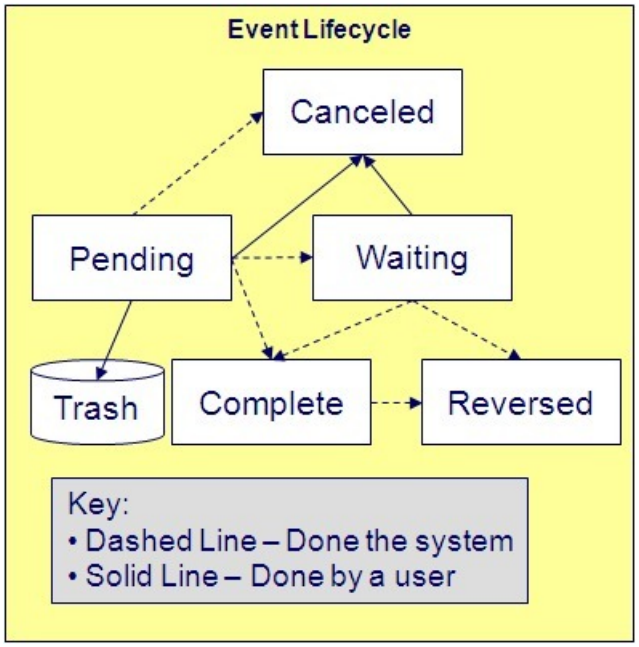
Overdue Event Information Is Overridable

- "Overdue event info" is the concatenated string of information that summarizes an overdue event throughout the system. The base-product logic constructs this string by concatenating the following information:
- The event type's description
- The event's status
- If it's **pending**:
  - If the event has a trigger date, the number of days until it's triggered plus the verbiage **day(s) from today**
  - Otherwise, the verbiage **dependent on other events**
- If it's **waiting**, the number of days, hours and minutes that it's been waiting
- If it's **canceled**, the cancel reason code's description
- If it's **complete**, the number of days, hours and minutes that it's been complete

If you'd prefer a different info string, you can develop a new algorithm and plug-it in on your event types. This design allows some / all event types to have an override info string.

Overdue Event Lifecycle

The following diagram shows the possible lifecycle of an overdue event:



Overdue events are initially created in the **Pending** state. An event can take myriad paths after it's created; it all depends on how you've configured the system. The topics in this section describe an event's lifecycle.

How and When Events Are Activated

An overdue event contains the date it should be activated; this is referred to as its trigger date. On this date, the Overdue Event Manager (a background process (**C1-ODET**)) invokes the **Event Activation** algorithm plugged-in on the event's event type. The **Event Activation** algorithm, in turn, will decide on the state in which to leave the overdue event (e.g., it may transition it to the **Complete** state or the **Waiting** state).

If a user can't wait for the Overdue Event Manager real-time, they can click a button on *Overdue Process - Main* to activate (and recursively trigger) events online / real-time.

Some implementations may wish to activate events using Overdue Control rather than the Overdue Event Manager, which allows a user to target overdue event types and count limits for activation. Refer to *The Big Picture of Overdue Control* for more information.

You control how an event's trigger date is populated by configuring the *overdue process template*. You are given two choices when you link an event type to an overdue process template:

- You can indicate the event should be assigned a trigger date when it is first created. You'd use this approach on the first event and events with no dependencies on earlier events. The following points describe how to configure the overdue process template to do this:
  - Indicate the event type is not dependent on other events, and
  - Define the number of days after the process's creation to use when calculating the trigger date.
- You can indicate the event should be assigned a trigger date only after earlier events are **Complete**. This technique should be used whenever you have an event that is only executed after other events are **Complete**. The following points describe how to configure the overdue process template to do this:
  - Indicate the event is dependent on other events, and
  - Define the number of days after the completion / cancellation of all dependent event(s) that the trigger date should be set to. The Overdue Event Manager sets the trigger date on such an event when it detects that all of its dependent events are complete / canceled.

NOTE:
Calendar vs. Workdays. When an overdue event is created by the system, its trigger date is set in accordance with your date arithmetic preferences. Refer to *Calendar vs. Work Days* for more information.

Activating Events Should Add A Log Entry

As described *above*, an overdue process has a log holding a history of meaningful events in the process's life. Most **Event Activation** algorithms will add an entry to the process's log.

These log entries are more than just an audit trail as they also reference the objects that are created during activation. For example, if an activation algorithm creates a customer contact, the ID of the customer contact will be referenced on the log (and end-users will be able to drill down on the log entry to see the customer contact).

Holding Events

You can prevent a **pending** event with a trigger date on / before the current date from activating by plugging-in a **Hold Event Activation** plug-in on the overdue process template. This might prove useful, for example, if you want to suspend an overdue process while another process, such as an appeal by the taxpayer, is outstanding. Then, when the other process is complete, the overdue process can start up where it left off. The base provides an algorithm type (*C1-OVRD_SUPP*) to suspend an overdue process while the account or person is linked to a *The Big Picture of Suppressions* configured to suppress overdue processes.

Some Events Wait For Something Before They Activate

Consider this scenario - you want an overdue event to create a To Do entry so a user can authorize the next phase of an overdue process. When this event activates, the event's activation algorithm will create a To Do entry, but it will not transition the event to **complete**. Rather, the overdue event will exist in the **waiting** state. While in the **waiting** state, the Overdue Event Manager will monitor the state of the To Do entry. When the To Do entry completes, the original overdue event can transition to the **complete** state and then latter dependent events can be triggered. The following points describe how to configure the system to support this type of event:

- The event type's **Event Activation** algorithm should behave as follows:
  - It creates the object on which the overdue event waits.
  - It must link this object to the overdue process by creating a log entry where the prime-key of the related object is referenced (in a foreign-key characteristic). This log entry should also reference the event.
  - It should leave the overdue event in the **waiting** state.
- The event type must have a **Monitor Waiting Event** algorithm. This algorithm is invoked each time the *Overdue Event Manager* executes. If the related object has transitioned to a "final" state, the originating overdue event is transitioned to the **complete** state (and then latter dependent events are triggered).

NOTE:
Bottom line. Two algorithms must be set up on an overdue event type to implement waiting functionality: an Event Activation algorithm that creates the monitored object and a **Monitor Waiting Event** algorithm to check on the state of the monitored object. The Overdue Event Manager has the dual responsibility of activating the event and monitoring its related object for completion (and then triggering the dependent events when it completes).

While the above example illustrated how an overdue event could create and then monitor a To Do entry, you can use this functionality to create and monitor any object that has an initial and final state. If the base product does not contain the algorithms you need, simply develop new ones using the base-product algorithms as examples.

How Are Events Canceled

A **pending** event will be **cancelled** automatically by the system when the overdue process is canceled. Refer to *How Are Overdue Processes Cancelled* for more information.

A user may cancel a **pending** or **waiting** event at their discretion.

Regardless of what triggers the cancellation, the **Cancel Logic** algorithm plugged in on the overdue event type handles the cancellation. This allows you to introduce additional cancellation logic should the need arise. Please note that the base product cancel algorithms insert a *log entry* when a user manually cancels an event.

Reversing Events

If for any reason, the action taken by event activation needs to be reversed, the **Event Reversal** algorithm may be executed to perform logic that reverses the effect of the activation.

Note that some event types may not be reversible. For example, P&I charges don't need to be reversed. The P&I calculation logic corrects itself, so it simply needs to be recalculated. Also, an event that creates a collection case doesn't support reversal given that a user is involved with a collection case. It is not clear what can / should be reversed.

FASTPATH: Refer to *overdue correction* link for more information.

Overdue Correction

Some implementations require the ability to correct an overdue process that is in progress. For example, a revenue authority may detect that a large group of accounts have been impacted by some incorrect information and steps are needed to attempt to reverse and restart collections for those account. This is an unusual circumstance that shouldn't happen very often.

NOTE: The product does not support this functionality for a single overdue process. It is only supported en masse using an entity correction record to manage the list of overdue processes effected and the action to take. Refer to *The Big Picture of Entity Correction* for more information.

The overdue correction business object provided (**C1-OverdueCorrectionControl**) supports the following options:

- Cancel Only. This option means that the identified overdue processes should simply discontinue processing. However, any actions already taken are considered done. The overdue correction process will cancel all **Pending** and **Waiting** events for the linked overdue processes. In addition the overdue processes themselves will be canceled.
- Reverse. This option means that in addition to discontinue future events for the identified overdue processes, the correction should also attempt to reverse actions taken by already activated events. This option requires an overdue event type to be provided. The overdue correction process will run the *event reversal* algorithm for any completed or waiting events for the linked overdue processes from the most recent event back to the input event. Any pending events are canceled along with the overdue processes themselves.
- Reverse and Restart. This option means the correction should attempt to reverse actions taken by already activated events and then recreate the template's events from a given event type. This option requires an overdue process template and a restart date along with the overdue event type to reverse to. The overdue correction process will perform the reversal logic as described above. In addition, it will rebuild the events for the overdue processes from the input overdue event type using the information on the overdue process template to rebuild subsequent events. Event dependencies are built as per the template. The trigger date for any new pending event that does not have a dependency is set to the input restart date.

  NOTE: Not all events may allow for restart. For example, if a given overdue process has a collection case in progress, a request to reverse and restart this process may not make sense. The *overdue event type* includes an event restart flag to indicate if events of this type support restart. If an overdue process in an overdue correction list that is configured to reverse and restart has an event in the list with this flag set to **Not Applicable**, the overdue process will not be processed. Refer to the entity correction validation algorithm *C1-OD-CORVAL* for more information.

NOTE: Refer to the correct entity algorithm *C1-OD-COROP* for more information.

The Big Picture of Collection Cases

In many tax authorities collecting unpaid debt is typically done in two phases: a series of unmonitored actions, typically letters, attempting to convince the taxpayer to pay, and a series of user-oriented actions such as contacting the taxpayer, setting up payment plans, and referring debt to a collection agency. The user-oriented actions are handled using a collection case. While not required, it is expected that many overdue processes will create a collection case when the overdue events did not prompt payment of the debt.

The topics in this section provide background information about collection cases.

Collection Case Overview

A collection case provides the functionality to record and track the interactions between the taxpayer and the user responsible for the collection. Many actions can take place once a collection case is created:

- A pay plan can be created
- The debt may be referred to a collection agency
- Letters may be sent to the taxpayer to advise of additional penalties
- A lien may be placed to secure the debt

How Are Collection Cases Created?

The activation of an overdue event creates a collection case. It is possible for an overdue process to be linked to more than one collection case over time but only one collection case can be active for an overdue process at a given time. The base package provides a sample overdue event activation algorithm (*dataDictionary?type=algtype&name=C1-CR-COL-CS*) to create a standard collection case.

Collection cases are created for persons not accounts. It is possible for collection cases that are linked to different overdue processes to be consolidated into a single case.

It is important to note that a collection case exists with respect to one or more overdue processes. A collection case's overdue process defines the objects in arrears. These objects are monitored to determine if the overdue process can be cancelled and the collection case can be closed.

Collection Case Lifecycle

The lifecycle of the collection case depends upon the configuration of the associated business object. The base package includes a sample standard collection case with a simple lifecycle, as follows:

- The collection case is initially created in the **Pending Investigation** state.
- The case will transition to the **Actions In Progress** state the first time a user initiates an action, such as creating a pay plan or sending a letter. Since many collection case actions happen in parallel, the expectation is that the case remains in this state until closed. Monitoring algorithms can be configured to check whether any of the actions in progress for the case have been waiting too long.
- The case may be **Transferred** to another collection case type or to an existing collection case.
- The user can manually transition the collection case to the **Uncollectible** state if they determine that no further action is to collect the debt is possible.

In addition to the standard actions for edit and state transition, a collection case may have special actions that apply to this type of collection, such as creating a pay plan or a collection agency referral. Additional actions are configured via the maintenance UI map. Refer to the base business objects for further details of the sample configuration.

How Are Collection Cases Closed?

Collection cases can be closed at the user's discretion or when the associated overdue process is cancelled. The base package provides a sample **Cancel Logic** algorithm (*C1-CL-COLLCS*) that closes any open collection cases linked to the process provided there are no other active overdue processes for the case.

Overdue Events Wait For The Collection Case To Conclude

Overdue events that create collection cases are perfect examples of events that *wait* for the object they create to complete before they, in turn, **complete.** After the collection case concludes, the originating overdue event will complete thus triggering its dependent events, such as writing off the debt. The base package provides a sample **Monitor Waiting Event** algorithm that checks whether all collection cases associated with the overdue process are in a final state.

Collection Case Type Defines Parameters

For each type of collection case, you must configure a collection case type to capture the appropriate parameters needed by the collection case actions. Typical parameters include:

- The To Do Type used to notify the responsible user that a new collection case has been created
- The default pay plan type to be used for a collection case of this type
- The To Do Types to be used to notify the responsible user if certain actions have been outstanding for too long without a response, such as a collection agency referral with no updates.

The Big Picture Of Collection Agency Referrals

Before debt is written off, many implementations refer the unpaid debt to a collection agency. The topics in this section describe how collection agency referrals are managed.

Collection Agency Referrals Overview

The system creates a *Collection Referral* record for a collection agency to track the debt that is to be collected. A collection referral is linked to an account. Collection referrals have history records that contain the amount of debt referred to the agency. Creating a history record triggers the interface of information to the collection agency. The method used to interface the information to the agency is defined on the collection agency's record. Refer to *Setting Up Collection Agencies* for more information.

How Are Collection Agency Referrals Created?

Users can create collection agency referral manually or by configuring an overdue event type with an activation algorithm that creates the referral. The base package sample activation algorithm (*C1-OE-AGYREF*) will refer the total unpaid debt for the overdue process to the collection agency with the least amount of referred debt. If you prefer different logic, you must develop your own algorithm.

In many tax authorities, creating a collection agency referral is one of the actions that would typically take place for a collection case. The base product BO for collection case **C1-StandardCollectioncase** can be used as an example of how to include the functionality to create a collection agency referral and link it to the collection case.

Cancelling Collection Agency Referrals

Collection agencies are notified of the cancellation of a referral by the creation of a new collection agency referral history record (with a type of cancel). This record will be interfaced to the agency in the same manner used to interface a new referral (see above). You can cancel a referral manually by simply creating a new collection agency referral history record (with a type of **cancel**).

If the collection agency is successful in obtaining the funds, a payment will be added. If the payment satisfies the cancel criteria defined on the overdue process template's cancellation plug-in, the overdue process will cancel. When an overdue process is cancelled, the cancel criteria on the overdue process's template are executed. If your implementation chooses to create collection agency referrals via overdue events, we strongly recommend plugging in an algorithm that will cancel the referrals when an overdue process is cancelled. If you choose to manage collection agency referrals via collection cases, the base package provides a sample business object status **Enter** algorithm (*C1-CCC-AGCYR*) to cancel any referrals linked to the collection case when it is closed.

If the collection agency is not successful in obtaining your funds after a given amount of time, you probably want to cancel the referral and write-off the debt. If your implementation chooses to create collection agency referrals via overdue events,

you set can set up your overdue process template to have an event that creates a collection agency cancellation X days after the referral. The base package provides a sample event activation algorithm (*C1-OE-AGYCAN*) to cancel all active collection agency referrals associated with the overdue process

NOTE:
Log entry. The base-product overdue event activation algorithms that make and cancel collection agency referrals insert rows in the overdue process's *log* to audit these events.

Write Offs Are Implemented Using Overdue Events

The system has been designed to allow overdue events on the original overdue process to write-off the objects being collected.

Starting Write-Off Oriented Events

While the system provides overdue event activation algorithms that manage write-off oriented actions, such as referral to collection agency, tax authorities typically handle those actions as part of collection case activity.

Most overdue process templates will be configured to contain an event that writes-off the unpaid balance of the debt. This event should be configured to be dependent on the event that created the associated collection case. A **Monitor Waiting Event**algorithm can detect the collection case is closed and complete the waiting event. This allows the subsequent write off event to be triggered.

Small Amount Write-Downs

Many organizations will write-down a debt whose value is small early in an overdue process. The base package overdue event activation algorithm to write off assessments (*C1-WRITE-OFF*) includes a parameter to support this requirement. (For example, indicate that you should write down an overdue process's assessment if their value is less than a threshold amount).

If your organization writes-down small amounts differently than large amount, simply set up an overdue event type to reference such an activation algorithm and position it in the appropriate place in the overdue process template.

Write Offs And Overdue Process Cancellation

If an overdue event writes off debt, the state of the process depends on your cancel criteria and where the overdue event is positioned in the overdue process. For example, if an overdue process has an overdue event that writes off small amounts of debt early in the process, a process whose debt meets the threshold criterion will be canceled when the event activates.

Contrast this to an overdue process where the last event writes off the debt. Because there are no other events to activate, the process will complete (i.e., it will not be canceled).

Calendar vs. Work Days

When you set up your overdue templates, you supply information that controls how the event's trigger date is calculated. You have two options:

- You can say that an event's trigger date can only be populated after earlier, dependent events are complete. For example, the 2 nd event is triggered 2 days after the 1 st event is complete.
- You can say that an event's trigger date is populated when the process is first created. You simply define the number of days after the start of the process when each such event should be triggered. For example, the 2 nd event can be triggered 7 days after the start of the process.

In addition to the above, an option defined on the *Feature Configuration for Overdue Processing* plays a part in the calculation of an event's trigger date:

- If you set the option to use **calendar days**, the trigger date of events will be set to the first workday on / after the calculated date. For example, if you indicate that the 2 nd event is triggered 7 days after the 1 st event, the system will add 7 days to the 1 st event's completion date. It then checks if this is a workday (and not a holiday); if so, this is the trigger date of the event; if not, it assigns the trigger date to the next workday.
- If you set the option to use **workdays**, the trigger date will be calculated by counting workdays. For example, if you indicate that the 2 nd event is triggered 7 days after the 1 st event, the system will count 7 workdays and set the trigger date accordingly.

NOTE:
Account's division controls the work calendar. The system uses the above information in conjunction with the *work calendar* associated with the account's division to determine workdays.

The Big Picture Of Overdue Control

The Overdue Event Manager (**C1-ODET**) is configured to activate all events whose trigger date has arrived. However, there are some implementations that want to control volumes and types of overdue events that are activated. The product provides an object called Overdue Control that may be used by implementations that prefer to work this way. The topics in this section provide more information about overdue control records.

How Are Overdue Controls Created?

A user manually creates an overdue control and define criteria such as overdue event type, tax type, revenue period and maximum number of events. (Note that the exact criteria is determined by the business object).

NOTE: The base overdue control BO includes criteria for limiting overdue processes by tax type or revenue period. As such, the processing is limited to overdue processes that collect on obligations. The algorithms supplied with the base business object would not work with other collecting on objects, such as assessment.

The overdue control record is created in the **Active** status. The base product attaches a deferred monitor to the active state so that the next step, selection of the overdue processes that satisfy the criteria, occurs in batch allowing for large volumes. Depending on an implementation's business practice, this deferred monitor may be one to run often during the day.

NOTE: Note that waiting events are not included in the selection. The assumption is that waiting events are only waiting for user intervention and that a user will progress the event as appropriate.

The system captures the list of overdue processes in an internal trigger table for technical purposes to aid in performance. The list is not visible to the user. The assumption is that exactly which overdue processes get triggered is not important. The record is simply trying to control volumes.

Once the overdue processes are selected, the record transitions to **Processed**. Note that the overdue control does not need any approval step.

Processing Events

Once an overdue control transitions to processed, the overdue processes that it selected in the trigger table may be activated. The transition from **Active** to **Processed** stamps the overdue control with the batch job that is responsible for activating the overdue events. The batch job is taken from the overdue control type. The current run number for that batch job is stamped as well. The base product provides a batch job (C1-AOPFR - Activate Overdue Process from Triggers) that is responsible

for finding overdue controls for the current run number and activating the appropriate events for the overdue processes listed in the trigger table.

The standard event activation logic is used when activating the overdue processes in the trigger table. As per standard activation logic one or more of the following may occur:

- The overdue process' cancel criteria algorithm is executed and if the criteria are satisfied, the overdue process is canceled.
- If applicable, the hold event activation algorithm is executed and if the hold conditions are met, the event activation is skipped.
- Once the initial event to activate is processed, any subsequent dependent events that are eligible to be activated will also be activated.

Creating Overdue Procedures

Your overdue procedures define how your organization collects overdue debt. In this section, we describe how to set up the data that controls these procedures.

CAUTION:
There are numerous ways to design your overdue procedures. Some designs will result in easy long-term maintenance; others will result in maintenance headaches. In this section, we provide information to help you understand the ramifications of the various options. Before you set up your overdue procedures, we encourage you to gain an intuitive understanding of these options by using the system to prototype the alternatives.

Set Up Tasks

The above topics provided background information about how overdue processing works. The following discussion summarizes the various set up tasks.

Overdue Event Types

You will find that most of the time spent setting up your overdue event types is spent setting up the objects that are referenced on the overdue event type algorithms. For example, if you use the base-product algorithms, you will set up the following:

- The various "types" for the objects created by the plug-ins. For example,
  - If an overdue event type creates a To Do entry, you must set up the To Do type.
  - If an overdue event type creates a customer contact, you must set up the customer contact type.
- *Foreign key characteristic types* that are used to reference the ancillary objects in the *log entries* (e.g., if an event creates a customer contact, the log references this customer contact using a FK characteristic type). Note, many of these will exist in the base-product.
- *Messages* that are used to define the verbiage in the *log entries*. For example, if you use the base-product algorithm that creates a customer contact, you must supply the desired message category and number that contains the verbiage that appears in the log when customer contacts are created. Note, messages have been set up for all base-product algorithms (this means you should not have to set up new messages).

  The only way to compile the complete list is to design the parameters for each overdue event type algorithm. Refer to *Overdue Event Type - Main* for the supported plug-in spots.

After you've set up the objects referenced on the algorithms, you can then set up the algorithms. Only then can you set up the overdue event types.

Overdue Process Templates

After your overdue event types exist, you can set up your overdue process templates. You will find that most of the time spent setting up your overdue process templates is spent setting up the objects that are referenced on the overdue process template algorithms. Refer to *Overdue Process Template - Main* for the supported system events.

Collection Classes

When setting up *collection classes*, make sure to indicate that these collection classes use the **Overdue** collection method (only accounts linked to collection classes designated as using the **Overdue** collection method or processed by the Overdue Monitor).

Collection Class Overdue Monitor Rules

After your overdue process templates exist, you can set up your **Overdue Monitor Rules**. These rules are algorithms plugged in on *Collection Class Overdue Rules*. You will find most of the time spent setting up these algorithms is spent setting up the objects referenced on the base-product algorithm.

Collections - Installation Options

For more information about collections installation options, refer to *Installation Options - Collections*.

Standard Collection Case Type

The base product supplies the business object **C1-StandardCollectionCase**, which is designed to cater for collection cases that incorporate standard actions such as creating pay plans and collection agency referrals.

The base product also supplies the business object **C1-StandardCollectionCaseType**, which defines the configuration information used by the standard collection case. To enable this functionality the following configuration tasks are needed:

- Define an appropriate To Do type and To Do role for sending a notification that a new collection case has been created for an overdue process.
- Define a Customer Contact class and type that reference the default letter template to be sent to a taxpayer for a collection case of this type.
- Define an appropriate To Do type and To Do role for sending a notification that the maximum days to wait after sending a letter before additional activity should occur has been exceeded.
- Define an appropriate To Do type and To Do role for sending a notification that the maximum days to wait after referring debt to a collection agency has been exceeded.
- Define a default Pay Plan obligation type for collection cases of this type
- Define appropriate reasons for closing a collection case due to the debt being uncollectible. Uncollectible reasons are defined using a customizable *lookup*. The lookup field name is **C1_COLL_CASE_UNCOLL_RSN_FLG**.
- Define a collection case type for the business object **C1-StandardCollectionCase**

Your implementation can define additional business objects to support collection case processing.

Feature Configuration

You must set up a *Feature Configuration* to define parameters that control various overdue processing options. Find the Feature Configuration record for the **Overdue Processing** feature type. (It may need to be defined if it does not exist).

The following points describe the various **Option Types** that must be defined:

- **Trigger Date Option** This option controls how the system computes the trigger dates on overdue events. Enter **Y** if the system should use workdays. Enter **N** if the system should use calendar days. Refer to *Calendar vs Work Days* for the details.
- **Champion Challenger Option.** You need only set up options of this type if your implementation implements *Champion / Challenger* functionality. Options of this type are entered in the format **ABnnn** where A is the overdue process template of the champion template, B is the overdue process template of the challenger template, and C is the percent of the time that the system should create the challenger template. The overdue monitor rule algorithm uses this option to override the champion overdue process template X% of the time with the challenger template. You may enter any number of these options (but only one per Champion Template).

Overdue Cancellation Reasons

Overdue events can be cancelled automatically and manually (at the discretion of a user). Regardless of the method of cancellation, a cancellation reason must be supplied. You set up your overdue event cancellation reasons using *Overdue Event Cancellation Reason - Main*.

Collection Agencies

If you refer debt to collection agents, you must set up your *collection agencies*.

Alert To Highlight Active Overdue Processes

If you want an alert to appear if the account has active overdue processes, you must configure an appropriate **Alert** algorithm (*C1-OD-PROC*). This algorithm is plugged in on the*Installation* record.

Alert To Highlight Active Collection Cases

If you want an alert to appear if the account has active collection cases, you must configure an appropriate **Alert** algorithm (*C1-CCAL-COCS*). This algorithm is plugged in on the*Installation* record.

Overdue Control Tasks

If your implementation chooses to use overdue control, the following tasks must be configured.

- You must define an appropriate *overdue control type*.
- The following batch jobs must be scheduled as per your implementation's business rules:
  - **C1-OCDM** (Overdue Control Monitor (Deferred)). This batch job selects overdue control records that are **Active** and transitions them to **Processed**. This step selects the overdue processes to include and creates the internal activation triggers. It also stamps the batch code for the next step and its current run number.
  - **C1-AOPFR** (Activate Overdue Process from Trigger). This batch job selects overdue controls that are stamped with this batch code and the current run number and calls the standard event activation logic for each overdue process.

NOTE: The recommendation is to schedule these batch jobs in the nightly run.

Setting Up Overdue Processing

The topics in this section describe how to set up the control tables to implement your overdue processing and collection procedures.

Setting Up Overdue Event Types

An overdue event type encapsulates the business rules that govern a given type of overdue event. Open this page by selecting **Admin** > **Overdue Event Type**.

> **NOTE: Recommendation.** Before using this transaction, we strongly recommend that you review *The Big Picture Of Overdue Events*.

Description of Page

Enter a unique **Overdue Event Type** code and **Description** for the overdue event type.

Use **Long Description** to provide a more detailed explanation of the purpose of the overdue event type.

Use **Event Restart** to indicate if the ability to restart an event of this type during overdue correction is **Applicable** or **Not Applicable**.

> **FASTPATH:** Refer to *Overdue Correction* for more information.

The **Algorithms** grid contains algorithms that control important functions. You must define the following for each algorithm:

- Specify the algorithm's **System Event** (see the following table for a description of all possible events).
- Specify the **Algorithm** to be executed when the System Event executes. 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.

The following table describes each **System Event** (note, all system event's are optional and you can define an unlimited number of algorithms for each event).

System Event	*Optional / Required*	*Description*
Cancel Logic	Required	This algorithm is executed to cancel an overdue event. Refer to *How Are Events Canceled* for the details. Click *here* to see the algorithm types available for this system event.
Event Activation	Required	This algorithm is executed to activate an overdue event on its trigger date. Refer to *Overdue Events Can Do Many Things* and *How and When Events Are Activated* for the details. Click *here* to see the algorithm types available for this system event.
Event Information	Optional - only used if you want to override an overdue event's info string	This algorithm is executed to construct an overdue event's override info string. Refer to *Overdue Event Information Is Overridable* for the details. Click *here* to see the algorithm types available for this system event.
Event Reversal	Optional - only used if your implementation supports overdue correction.	This algorithm is executed to reverse the effect of an overdue event. Refer to *Reversing Events* and *Overdue Correction* for the details.

		Click *here* to see the algorithm types available for this system event.
Monitor Waiting Events	Optional - only used if events of this type can enter the **Waiting** state	This algorithm is invoked by the Overdue Event Manager for events in the Waiting state. Refer to *Some Events Wait For Something Before Completing* for the details. Click *here* to see the algorithm types available for this system event.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_OD_EVT_TYPE*.

Setting Up Overdue Process Templates

An overdue process template encapsulates the business rules that govern a given type of overdue process. Open this page by selecting **Admin** > **Overdue Process Template**.

NOTE:
Recommendation. Before using this transaction, we strongly recommend that you review *The Big Picture Of Overdue Processes*.

Description of Page

Enter a unique **Overdue Process Template** and **Description** for the overdue process template.

Collecting On Object defines the type of object managed by this overdue process. This field actually references a *foreign key characteristic type* that references the managed object. For example, if this overdue process template manages overdue assessment FTs, you'd reference a foreign key characteristic that references the FT object.

The **Algorithms** grid contains algorithms that control important functions. You must define the following for each algorithm:

- Specify the algorithm's **System Event** (see the following table for a description of all possible events).
- Specify the **Algorithm** to be executed when the System Event executes. 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.

The following table describes each **System Event** (note, all system event's are optional and you can define an unlimited number of algorithms for each event).

System Event	*Optional / Required*	*Description*
Calculate Unpaid & Original Amount	Required	This algorithm is executed to calculate the unpaid and original amounts of the objects associated with the overdue process. These amounts are shown on the overdue process page and in the base-product *overdue info string*. Click *here* to see the algorithm types available for this system event.
Cancel Criteria	Required	This algorithm is executed to determine if an overdue process can be cancelled. Refer to *How Are Overdue Processes Cancelled* for the details. Click *here* to see the algorithm types available for this system event.
Cancel Logic	Required	This algorithm is executed to cancel an overdue process. Refer to *How Are Overdue Processes Cancelled* for the details.

		Click *here* to see the algorithm types available for this system event.
Hold Event Activation Criteria	Optional - only used if overdue processes of this type can be suspended while some condition is true	This algorithm is executed to determine if the activation of overdue events should be suspended. Refer to *Holding Events* for the details. Click *here* to see the algorithm types available for this system event.
Overdue Process Information	Optional - only used if you want to override an overdue process's info string	This algorithm is executed to construct an overdue process's override info string. Refer to *Overdue Process Information Is Overridable* for the details. Click *here* to see the algorithm types available for this system event.

The **Event Types** control the number and type of overdue events linked to an overdue process when it is first created. The information in the scroll defines these events and the date on which they will be triggered. The following fields are required for each event type:

- **Event Sequence.** Sequence controls the order in which the overdue event types appear in the scroll.
- **Overdue Event Type.** Specify the type of overdue event to be created.
- **Days After.** If **Dep on Other Events** is on, events will be triggered this many days after the completion of the dependent events (specified in the grid). Set this value to 0 (zero) if you want the event triggered immediately after the completion of the dependent events. If **Dep on Other Events** is off, events will be triggered this many days after the creation of the overdue process. Refer to *How and When Events Are Activated* for the details.
- If **Dep on Other Events** is on, define the events that must be completed or cancelled before the event will be triggered.
  - **Sequence** is system-assigned and cannot be specified or changed.
  - **Dependent on Sequence** is the sequence of the dependent event.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_OD_PROC_TMP*.

Setting Up Collection Classes

Every account has a collection class. This class is one of several fields that control the collection method applied to the account's debt. Open **Admin Menu, Collection Class** to define your collection classes.

Description of Page

Enter a unique **Collection Class** code and **Description** for each collection class.

Indicate a **Collection Method** of **Overdue** if the accounts belonging to this collection class are subject to overdue collection procedures. If accounts belonging to this collection class are not subject to collection, select **Not Eligible For Collection**. Please be aware that these accounts will NOT be reviewed for overdue debt.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_COLL_CL*.

Setting Up Collection Class Overdue Rules

Collection class overdue rules contain algorithms that impact how accounts associated with a given collection class, division and currency code are managed. Open this page by selecting **Admin,Collection Class Overdue Rules**.

NOTE:

Recommendation. Before using this transaction, we strongly recommend that you review *Different Overdue Rules For Different Taxpayers*.

Description of Page

Enter the **Collection Class**, **Division** and **Currency Code** to which the rules apply.

The **Algorithms** grid contains algorithms that control important functions. You must define the following for each algorithm:

- Specify the algorithm's **System Event** (see the following table for a description of all possible events).
- Specify the **Algorithm** to be executed when the System Event executes. 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.

The following table describes each **System Event**.

System Event	*Optional / Required*	*Description*
Overdue Monitor Rule	Required	This algorithm is invoked by the Overdue Monitor to analyze an account's debt. Refer to *How Does The Overdue Monitor Work* for the details. If you have multiple rules (and therefore multiple algorithms), please take care when assigning the sequence number, as the Overdue Monitor will invoke these rules in sequence order. Click *here* to see the algorithm types available for this system event.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_OD_RULE_ALG*.

Setting Up Overdue Event Cancellation Reasons

An overdue event cancel reason must be supplied before an overdue event can be canceled. Open this page by selecting **Admin, Overdue Event Cancel Reason**.

Description of Page

Enter an easily recognizable **Overdue Event Cancel Reason** and **Description** for each cancellation reason.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_OEVT_CAN_RSN*.

Setting Up Collection Case Types

A **Collection Case Type** defines the configuration information that is common to collection cases of a given type. The type of information captured on the collection case type is governed by the collection case type's business object.

To set up a Collection Case Type, select **Admin, Collection Case Type**.

The topics in this section describe the base-package zones that appear on the Collection Case Type portal.

Collection Case Type List

The Collection Case Type List zone lists every collection case type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent collection case type.
- The standard actions of **Edit, Duplicate** and **Delete** are available for each collection case type.
- State transition buttons are available to transition the collection case type to an appropriate next state.
- Click the **Add** link in the zone's title bar to add a new collection case type.

Collection Case Type Actions

This is a standard actions zone. The Edit, Delete and Duplicate actions and appropriate state transition buttons are available.

Collection Case Type

The Collection Case Type zone contains display-only information about a Collection Case Type. This zone appears when a Collection Case Type has been broadcast from the Collection Case Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Collection Case Type Log

This is a standard *log zone*.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *CI_COLL_CASE_TYPE* and *CI_COLL_CASE*.

Setting Up Collection Agencies

You must set up a collection agency for each such organization to which you refer delinquent debt. To define a collection agency, select **Admin, Collection Agency**.

Description of Page

Enter an easily recognizable **Collection Agency** code and **Description** for each collection agency.

A collection agency must be associated with a Person. Choose the **Person ID** of the organization from the prompt.

> **FASTPATH:**
> Information about how to set up persons is discussed in *Maintaining Persons*.

Turn on the **Active** switch if the collection agency is actively receiving referrals.

Specify the **Batch Control** that's used to route new and cancelled referrals to the collection agency. The batch control's description is displayed adjacent.

Where Used

Collection agencies are assigned to collection agency referrals when the collection agency referral background process executes. Refer to *The Big Picture Of Collection Agency Referrals* for more information.

Setting Up Overdue Control Types

An Overdue Control Type defines the configuration information that is common to overdue controls of a given type. Refer to *The Big Picture of Overdue Control* for more information.

The type of information captured on the overdue control type is governed by the overdue control type's business object.

To set up an Overdue Control Type, select **Admin** > **Overdue Control Type**.

The topics in this section describe the base-package zones that appear on the Overdue Control Type portal.

Overdue Control Type List

The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent overdue control type.
- Click the **Add** link in the zone's title bar to add a new overdue control type.

Overdue Control Type

The Overdue Control Type zone contains display-only information about an Overdue Control Type. This zone appears when an Overdue Control Type has been broadcast from the Overdue Control Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_OD_CTRL_TYPE*.

Defining Bankruptcy Options

A bankruptcy is a legal procedure for dealing with taxpayer debt problems. The goal of a bankruptcy process is to relieve the debtor of some if not all of his/her debt either through liquidation of assets or readjustment of debts.

The Big Picture Of Bankruptcy

The bankruptcy process begins when the debtor files a petition.

The bankruptcy petition can include the following information:

- A list of all creditors and the amount and nature of their claims
- Source, amount and frequency of income
- List of all property
- List of monthly living expenses, such as food, clothing, shelter, utilities, taxes, transportation, medicine, etc.

The petition date usually determines which of the debtor's obligations can be included in the bankruptcy. Any outstanding obligations as of the petition date are typically included.

Types Of Bankruptcy

Bankruptcy law typically classifies bankruptcy cases into certain types.

For instance, in the United States, bankruptcy cases are classified into 'chapters', the common ones being:

- Chapter 7 - Liquidation of assets
- Chapter 11 - Rehabilitation / reorganization for businesses
- Chapter 13 - Rehabilitation for individuals

The other chapters are:

- Chapter 9 - Bankruptcy for municipalities
- Chapter 12 - Rehabilitation for family farmers and fishermen
- Chapter 15 - Ancillary / international cases

Bankruptcy Courts

The bankruptcy petition is filed with the appropriate bankruptcy court, which assigns a case number/identifier, reviews the petition and eventually makes a ruling on the bankruptcy.

Key information about a court includes: court name, address, phone numbers, email addresses, web addresses, etc.

Bankruptcies Cover Obligations

A bankruptcy defines which of the debtor's obligations are covered.

The rules for determining eligible obligations are configurable in a plug-in spot on bankruptcy type. The base sample algorithm selects the taxpayer's obligations as of the petition date based on a specified reference date - e.g. obligation start date, obligation end date or obligation filing due date (for filing-based obligations only).

See *Setting Up the 'Determine Eligible Obligations'* for more information on how to configure this algorithm.

Other Related Persons On A Bankruptcy

Bankruptcies also identify other parties that are related to the case - e.g. attorney, trustee, administrator, etc. The information captured for each of these persons include: name, address, phone numbers, email addresses, etc.

Lifecycle Of A Bankruptcy

The steps in the bankruptcy process vary based on local bankruptcy laws.

The base product provides a bankruptcy business object **C1-Bankruptcy** that includes a number of common steps.

The bankruptcy is created in a **Pending** state that allows for all pertinent information to be set up before the bankruptcy takes effect. A **Pending** bankruptcy can be **Canceled**.

The bankruptcy goes to a **Review In Progress** step and stays in that state while the case is waiting for a decision from the court. This is the state where the bankruptcy is considered to be in effect. Therefore, any related suppressions on collection activity or penalty & interest are typically in place by this time. Proofs of claim can also be created at this point.

A bankruptcy case could result in any of the following decisions:

- Additional actions prior to discharge / dismissal - Depending in the type of bankruptcy, an agreed-upon payment plan may be established, to allow the debtor to repay some or all of his/her debt. The bankruptcy sits in an **Actions In Progress** state, while the payment plan is ongoing. The fulfillment of the payment plan typically leads to discharge. On the other hand, if the payment plan is not fulfilled, the bankruptcy could be dismissed or discharged, depending on the debtor's situation.
- **Discharge** - This action releases the debtor from personal liability from specific debts and prohibits creditors from taking any action against the debtor to collect those debts. In other words, the debt is written off. Certain types of debts

may be deemed non-dischargeable, and thus, continue to be collectible. Any related suppression(s) are end-dated when discharge occurs.

- **Discharge Denial** - The case can be denied discharge for reasons involving fraud, such as: transferring / destroying / concealing property within a certain period before or after filing bankruptcy, false oath / claim, concealed / falsified books on financial position, etc. No write offs are done in this case.
- **Dismissal** - The case can be dismissed for reasons such as failure to provide requested tax documents, failure to make payments under the confirmed plan, failure to pay administrative fees, debtor previously received a discharge for a similar bankruptcy case within a certain time period, etc. No write-offs are done in this case.

The bankruptcy can be **Closed** after all necessary post-decision tasks have been completed.

Refer to the **C1-Bankruptcy** business object metadata for an illustration of the bankruptcy lifecycle.

Creating Proofs Of Claim

A proof of claim is a written statement describing the reason(s) a debtor owes the creditor money. The creditor files this document with the court and/or the administrator of the bankruptcy case. In most cases, the proof of claim ensures that every creditor is given due consideration when resolving the debt. Some types of debts are given more priority than others. So the proof of claim is one of the most important documents that are reviewed in bankruptcy proceedings.

The proof of claim may be deemed filed if the debt appears in the bankruptcy petition's list of creditors. Creditors can file additional proofs of claim for any debt that may not be included in the petition.

The **C1-Bankruptcy** business object provides for an ability to create proofs of claims as customer contacts. The extract logic, however, is assumed to be the implementation's responsibility.

Bankruptcies Can Cause Suppression

When obligations are included in a bankruptcy case, penalty and interest and collection activity can be suppressed for these obligations.

The type of bankruptcy determines whether or not suppression is applicable. Bankruptcy types that cause suppression should specify a suppression type.

Suppressions can be automatically created when the bankruptcy goes into a certain state. The **C1-Bankruptcy** business object has an algorithm *C1-BK-CRTSPR* that creates and activates suppression when the bankruptcy enters the **Review In Progress** state.

During the course of the bankruptcy case, obligations may get added to or removed from the bankruptcy. In some exceptional cases, the petition date may change, which may cause some obligations to become ineligible. If suppression already exists, adding / removing obligations to / from the bankruptcy will also add / remove them to / from the suppressed entities.

Suppressions can be automatically released when the debt is discharged. Your implementation will need to build your discharge processing logic (e.g. write off) based on your specific business rules. That logic can be plugged in directly on the Discharged state or configured in overdue processing.

The base product provides two algorithms that you can use, depending on the option you choose:

- *C1-BK-RLSSPR* releases the related suppression when the bankruptcy enters a certain state. Plug this in the **Discharged** state.
- *C1-OE-RLBKSU* is an overdue event activation algorithm that releases the related suppression when the overdue event is triggered.

Suppression can be automatically canceled when the bankruptcy is canceled. The **C1-Bankruptcy** business object has an algorithm *C1-BK-CNLSPR* that does this.

Refer to *The Big Picture of Suppression* for more information about suppression.

Bankruptcies Can Create Pay Plans

Payment plans can be created as a result of bankruptcy. Certain types of bankruptcy, specifically those that seek readjustment of debts typically require that the debtor fulfill an agreed-upon payment plan.

The debt is usually not discharged until the payment plan is fulfilled. In some exceptional cases, the debtor may declare hardship, in which case, the court may decide to discharge the debt anyway.

The **C1-Bankrutpcy** business object provides for an ability to create pay plans for the bankruptcy. Creating a pay plan for the bankruptcy results in the cancellation/stopping of any pay plans that existed before the bankruptcy and that cover any of the obligations that are included in the bankruptcy. It also has logic to prevent automatic discharge when the bankruptcy-related pay plans are not yet fulfilled.

Assigning Bankruptcies To Responsible Users

One or more tax authority users may be assigned as responsible users on a bankruptcy case.

A responsible user can be assigned automatically when the bankruptcy is created. The base algorithm *C1-BK-ADDUSR* assigns the user who created the bankruptcy as a responsible user. This algorithm is plugged in on **C1-Bankrutpcy** business object's **Pending** state.

Setting Up Bankruptcy Options

The topics in this section describe the objects that must be defined as part of bankruptcy processing setup.

Setting Up Bankruptcy Types

Bankruptcy Types contain the rules that control how bankruptcies are processed.

To set up a Bankruptcy Type, select **Admin** > **Bankruptcy Type**.

The topics in this section describe the base-package zones that appear on the Bankruptcy Type portal.

Bankruptcy Type List

The Bankruptcy Type *List zone* lists every bankruptcy type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent bankruptcy type.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each bankruptcy type.
- Click the **Add** link in the zone's title bar to add a new bankruptcy type.

Bankruptcy Type

The Bankruptcy Type zone contains display-only information about a Bankruptcy Type. This zone appears when a Bankruptcy Type has been broadcast from the Bankruptcy Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_BANKRUPTCY_TYPE*.

Setting Up The 'Determine Eligible Obligations' Algorithm

The 'Determine Eligible Obligations' algorithm suggests a list of eligible obligations during bankruptcy maintenance.

A base sample algorithm *C1-BKTY-SEOP* selects obligations as of the petition date.

To use this algorithm, open **Admin** > **Algorithm**. Select the base algorithm type and configure the parameters accordingly.

Plug in the algorithm on your bankruptcy types.

Setting Up Suppression Types

Bankruptcy types that create suppression must specify a suppression type. Bankruptcy-related suppression types must specify a suppression entity level of **Obligation** .

Refer to *Suppression: Setting Up Suppression Types* for more details on setting up suppression types.

Setting Up Customer Contact Types For Proofs of Claim

To create proofs of claim using customer contacts, specify the customer contact type on the bankruptcy type. The Create Proof of Claim action on the bankruptcy will use this customer contact type.

You will need to build the extract logic for your 'proof of claim' customer contact types.

Refer to *Setting Up Customer Contact Options* for more details on customer contact types.

Setting Up Pay Plan Types And Pay Plan Recommendation Rules

Bankruptcy types that allow pay plans must specify a pay plan obligation type. In addition, if you need the system to suggest a payment schedule for bankruptcy-related pay plans, configure your pay plan recommendation rules accordingly.

Refer to *Setting Up Pay Plan Options* for more details on configuring for pay plans.

Setting Up Overdue Process Templates For Bankruptcy Discharge

If you opt to use overdue processing for discharging debt, you can specify the overdue process template for discharge on the bankruptcy type.

You can also use the following algorithms

- *C1-OE-RLBKSU* releases the related suppression when the overdue event is triggered. Plug this in your overdue process template as one of the last steps.
- *C1-BK-CRTODP* creates an overdue process when the bankruptcy enters a certain state. Plug this in the bankruptcy's Discharged state.

  Refer to *Creating Overdue Procedures* for more information on configuring overdue processing options.

Setting Up Bankruptcy Courts

Courts are set up as special types of Persons in the system. To configure court information:

- Set up a Person Type for courts. This could be a general one for all types of courts or a specific one for bankruptcy courts. You can reference the base business objects **C1-BusinessPersonType** or **C1-BusinessPerson** or your own business objects in this person type. Refer to *Defining Person Types* for more information.

- Create Person records for your bankruptcy courts, using the special Person Type you configured.

Setting Up Bankruptcy Filing Types

If you classify your bankruptcies into broad or specific categories, you can configure those categories as Bankruptcy Filing Type extendable lookup values.

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Bankruptcy Filing Type** extended lookup business object.
- The list of existing bankruptcy filing types are displayed in a standard *List zone*.
- Choose an existing bankruptcy filing type to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new bankruptcy filing type.

Setting Up Bankruptcy Claim Types

If you classify obligations into specific type of claims (e.g. for 'proof of claim' purposes), you can configure those types as Bankruptcy Claim Type extendable lookup values.

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Bankruptcy Claim Type** extended lookup business object.
- The list of existing bankruptcy claim types are displayed in a standard *List zone*.
- Choose an existing bankruptcy claim type to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new bankruptcy claim type.

Setting Up Milestone Types

You can define the types of milestone dates that can be captured on your bankruptcies as Milestone Type extendable lookup values.

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Milestone Type** extended lookup business object.
- The list of existing milestone types are displayed in a standard *List zone*.
- Choose an existing milestone type to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new milestone type.

Setting Up Bankruptcy Relationship Types

Base values for Bankruptcy Relationship Types are supplied. You can add your specific relationship types by updating the value for the BANKRUPTCY_REL_TYPE_FLG *lookup* field.

Setting Up Assignment Roles

Base values for responsible user's Assignment Roles are supplied. You can add your specific assignment roles by updating the value for the ASSIGNMENT_ROLE_FLG *lookup* field.

Setting Up An Alert For Highlighting Open Bankruptcies

To show an alert when the person in context has any open bankruptcies, define an algorithm for the *C1-BNKR-OPN* base algorithm type and configure the alert in Installation Options.

To configure the alert, open **Admin** > **Installation Options - Framework** and configure the algorithm you defined in the **Alert** system event.

Defining Audit Case Options

Tax audits are conducted to examine the accuracy of reported tax information. It could be as simple as reviewing the accuracy of the assessment on a single tax return or as complex as reviewing a number of obligations for specific filing periods.

Audits are also conducted when the tax authority finds that a taxpayer has failed to file certain tax returns that he/she is expected to file.

The Big Picture Of Audit Cases

A tax authority could have a number of reasons for initiating an audit. Internal reports and reviews usually identify specific taxpayers and/or accounts that need to be audited. The selection of taxpayers and/or accounts is based on specific criteria that the tax authority defines.

External interfaces could also send reports / information that prompt a tax authority to subject certain taxpayers to audits. The most common situation is when income information is reported for a taxpayer, who has either not filed a return or has filed but did not include that information.

Obligations Are Audited

An audit case identifies the primary account that is being audited. Any of the obligations of the primary taxpayer and other financially responsible persons on that primary account can be examined during the audit.

Other Related Persons On An Audit Case

Audit cases can also specify other parties that are related to the case. For instance, if the taxpayer is represented by an attorney, accountant, enrolled actuary, enrolled agent, paid preparer, etc., that representative is a related person on the case.

The information captured for the related persons can include: names, addresses, phone numbers, email addresses, etc.

Preparing For An Audit

An auditor may need to perform a number of tasks prior to the audit proper. These tasks can include: examining the taxpayer's information, looking at the overall picture of accounts, examining the latest tax forms, identifying any missed tax returns, creating obligations, etc.

Initial correspondence or meetings may also be conducted, to explain the audit process and request for additional documentation that will be needed during the audit.

Conducting Audits

There are three general methods of conducting audits:

Desk Audits

This method uses correspondence / letters to ask for additional information or to notify the taxpayer of a change in the assessment. In the latter case, the taxpayer responds by either sending in a payment or filing for an appeal.

Office Audits

In this method, the taxpayer or an authorized representative is asked to go to the tax authority's office and bring the necessary documentation.

Field Audits

This is considered the most aggressive method. A field audit officer goes to the taxpayer's or the authorized representative's residence or office. Tax-related information is examined on site.

Lifecycle Of An Audit Case

The steps in an audit case may vary depending on the type of audit case.

The base product provides an audit case business object **C1-AuditCase** that includes a number of common steps.

The audit case is created in a **Pending** state to allow for any preparatory tasks prior to starting the audit.

When the audit process starts, the audit case goes to the **Audit In Progress** state. If suppression is applicable, the suppression is typically created and activated at this point. The audit case stays in this state until findings are identified. The most common result of an audit is a new assessment. This happens when either an existing tax form is audited or when the auditor creates an audit form for tax returns that the taxpayer failed to file.

The findings of the audit can be subjected to any required reviews and/or approvals while the audit case is in the **Review In Progress** state. If there are multiple review steps, a separate Review process can be created from the audit case. Refer to *Creating Audit Case Reviews* for more information on audit case reviews.

If the findings do not pass the review - e.g. the proposed audit assessment is incorrect - the audit case can go back to the **Audit In Progress** , so that the necessary changes can be made. The audit case can cycle through the **Audit In Progress** and **Review In Progress** states until the findings pass the reviews, in which case, the audit case goes to the **Final Decision** state.

Any related suppressions are released when the audit case is **Closed** .

Audit cases that are in the **Pending** , **Audit In Progress** or **Review In Progress** states can be **Canceled** . Audit case cancellation also cancels any related suppressions.

Refer to the **C1-AuditCase** business object metadata for an illustration of the audit case lifecycle.

Audit Cases Can Cause Suppression

Certain processes or activity may be suppressed while an audit case is ongoing. These processes can include penalty & interest calculation, overdue processing and overpayment processing.

The type of audit case determines whether or not suppression is applicable. Audit case types that cause suppression should specify a suppression type.

Suppressions can be automatically created when the audit case goes into a certain state. The **C1-AuditCase** business object has an algorithm *C1-ADCS-CRSP* that creates and activates suppression when the audit case enters the **Audit In Progress** state.

Changes to the audit start date cause the related suppression's start date to also change.

While an audit is in progress, obligations may get added to or removed from the audit case. If suppression already exists, adding / removing obligations to / from the audit case will also add / remove them to / from the suppressed entities.

Suppressions can be automatically released when the audit case is closed. The **C1-AuditCase** business object has an algorithm *C1-ADCS-RLSP* that does this.

Suppression can be automatically canceled when the audit case is canceled. The **C1-AuditCase** business object has an algorithm *C1-ADCS-CNSP* that does this.

Refer to *The Big Picture of Suppression* for more information about suppression.

Audit Assessments

When the audit identifies necessary changes to the information that the taxpayer originally reported, it usually results in the calculation of a new assessment.

The most common way of determining this new assessment is through an audit form. The form could be the same form type as the one that the taxpayer filed (except that the form is marked as an 'audit' form) or it could be a special audit form type. In either case, the form is brought to a state where the user can review the details of the proposed assessment, see the potential impact to the obligation's balance and make additional changes, as needed.

In some exceptional cases, the adjustment may be created manually (i.e. not via tax form) or certain changes to the taxpayer information are made to trigger a change in the assessed tax (e.g. removing an exemption).

There are two common scenarios for initiating audit forms:

- The taxpayer being audited did not file a tax return. In this case, the auditor creates the tax form.
- An existing tax return is audited. The auditor creates the audit form by copying the details from the existing form and making the necessary changes. When the audit form posts, the assessment adjustment is created for the difference between the prior assessment and the new assessment.

The **C1-ParentTaxForm** business object provides an Audit action that allows a user to create an audit form from an existing posted form. Any tax forms that inherit from this business object will have the Audit action available. Refer to *Auditing Tax Forms* for more information on auditing existing tax forms.

The audit form is usually not posted until it has gone through proper approval / review and until the taxpayer has accepted the new assessment.

Should the taxpayer disagree with the changed assessment, he/she can file for an appeal. The tax authority may or may not choose to keep the audit open while the appeal is in progress. The audit assessment is not applied to the obligation's balance until a decision is made on the appeal. If the appeal is upheld, the new assessment is not created. On the other hand, if the appeal is denied, the new assessment is posted. Refer to *The Big Picture of Appeals* for more information on appeals.

Audit Case Reviews

The **C1-AuditCase** business object provides for an ability to create reviews from an audit case. This action is available when the audit case's current state supports it.

Refer to *Creating Audit Case Reviews* for more information on how to create audit case reviews.

Reviews have their own lifecycles, which depend on the associated business object. The **C1-AuditCaseReview** business object supplied in base defines a typical lifecycle for an audit case review. It follows a basic lifecycle, as described in *Review Lifecycle*. This business object also has logic to automatically transition the audit case when the last review completes.

Refer to *The Big Picture of Reviews* for more information on reviews.

Assigning Audit Cases To Responsible Users

One or more tax authority users may be assigned as responsible users on an audit case.

A responsible user can be assigned automatically when the audit case is created. The base algorithm *C1-ADCS-ASUR* assigns the user who created the audit case as a responsible user. This algorithm is plugged in on **C1-AuditCase** business object's **Pending** state.

Setting Up Audit Case Options

The following sections describe the objects that must be defined as part of the audit case processing setup process.

Setting Up Audit Case Types

An Audit Case Type defines the configuration information that is common to bankruptcies of a given type. The type of information captured on the audit case type is governed by the audit case type's business object.

To set up an Audit Case Type, select **Admin** > **Audit Case Type**.

The topics in this section describe the base-package zones that appear on the Audit Case Type portal.

Audit Case Type List

The Audit Case Type *List zone* lists every audit case type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent audit case type.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each audit case type.
- Click the **Add** link in the zone's title bar to add a new audit case type.

Audit Case Type

The Audit Case Type zone contains display-only information about an Audit Case Type. This zone appears when an Audit Case Type has been broadcast from the Audit Case Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_AUDIT_CASE_TYPE*.

Setting Up Suppression Types

Audit case types that create suppression must specify a suppression type. Audit-case-related suppression types must specify a suppression entity level of **Obligation** .

Refer to *Suppression: Setting Up Suppression Types* for more details on setting up suppression types.

Setting Up Customer Contact Types For Letters

Define the customer contact types for each type of letter that can be generated from the audit case. Build the extract logic for these customer contact types and define the letter templates accordingly.

Refer to *Setting Up Customer Contact Options* for more details on customer contact types.

Setting Up Review Process Controls For Audit Case Reviews

Audit case types that require reviews must specify a review process control, which defines the types of reviews that are required and the sequence in which they are conducted. The audit case's review process control will default from the value on the audit case type when the audit is created. This default can be overridden.

Refer to *Setting Up Review Options* for details on setting up Review Types and Review Process Controls.

Setting Up Audit Case Reasons

Identify the various reasons for creating an audit case and configure those reasons as Audit Case Reason extendable lookup values.

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Audit Case Reason** extendable lookup business object.
- The list of existing audit case reasons are displayed in a standard *List zone*.
- Choose an existing audit case reason to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new audit case reason.

Setting Up Audit Case Sources

If your audit cases can be triggered from a number of different sources, you can configure those sources as Audit Case Source extendable lookup values.

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Audit Case Source** extendable lookup business object.
- The list of existing audit case sources are displayed in a standard *List zone*.
- Choose an existing audit case source to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new audit case source.

Setting Up Audit Case Relationship Types

Base values for Audit Case Relationship Types are supplied. You can add your specific relationship types by updating the value for the AUDIT_CASE_REL_TYPE_FLG *lookup* field.

Setting Up Assignment Roles

Base values for responsible user's Assignment Roles are supplied. You can add your specific assignment roles by updating the value for the ASSIGNMENT_ROLE_FLG *lookup* field.

Setting Up An Alert For Highlighting Open Audit Cases

To show an alert when the account in context has any open audit cases, define an algorithm for the *C1-CCAL-ADCS* base algorithm type and configure the alert in Installation Options.

To configure the alert, open **Admin** > **Installation Options - Framework** and plug in the algorithm you defined in the **Alert** system event.

Defining Appeal Options

An appeal is an administrative review process used to manage a request from a taxpayer for a change to an official decision by a tax authority. The topics in this section describe how to configure the system to manage appeals.

The Big Picture of Appeals

A taxpayer can lodge an appeal for a variety of reasons. They may wish to dispute certain specific assessments or they may wish to appeal a number of charges related to an assessment such as systemic penalty and interest amounts. If tax returns are adjusted by tax authority staff or new obligations created as a result of an audit case, new assessments may be created that could be disputed.

An appeal process is used to capture the information related to an appeal, track the events involved in reviewing the appeal and record the decision made by each review process.

Taxpayer and Other Related Persons On An Appeal

An appeal process must be linked to a taxpayer. The taxpayer who lodged the appeal can nominate themselves as the primary contact or delegate to an authorized representative such as an accountant. The base package provides the ability to link other persons to the appeal, such as persons who are also financially responsible for the disputed charges or additional representatives such as attorneys. Each related person has a nominated relationship type.

Appeals Are Assigned to Responsible Users

One or more tax authority users may be assigned as responsible users on an appeal.

A responsible user can be assigned automatically when the appeal is created. The base algorithm *C1-AP-ADDUSR* assigns the user who created the appeal as a responsible user with an assignment role of **Primary** .

Appeals Can Cause Suppression

The obligations related to an appeal are usually suppressed from any collection activity or overpayment processing. The system provides the ability to specify which obligations should have activity suppressed as a result of the appeal.

Appeal types that require suppression need to specify a suppression type. The base algorithm *C1-AP-CRTSPR* automatically creates and activates a suppression object for the obligations linked to the appeal when the appeal enters a given state. The **C1-Appeal** business object is configured to create suppression when the appeal enters the **Ready For Review** state.

If an obligation is added to or removed from the appeal, the suppression object is updated accordingly. Refer to base algorithm *C1-AP-PSUCHG* for more details.

The base algorithm *C1-AP-CNLSPR* automatically cancels all suppression objects linked to the appeal when the appeal enters a given state. The **C1-Appeal** business object is configured to create suppression when the appeal enters the **Canceled** state.

The base algorithm *C1-AP-RLSSPR* automatically releases all suppression objects linked to the appeal when the appeal enters a given state. The **C1-Appeal** business object is configured to create suppression when the appeal enters the **Closed** state.

Refer to *Defining Suppression Options* for an overview of Suppression and details on setting up Suppression options.

Related Objects On An Appeal

An appeal can be linked to a number of related objects. Examples include the adjustments or assessments that the taxpayer is contesting, related documents, audit cases or audit forms.

You define appeal related object types by defining the characteristic used to reference the object and linking that characteristic to the appeal related objects entity. For example, to link an adjustment to an appeal you would first define a foreign key characteristic that references the adjustment object. Refer to *Characteristic Types & Values* for more information on setting up characteristic types.

The objects related to an appeal have an associated category. Valid values are defined using the Appeal Related Object category lookup field.

Validating an Appeal

Tax authorities may have rules governing whether an appeal can be accepted for processing. An appeal may be initially assessed to see whether it complies with these rules to determine if it should be rejected without commencing the review or evaluation process. The **C1-Appeal** business object includes a validation state to support this.

It is common for tax authorities to impose time limits on lodging an appeal. The base algorithm *C1-AP-CHKATL* provides an example of logic that validates an appeal's timeliness via a call to an Oracle Policy Automation rule. Refer to *Configuring the Appeal Timeliness Rule* for more details.

If issues are reported during validation, the **C1-Appeal** business object will transition to the **Issues Detected** state. The base algorithm *C1-AP-CRTODO* may be configured on the **Issues Detected** state to send a notification that the appeal is invalid. If the appeal passes validation, the business object enters the **Ready For Review** state.

The **C1-Appeal** business object allows an appeal to be manually transitioned to the **Ready For Review** state from the **Issues Detected** state if a user wishes to override the validation rules. Your implementation may choose to restrict this action to specific user groups using standard application service security configuration.

Canceling an Appeal

The **C1-Appeal** business object provides the ability to cancel an appeal at any point prior to commencing the review process. A monitoring algorithm may be configured to automatically cancel an appeal that has failed validation. The base algorithm *C1-AP-TRNISS* provides an example of logic that transitions an appeal to a canceled state if the appeal has failed due to a specific issue and sufficient time has elapsed to allow for follow up.

Appeals Follow a Defined Review Process

Once an appeal is accepted, it will be reviewed internally by the tax authority. This may involve a conference or hearing with the taxpayer. Once the tax authority has made a decision, the taxpayer may have the option of referring the appeal to other boards of review or judicial courts. The types of reviews available and the order in which the taxpayer can escalate the appeal normally follow a defined sequence.

The system provides the ability to define different types of reviews and a process control that specifies what review types are allowed and in what order for a given appeal process. Appeal types define the default review process control but the user may override this for a particular appeal.

The **C1-Appeal** business object provides a **Create Review** action that allows the user to add a new review sub-process. Users are presented with a list of the next allowable review steps, based on the reviews already undertaken for the appeal. Only one review can be active for an appeal at a time, so the action is only available if the most recent review linked to the appeal is closed.

An appeal moves from the **Ready For Review** state to **Review In Progress** when the first review is created. The appeal remains in that state, allowing the user to continue to add successive review events until the taxpayer accepts the response to the latest review or the appeal has passed through all possible internal and external review types.

Refer to *Defining Review Options* for more information on configuring reviews.

Appeal Reviews

The lifecycle of a review depends upon the configuration of the associated business object. The base **C1-AppealReview** business object defines a typical review for an appeal process. It follows a basic lifecycle, as described in *Review Lifecycle*.

In addition to the common functionality, a base algorithm is provided to create a customer contact for an appeal based on the response type. The base algorithm type *C1-RVW-CCCRR* is designed to be configured on the appeal **Response Recorded** state.

Closing Appeals

Once the last review process is complete, the appeal can be manually transitioned to the **Final Decision** state. The base algorithm *C1-AP-CINCRE* provides the ability to prevent an appeal from being transitioned to **Final Decision** before the most recent review is complete.

The appeal remains in the **Final Decision** state while users make the appropriate corrections to the taxpayer's account, depending on the outcome of the appeal. When no further action is required, the appeal can be transitioned to **Closed** .

The base algorithm *C1-AP-CPTODO* can be configured on the **Closed** or **Canceled** states to complete any outstanding to do entries for the appeal .

Monitoring Appeals

The actions required to progress an appeal are mostly manual. An appeal may be waiting for a review to be scheduled. Appeals can remain open while the taxpayer has the ability to escalate the appeal in response to the most recent decision. Periodic monitoring provides the ability to check whether an appeal has not progressed as expected.

The base algorithm *C1-AP-APWL* provides the ability to send a notification that the appeal has been waiting in a given state for too long. The algorithm is designed to be configured on the **Ready For Review** and **Final Decision** states.

The base algorithm *C1-RVW-CCCRR* provides the ability to send a notification that the appeal has been waiting in the **Review In Progress** state for too long after the latest review was completed.

Setting Up Appeal Options

The following sections describe the objects that must be defined as part of the appeal processing setup process.

Setting Up Appeal Types

Appeal Types contain the rules that control how appeals are processed.

To set up an appeal type, select **Admin** > **Appeal Type**.

The topics in this section describe the base-package zones that appear on the Appeal Type portal.

Appeal Type List

The Appeal Type *List zone* lists every appeal type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent appeal type.

- The standard actions of **Edit, Delete** and **Duplicate** are available for each appeal type.
- Click the **Add** link in the zone's title bar to add a new appeal type.

Appeal Type

The Appeal Type zone contains display-only information about an appeal type. This zone appears when an appeal type has been broadcast from the Appeal Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_APPEAL_TYPE*.

Setting Up Review Process Controls

An appeal type must be linked to a review process control, which defines the types of reviews required to process the appeal and the sequence in which they are conducted. The appeal's review process control will default to this value when an appeal of this type is added but may be overridden.

Refer to *Setting Up Review Options* for details on setting up Review Types and Review Process Controls.

Setting Up Suppression Types

An appeal type may be optionally linked to a suppression type, which defines the suppression entity level and the processes to be suppressed. If an appeal type references a suppression type, a suppression object of that type is automatically created when the appeal enters the appropriate state. Appeals suppress activity on selected obligations, so appeal types should reference suppression types with an entity level of **Obligation** .

Refer to *Setting Up Suppression Options* for details on setting up Suppression Types.

Setting Up Customer Contact Types

The base Review Response Type extendable lookup business object allows users to specify an optional customer contact type and class to be used when notifying taxpayers of the response given to their appeal review.

To set up a customer contact type, go to **Admin** > **Customer Contact Type** . Refer to existing help for more information on setting up customer contact types.

Setting Up an Alert to Highlight Open Appeals

The base algorithm type *C1-AP-OPEN* provides the ability to create an Alert if open appeals exist for the person or account in context.

To configure the alert, navigate to **Admin** > **Installation Options - Framework** and configure the base algorithm using system event **Alert**.

Configuring the Appeal Timeliness Rule

In order to use the base algorithm type that invokes the Oracle Policy Automation rulebase to validate an appeal's timeliness, you must define additional components, as follows:

- Define a web service adapter for the rule. Refer to *OPA configuration* for more details.

- Define a message category and number to be used to indicate that the appeal has failed the rule in the appeal's issues list. To set up a message, navigate to **Admin** > **Message** and add a new message for the 'Implementer's Messages' category.
- Create an algorithm for algorithm type *C1-AP-CHKATL* that references the web service adapter, message category and number as input parameters.
- Configure the algorithm on the **Validated** state for the appropriate appeal business objects, using the **Enter** system event.

Setting Up Appeal Relationship Types

Each related person on an appeal must be assigned to a relationship type. Valid types include **Accountant**, **Attorney**, **Court**, **Financially Responsible** and **Trustee**.

Go to **Admin** > **Lookup** and search for field **APPEAL_REL_TYPE_FLG** to add specific relationship types for your implementation.

Setting Up Assignment Roles

Each responsible user on an appeal must have an assignment role. Valid roles include **Primary**, **Secondary** and **Supervisor**.

Go to **Admin** > **Lookup** and search for field **ASSIGNMENT_ROLE_FLG** to add specific assignment roles for your implementation.

Setting Up Appeal Related Object Categories

Each related object on an appeal must be assigned to a category. Go to **Admin** > **Lookup** and search for field **APPEAL_REL_OBJ_CAT_FLG** to add specific categories for your implementation.

Defining Review Options

Some common case management processes such as appeals and audits, include steps in which the case is evaluated either internally by different groups within the tax authority, or externally by other agencies, such as judicial courts. These review processes typically follow their own lifecycle and may be part of a sequence of reviews that are escalated to higher levels of authority. The topics in this section describe how to configure the system to manage reviews.

The Big Picture of Reviews

A review provides the functionality to record key dates and determinations of a review process. Reviewers may be required to make a decision by a certain date and taxpayers may be given a fixed period of time to respond. A predefined list of responses is used to ensure review decisions are described and classified consistently. External reviews may be linked to the person or entity conducting the review, such as a court.

Defining Allowable Review Types and Sequences

A case management process may trigger more than one review. The types of reviews that can occur differ according to the process type. In addition, the order in which the allowable review types are conducted often follows a defined sequence. For instance, if a taxpayer lodges an appeal with a tax authority and disagrees with their decision, they may have the right to refer the case to one or more external courts. Audit cases may need to be approved by more than one supervising group before any action is taken.

Review process controls are used to define a particular sequence or hierarchy of review types. Users can specify what review types are allowed and in what order for a specific process control. The review process control also allows the user to indicate whether a given review type may be bypassed or repeated.

Creating Reviews

A review is created as a result of a user-initiated action invoked from a case management process. The base package supports the creation of reviews from an appeal or audit case. The **Create Review** action in the appeal or audit case portal zone guides the user to select the next available review type as governed by the associated review process control. The applicable review process control is defined on the appeal or audit case type.

It is important to note that a review exists as a sub-process linked to another object and cannot be added or viewed independently of the primary process. Refer to the documentation on *Reviewing an Appeal* and *Creating Audit Case Reviews* for more details on how to create and maintain reviews.

Review Lifecycle

The lifecycle of the review depends upon the configuration of the associated business object. The base package includes review business objects that are specific to appeals and audit cases that have the same simple lifecycle, as follows:

- The review is initially created in the **Pending** state.
- A **Pending** review may be manually transitioned to **Canceled**.
- The user can manually transition the review to the **In Progress** state once key information has been recorded or dates have been set. A review that has transitioned to **In Progress** cannot be canceled—it must progress through the **Response Recorded** and **Closed** states. A monitoring algorithm can be configured to check whether the review has been waiting too long in the pending or in progress states. Base algorithm *C1-RVW-TDRPD* provides an example of this logic.
- The user can manually transition the review to the **Response Recorded** state when a decision has been reached and the review has been updated with the appropriate review response code. A monitoring algorithm can be configured to automatically transition the review to the **Response Recorded** state when the review decision date has been populated and is on or before the business date. Base algorithm *C1-RVW-TRTRR* provides an example of this logic.
- The user can manually transition the review to the **Closed** state once all activities are complete. An algorithm can be configured to complete all open to do entries that are linked to the review. Base algorithm *C1-RVW-CMPTD* provides an example of this logic.

Setting Up Review Options

The following sections describe the objects that must be defined as part of the review processing setup process.

Setting Up Review Types

Review Types contain the rules that control how reviews are processed.

To set up a Review Type, select **Admin** > **Review Type**.

The topics in this section describe the base-package zones that appear on the Review Type portal.

Review Type List

The Review Type *List zone* lists every review type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent review type.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each review type.

- Click the **Add** link in the zone's title bar to add a new review type.

Review Type

The Review Type zone contains display-only information about a Review Type. This zone appears when a Review Type has been broadcast from the Review Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_REVIEW_TYPE* .

Setting Up Review Process Controls

Review types are logically grouped together in a review process control. The sequence of the review types in the review process control governs the order in which reviews may be created for processes associated with that control.

To set up a Review Process Control, select **Admin** > **Review Process Control**.

The topics in this section describe the base-package zones that appear on the Review Process Control portal.

Review Process Control List

The Review Process Control *List zone* lists every review process control. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent review process control.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each review process control.
- Click the **Add** link in the zone's title bar to add a new review process control.

Review Process Control

The Review Process Control zone contains display-only information about the review process control. This zone appears when a review process control has been broadcast from the Review Process Control List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_REVIEW_PROC_CTRL*.

Setting Up Review Response Types

Review response types are defined using an extendable lookup. To view or create review response types:

- Open **Admin** > **Extendable Lookup**
- Search for and select the **Review Response Type** extendable lookup business object.
- The list of existing review response types is displayed in a standard *List zone*.
- Choose an existing review response type to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new review response type.

The base Review Response Type extendable lookup business object allows users to specify an optional customer contact type and class. Refer to *Appeal Reviews* for details on how customer contacts are used in appeal reviews.

Defining Suppression Options

Suppression is a common function to stop certain events from taking place on a taxpayer's account. Common causes of suppression are processes such as bankruptcy cases, appeals or other internal investigations such as audit cases. The topics in this section describe how to configure the system to manage suppression.

The Big Picture of Suppressions

A tax authority may want to suppress activity on a taxpayer's account for a number of different reasons. In some cases it is a matter of internal policy, where the tax authority suppresses certain activities while processing an appeal or audit case. In other instances, it may be a statutory requirement imposed by the regulations surrounding a process initiated externally, such as a bankruptcy proceeding.

Some common types of activities that may be suppressed are penalty and interest calculation, overdue processing and overpayment processing. Levels of suppression can be large or small, encompassing a specific account, a tax role or a single obligation. Suppressions may be initiated and released manually or created and released automatically by other processes.

A suppression object is used to capture the specific entities and processes that are subject to a given suppression event.

Suppression Types

Suppression types define the rules governing how suppressions are created and managed. Certain types of suppressions may be created manually while others should only be created automatically by other processes. The processes affected by a suppression event are defined on the suppression type. Users may choose to add to or remove suppressed processes when the suppression is added manually.

Some types of suppression may be configured to be automatically released after a given period of time whereas other must be released manually.

Suppressing Process Activity

The activities that need to be suppressed can vary according to the reason for suppression - for example, if a tax authority receives notice that a bankruptcy proceeding is in place that affects taxes owed, penalty and interest (P&I) calculation and overdue processing activity must be suppressed until the bankruptcy case is closed.

In most cases, processing is put on hold starting at the suppression's start date and resumes on the suppression's release date. Penalty and interest calculations are an exception to this, as P&I may be recalculated to accommodate retroactive changes to the obligation's balance. Refer to *How Suppression Affects Penalty and Interest* for more details on P&I specific processing.

A suppression event does not actively "hold" work but rather affects how the associated processes work . It is the responsibility of the associated processes to consider effective suppressions whenever actions are initiated. The way in which suppression affects processing can differ according to the activity being suppressed. For example:

- P&I provides the ability to turn off P&I rules for the suppressed period
- Overdue Processing has a plug-in designed to hold event activation
- Business object -based processes such as overpayment processing need algorithms that suppress actions like state transitions

The system provides sample algorithms that can be used to suppress some common activities. Refer to *Configuring Overdue Processes For Suppression*, *Configuring Overpayment Processes For Suppression*, and *Configuring Obligation Types For P&I Suppression* for a description of how these processes can be suppressed.

Suppressed Entity Level Defines Suppression Scope

Suppression can apply at one of four entity levels - person, account, tax role or obligation. The base package provides common logic to determine if suppression is in effect for an entity. This logic considers all suppression records for the entity and its higher level entities.

Suppression scope can be summarized as follows:

- A person-level suppression object will also cause suppression on all the accounts for which that person has financially responsibility, all tax roles for those accounts and all obligations for those accounts.
- An account-level suppression object will also cause suppression on all tax roles for that account and all obligations for that account.
- A tax role-level suppression object will also cause suppression on all obligations for that tax role.
- An obligation-level suppression object will cause suppression only on that obligation.

It is possible for a given entity, such as an obligation, to be affected by suppressions with differing periods or at differing levels. For example, a suppression record may be manually added for an account with one or more obligations. A subsequent bankruptcy case may be created that includes one of those account's obligations. The system assumes that both suppressions are in effect for the obligation and that the period of suppression starts from the start of the earlier suppression record (for the account) until the later of the two release dates.

Note that the release date of a suppression event is the date on which the suppression ceases to have effect. Processes that are put on hold due to suppression will restart processing on the release date - for example, overdue events will be triggered on the day of release. For P&I calculations, P&I will be suppressed from the start date of the suppression until the day prior to the release date, inclusive.

Refer to the base business service **C1-GetEffectiveSuppressions** for more details on the common logic used to retrieve suppression details and periods.

How Suppression Affects Penalty and Interest

P&I processing caters for retroactive changes to an obligation's balance. It needs to consider suppressions that were in effect during the recalculation period even though the suppressions may now be released . The logic that gets effective suppressions considers both Active and Released states for P&I processing - these states are marked as 'P&I In Effect'. The result is that P&I rules are permanently turned off for the period of the suppression event.

If a suppression event is cancelled, it is regarded as if it had been deleted and no longer has an effect. Penalty and interest calculations are updated to reverse any prior effect of the suppression.

The base package provides a **Business Object - Post-processing** algorithm and a **Business Object Status - Enter** algorithm for the **C1-Suppression** business object that calculates P&I for entities affected by the suppression whenever key events occur. Refer to base algorithms *C1-SUPP-PI* and *C1-SUPP-UPI* for more details.

Your implementation may wish to prevent certain adjustments or charges being made to a taxpayer's obligations will suppression is in effect. The system provides an Adjustment Type Validation algorithm designed to return an error if suppression applied to the adjustment's obligation. Refer to *Configuring Adjustment Types For P&I Suppression* for more details.

Other Processes Create Suppression

Many suppression events will be created automatically as the result of initiating another process, such as a bankruptcy case or an appeal.

The process that causes the suppression is responsible for creating the suppression object with its associated entities and processes. The initiating process is also responsible for ongoing maintenance of the suppression object, including:

- Updating the related suppression date when a key date on the process is changed, such as an appeal submission date
- Adding or removing suppressed entities if the related entities are removed or added to the initiating process
- Cancelling or releasing the suppression at the appropriate time

Refer to *The Big Picture Of Bankruptcy*, *The Big Picture Of Appeals*, and *The Big Picture Of Audit Cases* for examples of processes that create and manage suppressions.

Auditing Suppressions

Because suppression events can cause retroactive changes to penalty and interest, key changes are audited. The base package provides **Business Object - Audit** algorithms for the **C1-Suppression** business object that log changes to the suppression dates and suppressed entities. Refer to base algorithms *C1-SUPP-DTCH* and *C1-SUPP-EDEL* for more details.

Suppression Lifecycle

The lifecycle of a suppression object depends upon the configuration of the associated business object. The base package includes a sample **C1-Suppression** business object with a simple lifecycle, as follows:

- The suppression is initially created in the **Pending** state. The suppression has no effect while in this state - the details may be edited without triggering other processing such as P&I updates. A deferred monitoring algorithm can be configured to automatically transition the suppression to **Active** if the start date is on or before the system date. Base algorithm *C1-SUPP-AC* provides an example of this logic.
- The user can manually transition the suppression to the **Active** state once the details are finalized. Suppressions that are created by other processes will typically be activated by the initiating process. An enter algorithm may be configured to trigger validation specific to the **Active** state. The base algorithm *C1-SUPP-VAAC* provides an example of this logic.
- A monitor algorithm may be configured on the **Active** state to check for suppressions that have been open too long. The base algorithm *C1-SUPP-MAXD* provides an example of this logic. An exit algorithm can be configured to complete all open monitoring to do entries when the suppression is no longer active. Base algorithm *C1-SUPP-CTDO* provides an example of this logic.
- A suppression object can be released by transitioning to the **Released** state or by updating the end date and having the suppression transition automatically. Suppressions that are created by other processes will typically be released by the initiating process. A monitor algorithm may be configured on the **Active** state to check for suppressions whose end date is populated and automatically transition them to **Released** . The base algorithm *C1-SUPP-REL* provides an example of this logic. An enter algorithm may be configured to provide a default end date or validate the existing end date for a suppression transitioned to **Released** . The base algorithm *C1-SUPP-END* provides an example of this logic.
- A suppression object can be **Canceled** from the **Pending** or **Active** states. Suppressions that are created by other processes will typically be canceled by the initiating process if appropriate.
- If the suppression affects penalty and interest, P&I should be updated for the related obligations when the suppression period starts and ends. An enter algorithm may be configured to trigger P&I updates when the suppression enters the **Active** , **Released** or **Canceled** states. Base algorithm *C1-SUPP-UPI* provides an example of this logic

Setting Up Suppression Options

The topics in this section describe the objects that must be defined as part of suppression processing setup.

Setting Up Suppression Types

Suppression Types contain the rules that control how suppressions are processed.

To set up a Suppression Type, select **Admin** > **Suppression Type**.

The topics in this section describe the base-package zones that appear on the Suppression Type portal.

Suppression Type List

The Suppression Type *List zone* lists every suppression type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent suppression type.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each suppression type.
- Click the **Add** link in the zone's title bar to add a new suppression type.

Suppression Type

The Suppression Type zone contains display-only information about a Suppression Type. This zone appears when a Suppression Type has been broadcast from the Suppression Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_SUPPRESSION_TYPE*.

Configuring Overdue Processes for Suppression

The base package includes a sample algorithm that provides an example of logic that determines if overdue event activation should be placed on hold when suppression applies. It is designed to be used for overdue processes that collection on obligations or assessments.

In order to use the base algorithm type to suppress overdue events, you must perform the following configuration:

- Create an algorithm for algorithm type *C1-OVRD-SUPP* . Refer to the algorithm type description of an explanation of the parameters required for the algorithm and their use.
- Navigate to **Admin** > **, Overdue Process Template** and configure the algorithm using the **Hold Event Activation Criteria** system event for each of the overdue process templates to which suppression applies.

Refer to *Setting Up Overdue Process Templates* for more information.

Configuring Overpayment Processes for Suppression

Business object based processes should be configured to check for suppression before triggering processing that should be placed on hold while suppression applies.

The base package includes sample algorithms for the Overpayment Process maintenance object that demonstrate how this can be achieved.

The base algorithm type *C1-OP-SUPPCH* provides an example of an enter algorithm that will issue an error if suppression applies to the overpayment process's obligation. This algorithm type would typically be configured on any state for the overpayment process business object that would affect the associated obligation's financial balance. Its purpose is to prevent online transitions to the invalid states.

The base algorithm type *C1-OP-SUPPMN* provides an example of a monitor algorithm that will indicate that transition should not take place if suppression applies to the overpayment process's obligation. This algorithm type would typically be configured on any state that is set up to automatically transition to a state for the overpayment process business object that would affect the associated obligation's financial balance. Its purpose is to prevent background transitions to the invalid states.

Refer to *Business Objects* for more information on business object lifecycles and configuration.

Configuring Obligation Types for P&I Suppression

The base functionality that supports penalty and interest calculations is designed to recognize discrete time periods in which differing calculation rules apply. This includes identifying periods where penalty and interest should not accrue. The base package supports functionality to suppress P&I calculation for a given period by providing a sample algorithm that identifies all the suppressed periods that apply to the overall calculation period and turns off all P&I rule processing for those date ranges.

In order to use the base functionality that suppresses P&I, you should configure algorithm *C1-PI-PR-SUP* on all appropriate obligation types. Refer to the algorithm type description for a detailed description of the way in which the periods of suppression are determined.

Refer to *The Big Picture Of Penalty and Interest* for more information on configuring penalty and interest rules.

Configuring Adjustment Types for P&I Suppression

In order to use the base algorithm type that validates whether a particular adjustment type can be created when suppression applies, you must perform the following configuration:

- Create an algorithm for algorithm type *C1-RVW-CCCRR* or use the base algorithm that applies the validation rule to all suppressed process types.
- If you wish to restrict the validation to suppressions of particular process types, create multiple algorithms specifying those process types as their input parameter.
- Navigate to **Admin** > **Adjustment Type** and configure the appropriate algorithm using the **Validate Adjustment** system event for each of the adjustment types that should not be created. Multiple **Validate Adjustment** algorithms may be configured to cover multiple processes for the same adjustment type.
- Refer to *Adjustment Type - Algorithms* for more information.

Setting Up Suppressed Process Types

The types of processes that can be affected by suppression are defined using an extendable lookup. To view or create suppressed process types:

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Suppressed Process Type** extendable lookup business object.
- The list of existing suppressed process types is displayed in a standard *List zone* .
- Choose an existing suppressed process type to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new suppressed process type.

Setting Up Suppression Creation Reasons

Suppression creation reasons are defined using an extendable lookup. To view or create suppression creation reasons:

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Suppression Creation Reason** extendable lookup business object.
- The list of existing suppression creation reasons is displayed in a standard *List zone* .
- Choose an existing suppression creation reason to view, edit, delete or duplicate.

- Use the **Add** link in the zone header to create a new suppression creation reason.

Alert to Highlight Active Suppressions

The base algorithm type *C1-CCAL-ASE* provides the ability to create an Alert if active suppressions exist for the person or account in context.

To configure the alert, navigate to **Admin** > **Installation Options - Framework** and configure the base algorithm using system event **Alert**.

Defining Work Management Options

This section describes miscellaneous functionality provided by the product to manage business processes that are not mainstream processes.

- Process flow is a generic maintenance object provided for implementations to build a business process for situations where the base product doesn't include a dedicated maintenance object.
- Entity correction is a maintenance object provided to support creation or updating of a group of object in bulk.

NOTE: This chapter also includes documentation for Case functionality, which is an older object no longer recommended. Process flow was provided to replace case functionality.

Configuring Process Flows

Process Flow is a business object based maintenance object provided to support workflow-type business processes or tasks when existing base product maintenance objects are not well suited for the task. The topics in this section describe the generic Process Flow entity and how it can be customized.

The Big Picture of Process Flows

The topics in this section describe process flow functionality.

Process Flow Is A Generic Entity

The Process Flow maintenance object is a generic entity that can be configured to represent custom entities and support automated workflows for a variety of applications. Each process flow references a business object to describe the type of entity it is. The base package does not provide any pre-configured business objects for Process Flow. Implementations configure their own business objects and related user interface to orchestrate the desired custom business process.

A status column on the process flow 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.

Process Flow's Business Object Controls Everything

A process flow's business object controls its contents, lifecycle and various other business rules:

- Its schema defines where each piece of information resides on the physical Process Flow maintenance object.

- It may define a lifecycle for all process flow instances of this type to follow. Each process flow 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 process flows of this type.

Using Process Flow Type To Control Process Flows

Each process flow must reference a process flow type. The process flow type will reference business objects that define:

- The structure and processing options of the process flow type itself.
- The structure, lifecycle, processing rules and processing options of the actual process flow.

The process flow type may be used to define parameters for the associated process. Examples of such parameters are:

- Account Types, Obligation Types or Tax Types applicable to the process.
- Adjustment Types for any financial transactions that are created as part of the process.
- Customer Contact Classes / Types for any correspondence triggered from the process flow.

Person / Account / Tax Role / Obligation References

Some types of processes may be person-oriented, others may be obligation-oriented or tax role-oriented, and still others may be account-oriented. Any combination of person, account, tax role and obligation is permitted on a process flow. The associated business object may be designed to include only those objects that are relevant to the particular type of process being modeled.

Process Flow Supports A Log

The Process Flow maintenance object supports a log. Any significant event related to a Process Flow may be recorded on its log. The system automatically records a log record when the process flow is created and when it transitions into a new state. In addition, any custom process or manual user activity can add log entries.

Access Rights

You can take advantage of the system's business object security functionality to restrict processes of a given type and states within the process lifecycle to certain user groups.

Additional Documentation

For more information about the various configuration tools available to customize the process flow maintenance object, refer to the Configuration Tools documentation.

Refer to *The Big Picture of Business Objects* for details of how to configure content, lifecycle and business rules. Refer to *State Transitions Are Audited* for more information on business object logs. Refer to *Granting Access To Business Objects* for more information on security options.

For more information about user interfaces, refer to *the Configurable User Interface* documentation.

Setting Up Process Flows

The following sections describe how to prepare process flow types.

Setting Up Process Flow Types

Each process flow requires a process flow type. To set up a process flow type, select **Admin** > **Process Flow Type**.

The topics in this section describe the base-package zones that appear on the Process Flow Type portal.

Process Flow Type List

The Process Flow Type List zone lists every process flow type. The following functions are available.

- Click a broadcast button to open other zones that contain more information about the adjacent process flow type.
- Click the **Edit** button to maintain the process flow type.
- Click the **Duplicate** button to copy the process flow type.
- Click the **Delete** button to delete the process flow type.
- Click the **Add** link in the zone's title bar to add a new process flow type.

Actions

This is a standard actions zone. The **Edit, Delete** and **Duplicate** actions are available.

Process Flow Type

The Process Flow Type zone contains display-only information about a process flow type. This zone appears when a process flow type has been broadcast from the Process Flow Type or if this portal is opened via a drill down from another page.

The UI Map used for the display is determined by the Display UI Map option on the associated business object.

The base package does not provide a business object for Process Flow Type. Each implementation must define its own business objects and user interfaces.

The Big Picture of Entity Correction

Entity correction is an object provided to perform an action on a group of records. The product provides base support for the following business use cases:

- Mass cancellation of tax forms.
- Mass cancellation of payment events.
- Mass cancellation / correction of overdue events for a group of overdue processes.
- Mass creation of suppressions for a group of taxpayers.
- Mass release of suppressions for a group of taxpayers.
- Mass retry for overpayment processes.

Implementations may follow the pattern to introduce additional business use cases. The topics in this section describe entity correction functionality.

How Are Entity Corrections Created?

The product expects that the entity correction is created via a web service. The expectation is that analysis is performed using an appropriate reporting or analysis tool to determine the records that require a special action to be performed. The reporting / analysis tool can then create a file and an appropriate mechanism like Oracle Service Bus transforms the file and

interfaces the information via a web service call. The web service is used to create the new entity correction and link the selected entities.

The product does not provide any logic for manually defining which entities to include in the entity correction.

The entity correction type includes configuration to indicate whether the list of IDs provided in a new entity correction represent internal system IDs or rather external references. Not all objects in the system have an external identifier. For example, when creating an entity correction for mass payment cancellation, there is no external identifier for payment events.

Entity Correction Lifecycle

Entity corrections require information unique to the particular instance that is typically not provided by the interface, for example, the reason for the correction. Some types of entity corrections require even more specific details in order to produce the mass action. For example, the mass suppression entity correction type requires a suppression reason and suppressed entity to be defined. The product supports two different entity correction lifecycles based on whether or not the additional information is needed prior to the validation of the entities.

- For use cases where the addition information is not required for validation of the entities, the business object **C1-EntityCorrectionControl** (Entity Correction) is provided.
  - A record is created from an external source and can be validated without any input from a user.
  - Once the record is validated, it is set to **Approval in Progress** at which time a user group is alerted via a To Do entry.

  If a given business use case does not require any additional information besides a correction reason and comments, this business object may be used as the transaction BO. The mass tax form cancellation and mass payment cancellation use cases use this business object. If a given business use case requires additional data where the user can provide the data when approving the record (i.e. it's not needed for validation) then this business object may be extended. The base business object **C1-MassSuppressionForTaxpayers** (Mass Suppression for Taxpayers) extends this business object.
- For use cases where the additional information is required for validation of the entities, the business object **C1-EntityCorrectionExtraInfo** (Entity Correction - Detail Validated) is provided. Once the additional data is provided the user transitions the record to pending to be picked up for validation. Once the record is validated, it is set to Approval in Progress at which time a user / group of users can be alerted via a To Do entry.
  - This business object is not expected to be used for any business use cases because by definition, additional data is expected from a user prior to validating. As such the expectation is that this BO is only used as a lifecycle BO for other business objects.
  - For a business use case that requires additional data prior to validation, this business object is extended. The business objects **C1-OverdueCorrectionControl** (Overdue Correction) and **C1–MassSuppressionRelease** (Mass Suppression Release) extend this business object.

Entity Correction Algorithms

The validation and processing of the entity correction is performed by algorithms linked to the entity correction type. This allows for various business use cases to be implemented without requiring different business objects. A specific business object for a type of entity correction is only required if there are explicit elements that need to be provided for a given use case.

- The validation algorithms are executed for the entity correction “parent” record. Validation algorithms are responsible for checking that the linked entities for the entity correction are valid records in the system and that the mass action is appropriate for each record. Any record that the validation algorithm detects should not be processed should be updated with an appropriate Link Status and for a link status of **Skipped**, an appropriate Skip Reason should be populated. Refer to the Entity Link Status section of *Common Entity Correction Functionality* for more information.
- The correction algorithm is called for each Active entity for the entity correction by the mass update background process. The correction algorithm should reverify any condition checked by the validation algorithm that could have changed

since that algorithm was run. For example, if the validation algorithm checked that the status of the entity was valid, the entity's status could have changed while waiting for approval so it should be checked again. If there is any reason that the entity should not be processed, the algorithm should return to the batch job the appropriate Link Status and for a link status of **Skipped**, an appropriate Skip Reason should be populated. The batch job will update the record. Otherwise, the algorithm should perform the appropriate mass action.

NOTE: Refer to the base provided algorithms for examples.

Entity Correction Approval

Once the validation of the entities linked to the entity correction has completed a user must review the entity correction and determine whether to approve or reject. The entity correction type defines the To Do type and To Do role used to alert the appropriate users that a entity correction is ready for review.

Mass Update of Entities

Once an entity correction is approved, the appropriate mass action may be performed on its related entities. The approval step stamps the entity correction with the batch job that is responsible for processing the mass action. The batch job is taken from the entity correction type. The current run number for that batch job is stamped as well. The base product provides a batch job (**C1-ENCOR -** Entity Correction Process) that is responsible for finding entity correction records for the current run number and running the entity correction type's Correct Entity algorithm for each entity with an **Active** link status.

Configuring Entity Corrections

If your implementation supports entity corrections, the following topics highlight configuration requirements.

In addition, your implementation should read the detailed descriptions for the base product business objects provided for Entity Correction Type (**C1-EntityCorrectionType**) and all the base Entity Correction business objects.

For additional detail about the overdue correction functionality, refer also to *Overdue Correction*.

Configuring Correction Reasons

Entity corrections include a correction reason that users can populate to record why the mass correction needs to occur. To view or create entity correction reasons:

- Open **Admin** > **Extendable Lookup**.
- Search for and select the **Entity Correction Reason** extendable lookup business object.
- The list of existing entity correction reasons are displayed in a standard *List zone*.
- Choose an existing entity correction reason to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new entity correction reason.

Configuring Skipped Reasons

When a linked entity is a valid record in the system, but for some reason is not in an appropriate situation for the requested action, the validation and correction algorithms should mark the entity's link status as **Skipped** along with a Skip Reason so that users may understand the reason the record was skipped. The product provides skipped reasons that may be used. Implementers may also choose to add additional values. To view or create skipped reasons:

- Open **Admin** > **Extendable Lookup**.

- Search for and select the **Entity Skipped Reason** extendable lookup business object.
- The list of existing skipped reasons are displayed in a standard *List zone*.
- Choose an existing skipped reason to view, edit, delete or duplicate.
- Use the **Add** link in the zone header to create a new entity skipped reason.

Configuring Entity Correction Algorithms

The system provides two plug-in spots on the entity correction type to perform logic that is specific to an entity correction use case.

- The validation plug-in is executed when an entity correction of this type transitions from pending to validated. It is responsible for ensuring that appropriate internal entity IDs are determined and valid for each entity linked to the entity correction.

  NOTE: Base plug-ins. Click *here* to see the algorithms types available for this system event.

- The correct entity plug-in is executed for each entity linked to an approved entity correction of this type and is responsible for correcting each entity as per business rules.

  NOTE: Base plug-ins. Click *here* to see the algorithms types available for this system event.

Setting Up Entity Correction Types

An Entity Correction Type defines the configuration information that is common to entity corrections of a given type. The type of information captured on the entity correction type is governed by the entity correction type's business object.

To set up an Entity Correction Type, select **Admin** > **Entity Correction Type**.

The topics in this section describe the base-package zones that appear on the Entity Correction Type portal.

Entity Correction Type List

The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent entity correction type.
- Click the **Add** link in the zone's title bar to add a new entity correction type.

Entity Correction Type

The Entity Correction Type zone contains display-only information about an Entity Correction Type. This zone appears when an Entity Correction Type has been broadcast from the Entity Correction Type List zone or if this portal is opened via a drill down from another page.

The information displayed in the zone is dictated by the entity correction type's business object . However, the expectation is that among other information, the Correct Entity and Validation algorithms are defined by every business object.

Please see the zone's help text for information about this zone's fields.

Where Used

Follow this link to open the data dictionary where you can view the tables that reference *C1_ENTITY_CORR_TYPE*.

Entity Correction Batch Jobs

The following batch jobs must be run to progress an entity correction record. Because the mass actions performed by an entity correction may be unusual and rare, implementations may choose not to schedule these jobs on a regular basis, but rather rely on communication between the business users and the technical support staff to run these batch jobs on an "on demand" basis.

- **C1-ENCTD** (Entity Correction Monitor (Deferred)). This batch job selects entity correction records that are **Pending** and validates that the record by calling the validation algorithms on the entity correction type. Once this batch job completes, the processed entity corrections are ready for approval.

  NOTE: Email routing. If your implementation plans to use email routing for the "entity correction requires approval" To Do entry, then the background process **F1-TDERR** (To Do External Routing) must be scheduled after the monitor batch job with the same or similar frequency.

- **C1-ENCOR** (Entity Correction Process). This batch job selects entity corrections that are stamped with this batch code and the current run number and calls the correct entity algorithm on the entity correction type.

Implementing Web Service Options

The product provides the following configuration to support interfacing a list of entities to link to an entity correction via a web service.

The XAI Inbound Service **C1-EntityCorrectionUpload** provides the API for the service script **C1-EnCrrUpld**. This service script includes logic creating an entity correction record and linking a group of entity IDs. Note that the script has been designed to be called iteratively for cases where a large file is received and the interface tool that processes the file can process it in chunks.

FASTPATH: Refer to the description of the XAI inbound service and the above service script for more information.

Defining Case Options

The Case functionality was originally provided as a highly configurable tool for managing business processes in situations where the base product didn't include a dedicated maintenance object. This functionality has now been superseded by either specific functionality (e.g. Appeals, Bankruptcy), or by the use of *Process Flow*.

The topics in this section describe how to configure the system to manage cases for those implementations that are continuing to use the legacy case functionality.

FASTPATH:
Refer to *Case Management* for a description of how end-users use cases.

The Big Picture Of Cases

The topics in this section provide background information about how to configure cases.

Case Type Controls Everything

Whenever a user creates a case, they must specify the type of case. The case type controls how the case is handled.

Case types hold the business rules that control cases. Since these business rules can sometimes be quite complicated, setting up case types requires planning and foresight. The topics in this section describe the type of business rules that can be configured on your case types.

Person / Account / Location Applicability

Some types of cases may be person-oriented, others may be location-oriented, and still others may be account-oriented. When you set up a case type, you define if its cases must reference a person, account, and/or location. Note, any combination of these objects is permitted on a case.

Contact Information Applicability

When a case is created as a result of contact from an outside party, you may want to keep track of how to contact its originator. For example, you may want to record the originator's email address or phone number. When you set up a case type, you define if contact information is required, optional or not allowed on its cases.

Business Object Association

A case type may reference a *business object*, which serves as a link between cases of that type and the options that are associated with the business object.

Additional Information

Some of your cases may require additional information (in the form of *characteristics*). When you set up a case type, you can define the additional fields that are required. In addition, you can define default values for these fields.

The case functionality also allows you to require characteristics when a case enters a given state. Refer to *Required Fields Before A Case Enters A State* for the details.

NOTE:
Requiring supporting documents. Because any *type of characteristic* can be referenced on a case, you can require references to supporting documents by requiring a **file location** characteristic.

Access Rights

You can take advantage of the system's *security* to restrict cases of a given type to certain users. The following points describe how to implement this type of security:

- Create an *application service* for each type of case you need to secure
- Define the access modes **Add, Inquire** and **Change** for each application service
- Define the applicable application service on each case type
- Link the appropriate *user groups* to each application service
- For user groups that are allowed to add cases of a given type, define **Add** as a valid access mode.
- For user groups that are allowed to view cases of a given type, define **Inquire** as a valid access mode
- For user groups that are allowed to change cases of a given type, define **Change** as a valid access mode

If you restrict access to a case type's cases, you can further restrict which users can work on cases given the status of the case. Refer to *Which Users Can Transition A Case* for more information.

Restricting access to cases is optional. If you don't specify an application service on a case type, all users (who have access to the case transaction) may access its cases.

Lifecycle

Many objects in the system have predefined lifecycle whose rules are governed by the base-package and cannot be changed. For example, an obligation starts out in the **Pending Start** state and eventually becomes **Closed** when it's been completely paid. You can't change the system to allow an obligation to starts its life in the **Closed** state.

The lifecycle of cases is not governed by the base product. Rather, you define the lifecycle of your cases when you set up their case types.

The topics in this section describe important lifecycle concepts.

Valid States versus State Transition Rules
A given case can have one or more potential valid states. State transition rules govern the states a case can move to while it's in a given state. When you set up a case type, you define both its valid states and the state transition rules.

Transitory States
You can define a state in a case type as **Transitory** if you do not wish the case to exist in a particular state. This means that a user will never see the case in this state. If the other states were marked as **non-transitory**, and an error were to occur during the transition from a transitory state, the case would roll back any changes to data made in the entered state (Enter Processing) along with the changes made in the transitory state, and would end up in the last non-transitory state prior to the transitory state.

One Initial State and Multiple Final States
When you set up a case type's states, you must pick one as the initial state. The initial state is the state assigned to new cases of a given type.

You must also define which statuses are considered to be "final". When a case enters a "final" state, it is complete and no further action is necessary. You might want to think of the "final" states as the potential outcomes of a case.

The "final" states are used by the system to differentiate between open and closed cases. For example, an alert highlights when the person / account / location in context has open cases (this alert only exists if you've plugged-in the appropriate installation *alert*).

Allowing A Case To Be Reopened
You can set up your state transition rules to allow a case to be reopened (i.e., to be moved from a final state to a non-final state).

Make Sure To Have A Canceled State
The system does not allow you to delete a case. Therefore, if you want to support logical deletion, you should have a status of **Canceled** early in a case type's lifecycle. Doing this allows a user to cancel (i.e., logically delete) a case.

NOTE:
Cancel reason. You might want to consider setting up your case types to require a cancel reason (in the form of a *predefined value characteristic*) when a user cancels a case. Refer to *Required Fields Before A Case Enters A State* for more information.

Buttons Allow A User To Transition A Case From Status To Status
When a case is displayed on *Case - Main*, a separate button is shown for each state into which the case can be transitioned. The case will transition to the appropriate state depending the button the user presses.

You may define the text displayed on the button differently for each state transition. This allows the action description to be varied according to the previous status. For example, the button to transition from **New** to **Active** may be labeled **Activate**, but the button to change from **Closed** to **Active** may be labeled **Reactivate**.

Refer to *Which Users Can Transition A Case* for instructions describing how to restrict users to specific actions.

State Transitions Are Audited
The system maintains an audit trail whenever a case transitions from one state to another. This audit is shown in the case's *log*.

Status-Specific Business Rules

As described in *Lifecycle*, when you set up a case type, you define the possible states its cases can pass through. The topics in this section describe business rules that can be configured for each state.

A Script That Helps A User Work Through A Case
You can define a *Business Process Assistant script* that helps a user work a case while it's in a given state. A user can then easily launch this script to help them work through a case in this state.

Please keep the following in mind when you're designing how to integrate BPA scripts with your cases:

- You can have a different script for each state.
- Rather than make a user launch a script by pressing a hyperlink on the *case page*, you can have the system automatically launch the script while the case is in a given state. Refer to *Script Launching Option* for more information.
- You can also have the system automatically launch a script when a user selects a To Do entry. Refer to *Launching Scripts When To Do Entries Are Selected* for more information.

FASTPATH:
Refer to *Scripts and Cases* for more information about how to streamline your case processing with scripts.

Required Fields Before A Case Enters A State
You can define additional fields (i.e., characteristics) that are required before a case can enter a given state. For example, You can indicate a case must reference a cancel reason before it enters a **Canceled** state

You do this by indicating that *characteristics* (that were optional when the case was added) are required when a case enters a given state.

Validation Before A Case Enters A State
You can define validation that executes before a case can enter a given state. For example, you can indicate the case must have been assigned a responsible user before it can enter the **Assigned** state. This validation logic is held in algorithms that are plugged in on the case type and therefore you can define any type of validation.

Additional Processing When Entering A State
You can define additional processing that should happen when a case enters a given state. For example, you can have a *To Do entry* created when a case enters a given state. This additional processing is held in algorithms that are plugged in on the case type.

You can also incorporate state transitioning logic within routines that are executed when a case enters a state, so that you do not need to rely upon CASETRAN to transition your cases. Note that your Exit Validation and Exit Processing logic, if configured for the case state, will still be executed as part of the state transition. Auto-Transition logic for this state will be ignored during this transition.

Validation Before A Case Exits A State
You can define validation that executes before a case can exit a given state. For example, you might want to check the account's balance is less than a given value before a collection case can exit a given state. This validation logic is held in algorithms that are plugged in on the case type and therefore you can define any type of validation.

Additional Processing When Exiting A State
You can define additional processing that should happen when a case exits a given state. For example, you can have a *To Do entry* automatically completed when a case leaves a certain state. This additional processing is held in algorithms that are plugged in on the case type and therefore you can define any type of additional processing.

Automatic Transition Rules
You can define rules that automatically transition a case into a different state using auto transition rules. For example, if you have a case that sends a letter to a taxpayer, it can be configured to transition to the **Follow Up** state 1 week after the letter is sent. These rules are held in algorithms that are plugged in on the case type and therefore you can define any type of automatic transition rules.

Cases in a state with automatic transition rules are monitored by the *CASETRAN* background process. Each time this program runs, the respective automatic transition plug-in is called for each such case and it transitions the case if the condition applies.

When the user adds a new case or changes the state of a case manually the system attempts to auto-transition the case to subsequent statuses as necessary. If auto-transition rules apply to the new state (and to subsequent ones) they would be executed right away. In other words, you don't need to wait for the auto-transition background process to be executed. An indication that the case was auto-transitioned online is displayed right below the action buttons section.

Auto-Transition Errors. Online auto-transition is performed recursively committing each successful state transition to the database. It is performed up to 100 times or until an error is encountered during the process. If this happens, auto-transition stops at the last **non-transitory** state into which a successful transition had occurred. Two case log entries will be generated automatically - one containing the message that a transition error has occurred, and a second containing the actual error message. A To Do entry will also be generated automatically upon rollback. The type of this To Do entry will be taken from 1) the **Case Transition Exception To Do Type** for the **Business Object** associated with the case type, and if this is not populated, 2) the **Exception To Do Type** indicated on the Case Options Feature Configuration. All of the above error handling is true for both batch and online processing of cases.

NOTE:
Triggering Auto-Transition. If you have a customized process that affects the state of a case and you want the case to be auto-transitioned right away, i.e. not wait for the next scheduled *CASETRAN* background process to execute, you can customize that process to trigger auto-transition for the specific case, or you can put the state transition logic into the routines that execute at state entry time.

Script Launching Option
You can define whether the script associated with a given state is to be automatically launched while the case is in that state. The system supports the following options:

- Launch the script only if no script is currently active.
- Always launch the script unless this specific script is currently active.

CAUTION:
With this option, if a script is currently open in the page's BPA script area then it will be automatically closed and the case script will open.

- Do not automatically launch the script.

You do this by plugging-in a **Script Launching** algorithm for the given state. If no such plug-in is provided the script is not automatically launched.

Which Users Can Transition A Case Into A State
If you have *restricted access* to a case type, you can further restrict which user groups are allowed to transition a case into specific states. The following points describe how this is done:

- Define actions on the *application service* defined on the case type. You must define an action for each status that you need to secure.
- Define each status's corresponding action. Note, you only need to link a status to an action if it's secured. Any user with *access* to the case type can perform statuses that aren't linked to actions.
- Define the transition role for each status's valid next status. You can assign valid next statuses to be reachable via system (only), or system and user.
- Define which *user groups* have access to the actions (i.e., statuses). In addition, these user groups should have access to the **Change** action.

Responsible User Applicability

Some of your cases may require a "responsible user". This is the user who has overall responsibility for the case. When you set up a case type, you define if a responsible user is required, optional or not allowed on its cases.

The following points describe how to set up the system if a responsible user is not required when a case is first created, but is later in its lifecycle:

- Indicate that a responsible user is optional on the case type
- Plug-in either an *exit validation* or *entry validation* algorithm on one of the case type's states to require a responsible user at some point in a case's lifecycle

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NOTE:
Address To Do entries to the responsible user. If you use the *base-package algorithm* to create a To Do entry when a case enters a given state, you can indicate that the To Do entry should be addressed to the responsible user on the case.

Scripts and Cases

There are three ways *Business Process Assistant scripts* can be used to manage cases:

- You can create a BPA script to help users create a case. For example, a script can help a user create a new formal appeal.

Using a script to create a case can save a user a lot of time (and training efforts). This is because the script can automatically populate many fields on the case based on answers to questions.

Refer to *Initiating Scripts* for a description of how end-users initiate scripts.

- You can create a script to help users work on a case when it's in a given state. Refer to *A Script That Helps A User Work A Case* for more information.
- You can *set up your case types to create To Do entries* to notify users when cases exist that require their attention. Users can complete many of these To Do entries 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 formal appeal that requires investigation. You can set up the system to execute a specific script when a user selects this To Do entry. This script might guide the user through the investigation process (and help them update the case). Refer to *Executing A Script When A To Do Entry Is Selected* for more information.

To Do's and Cases

The topics in this section provide background information about how to facilitate case functionality with *To Do entries*.

Creating and Completing To Do Entries

You can configure your case types to create and complete *To Do entries* when a case enters or exits a state. To implement this, you can set up the case type as follows:

- Plug-in an *entry processing* algorithm on the status where you wish a To Do entry to be created or completed.
- Plug-in an *exit processing* algorithm on the state where you wish the To Do entry to be created or completed.

Launching Scripts When To Do Entries Are Selected

You can set up your case types to create To Do entries to notify users when cases exist that require their attention. Users can complete many of these To Do entries 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 formal appeal that requires

investigation. You can set up the system to execute a specific script when a user selects this type of To Do entry. This script might guide the user through the investigation process. Refer to *Executing A Script When A To Do Entry Is Selected* for more information.

All To Do Entries Are Visible

When a case is displayed on *Case Maintenance*, the system summarizes the number of To Do entries associated with the case (if you've *set up your To Do types* appropriately).

Setting Up Case Options

The topics in this section describe how to set up the system to enable case functionality.

CAUTION:
The topics in this section assume you thoroughly understand the concepts described under *The Big Picture Of Cases*.

Installation Options

Case Info May Be Formatted By An Algorithm

The case information displayed throughout the system is controlled by a plug-in.

The system first looks to see if the case type references a case business object and if the business object defines an information plug-in. If a BO is not provided or if that BO does not define an information algorithm, the system looks for an information algorithm plugged into the case maintenance object.

If no plug-ins are found on the BO or the MO, the system looks for a plug-in algorithm on the *Case Type*.

If such an algorithm is not plugged-in on the Case Type, the system looks for a corresponding algorithm on the *installation record*.

Alert Info Is Controlled By An Installation Algorithm

An algorithm that is plugged in on the *installation record* is responsible for formatting the alerts that highlight if the person / account / location in context has open cases. Refer to *CCAL-CASE* for an example of this algorithm.

Setting Up Application Services

As described under *Access Rights*, you can prevent unauthorized users from accessing cases. The following points describe how to implement this type of security:

- Create an *application service* for each case type that needs to be secured
- Create an action on the application service for each status you need to secure
- Link the valid *user groups* to the application service and define which actions they can perform
- Define the application service on the *case type*
- Define the related action for each status on the *case type / status*

Setting Up Scripts

As described under *Scripts and Cases*, BPA scripts can facilitate the creation and working of cases. Refer to the *Defining Script Options* for instructions describing how to set up scripts.

Setting Up To Do Types

As described under *To Do's and Cases*, To Do entries can be used to highlight cases that require user attention.

The following points provide a high-level description of how to create (and complete) To Do entries for a case type:

- Create a To Do type for each different type of To Do entry used during a case's lifecycle
- On the To Do type, think carefully about the roles whose users can work on the entries
- Also consider if you would like a BPA script launched when a user selects the entry
- Specify the To Do type on the appropriate *entry processing* or *exit processing* algorithm
- If you want the system to automatically complete To Do entries, specify the To Do type on the appropriate *entry processing* or *exit processing* algorithm

Please be aware that the case maintenance transaction highlights the number of open and being worked To Do entries linked to the case being displayed on the page. However, the system can only do this if the To Do entries reference a *foreign-key characteristic* whose foreign key references the case table. If you use the *CSEN-TD* algorithm to create To Do entries when a case enters a given state, this algorithm will do this for you if:

- You have set up a *foreign-key characteristic type* whose *foreign key* references the case table
- In addition, the characteristic type must reference a characteristic entity of **To Do Entry**

Setting Up Characteristic Types

As described under *Additional Information*, some of your cases may require additional information (in the form of *characteristics*). If this is true, you must set up the characteristic types before setting up the case types.

Refer to *Setting Up To Do Types* for instructions regarding a characteristic type that must be set up in order for the system to know the To Do entries that are associated with a case.

If you use the *CSEN-CC* algorithm to create customer contacts when a case enters a given state, you should set up a *foreign-key characteristic type* as follows:

- Its *foreign key* must reference the case table
- In addition, the characteristic type must reference a characteristic entity of **Customer Contact**

Setting Up Case Types

The case type maintenance transaction is used to maintain your case types. The topics in this section describe how to use this transaction.

FASTPATH:
Refer to *The Big Picture Of Cases* for more information about how a case type encapsulates the business rules that govern a case.

Case Type - Main

Use this page to define basic information about a case type.

Open the case type page by selecting **Admin** > **Case Type**.

Main Information

Enter a unique **Case Type** code and **Description** for the case type.

Use **Long Description** to provide a more detailed explanation of the purpose of the case type.

Person Usage controls the applicability of a person on cases of this type. Select **Required** if a person must be defined on this type of case. Select **Optional** if a person can optionally be defined on this type of case. Select **Not Allowed** if a person is not allowed on this type of case.

Account Usage controls the applicability of an account on cases of this type. Select **Required** if an account must be defined on this type of case. Select **Optional** if an account can optionally be defined on this type of case. Select **Not Allowed** if an account is not allowed on this type of case.

Location Usage controls the applicability of a location on cases of this type. Select **Required** if a location must be defined on this type of case. Select **Optional** if a location can optionally be defined on this type of case. Select **Not Allowed** if a location is not allowed on this type of case.

If you need to restrict access to cases of this type to specific user groups, reference the appropriate **Application Service**. Refer to *Setting Up Application Services* for the details of how to secure access to your cases.

If you are configuring a case type to handle the processing of data defined via a **Business Object**, associating the case type with a business object serves to link the properties of the business object (e.g. BO options) with cases of that type. Refer to *Business Objects* for further information. In addition, refer to *Automatic Transition Rules* for information on the role of BO options in case auto-transition errors.

Responsible User Usage controls the applicability of a responsible user on cases of this type. Select **Required** if a responsible user must be defined on this type of case. Select **Optional** if a responsible user can optionally be defined on this type of case. Select **Not Allowed** if a responsible user is not allowed on this type of case. Refer to *Responsible User Applicability* for more information.

Contact Information Fields

There are three contact information fields: **Contact Person & Method Usage**, **Contact Instructions Usage**, and **Callback Phone Usage**. These fields are used to determine whether or not each type of contact information must be entered on case records with this case type. Select **Required** if the contact information must be entered, select **Optional** if the user can choose whether or not to include the contact information on this type of case, or select **Not Allowed** if the contact information cannot be entered on this type of case.

Algorithms

The **Algorithms** grid contains algorithms that control functions for cases of this type. 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.

The following table describes each **System Event**.

System Event	*Optional / Required*	*Description*

Case Information	Optional	We use the term "Case information" to describe the basic information that appears throughout the system to describe a case. The data that appears in "case information" may be constructed using an algorithm plugged in here. Refer to *Case Info May Be Formatted By An Algorithm* for more information on when this algorithm is used. Click *here* to see the algorithm types available for this system event.

Case Type Tree

The tree summarizes the case type's lifecycle. You can use the hyperlinks to transfer you to the **Lifecycle** tab with the corresponding status displayed.

Case Type - Case Characteristics

To define characteristics that can be defined for cases of this type, open **Admin** > **Case Type** and navigate to the **Case Characteristics** tab.

Description of Page

Use **Sequence** to control the order in which characteristics are defaulted.

Turn on the **Required** switch if the **Characteristic Type** must be defined on cases of this type.

Turn on the **Default** switch to default the **Characteristic Type** when cases of this type are created.

Enter a **Characteristic Value** to use as the default for a given **Characteristic Type** when the **Default** box is checked.

Refer to *Required Fields Before A Case Enters A State* for a description of how you can make option characteristics required at later stages in a case's lifecycle.

Case Type - Lifecycle

Case types that involve multiple users and multiple potential outcomes have complex lifecycle. Before you can design a case type's lifecycle, it's important that you thoroughly understand the concepts described under *Lifecycle* and *Status-Specific Business Rules*. After thoroughly understanding these concepts, we recommend you perform the following design steps:

- Draw a "state transition diagram" as illustrated above under *Lifecycle*. Keep in mind that if your state transition diagram is complex, your cases will be complex. While some cases warrant complexity, you should always ask yourself if there aren't better ways to achieve the desired results if your first effort results in complexity.
- Determine which characteristics (if any) are required during each stage of a case's lifecycle
- Determine when To Do entries (if any) should be created (and completed) during a case's lifecycle
- Determine additional validation (if any) that should be executed before a case enters and exits each state
- Determine additional processing (if any) that should transpire when a case enters or exits each state
- Determine if scripts are warranted to help users work the cases and, if so, design the scripts for each applicable state

When the above tasks are complete, you will be ready to set up a case type's lifecycle.

Open the Lifecycle page by selecting **Admin** > **Case Type** and navigate to the **Lifecycle** tab.

NOTE:

You can navigate to a status by clicking on the respective node in the tree on the Main tab. You can also use the hyperlinks in the Next Statuses grid to display a specific status in the accordion.

Main Information

The **Status** accordion contains an entry for every status in the case type's *lifecycle*.

Use **Status** to define the unique identifier of the status. This is NOT the status's description, it is simply the unique identifier used by the system.

Use **Description** to define the label that appears on the lifecycle accordion as well as the status displayed on the case.

Use **Script** to reference a BPA script that can assist a user to work on a case while it's in this status. Refer to *A Script That Helps A User Work Through A Case* for the details.

Use **Access Mode** to define the action associated with this status. This field is disabled if an application service is not specified on the Main page. Refer to *Access Rights* for the details of how to use this field to restrict which users can transition a case into this state.

Use **Batch** to specify a batch control that will auto-transition the case. Any case in a status configured with a batch control will be transitioned when the batch job runs (rather than when *CASETRAN* is executed). For this purpose, batch process *C1-CSTRS* (**Case Scheduled Transition**) is supplied with base package, which will execute all Exit Status logic for the current status, and Enter Status logic for the destination status. You may choose to create a batch process with your own transition logic.

NOTE:
If you wish to defer transitioning a case in a particular status until the batch process on your case type status is executed, you should not populate an Auto-Transition algorithm on that status. Otherwise, CASETRAN will transition the case according to your Auto-Transition logic.

Use **Comment** to describe the status. This is for your internal documentation requirements.

Use **Sequence** to define the relative order of this status in the tree on the Main page.

Use **Status Condition** to define if this status is an **Initial**, **Interim** or **Final** state. Refer to *One Initial State and Multiple Final States* for more information about how this field is used.

Use **Transitory State** to indicate whether a case should ever exist in this state. Only **Initial** or **Interim** states can have a transitory state value of **No**.

The **Alert Flag** is used to indicate whether or not an alert should be displayed for taxpayers with cases in the state. (The alert is shown via the base package Installation - Alert algorithm.)

Algorithms

The **Algorithms** grid contains algorithms that control important functions for cases of this type. 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.

The following table describes each **System Event** (note, all system event's are optional and you can define an unlimited number of algorithms for each event).

System Event	*Description*
Auto Transition	This algorithm is executed to determine if a case that's in this state should be transitioned into another state. Refer to *Automatic Transition Rules* for the details.

	Click *here* to see the algorithm types available for this system event.
Enter Processing	This algorithm holds additional processing that is executed when a case is transitioned into this state. You can also specify state transition logic within Enter Processing routines. Refer to *Additional Processing When Entering A State* for the details. Click *here* to see the algorithm types available for this system event.
Enter Validation	This algorithm holds validation logic that executes before a case can enter a given state. Refer to *Validation Before A Case Enters A State* for the details. Click *here* to see the algorithm types available for this system event.
Exit Processing	This algorithm holds additional processing that is executed when a case is transitioned out of this state. Refer to *Additional Processing When Exiting A State* for the details. Click *here* to see the algorithm types available for this system event.
Exit Validation	This algorithm holds validation logic that executes before a case can by transitioned out of a given state. Refer to *Validation Before A Case Exits A State* for the details. Click *here* to see the algorithm types available for this system event.
Script Launching	This algorithm sets the script launching option for the script associated with a given state, if any. Refer to *Script Launching Option* for the details. Click *here* to see the algorithm types available for this system event.

Next Statuses

Use the **Next Statuses** grid to define the statuses a user can transition a case into while it's in this state. Refer to *Valid States versus State Transition Rules* for more information. Please note the following about this grid:

- Use **Action Label** to indicate the verbiage to display on the action button used to transition to this status.
- **Sequence** controls the order of the buttons that appear on *Case - Main*. Refer to *Buttons Are Used To Transition A Case Into A State* for more information.
- **Use as Default** controls which button (if any) is the default button.
- **Transition Condition** may be configured to identify a common transition path for cases of this type in the current state. This transition condition may then be referenced across multiple case types. You'll need to add values to Look Up table field **TR_COND_FLG** that fit the typical transitions for your case types (e.g. **Ok**, **Error**, etc.).

By assigning the transition condition value to a given "next status", you can design your Enter State transition or Auto-Transition logic to utilize those flag values *without specifying a status particular to a given case type*. Thus, similar logic may be used across a range of case types to transition a case into, for example, the next **Ok** state for the case's current status.

- **Transition Role** controls whether only the **System** or both **System and User** have the ability to transition a case into a given "next status".
- You can use the status description hyperlink to open the Status accordion to the respective status.
- When you initially set up a case type, none of the statuses will reside on the database and therefore you can't use the search to define a "next status". We recommend working as follows to facilitate the definition of this information:
- Leave the Next Statuses grid blank when you initially define a case type's statuses
- After all statuses have been saved on the database, update each status to define its Next Statuses (this way, you can use the search to select the status).

Required Characteristics

Use the **Required Characteristics** grid to define characteristics that are required when a case enters this state. Only **Optional** characteristics defined on the main page appear in this grid. Refer to *Required Fields Before A Case Enters A State* for more information.

Background Processes Addendum

This chapter is an addendum to the general *Defining Background Processes* chapter. This addendum describes the background processes that are provided with Oracle Enterprise Taxation and Policy Management.

The System Background Processes

The system provides base background processes that are an important component of the system. Use the batch control page to view the detailed descriptions of each batch control. In addition, the list of background processes provided in the base product may be viewed in the *application viewer*'s *batch control* viewer.

> **NOTE: Regenerate application viewer.** If your implementation adds batch control records, you may *regenerate* the application viewer to see your additions reflected there.

The base processes fall into one of the following categories:

- **Process What's Ready**. These are background processes that create and update records that are "ready for processing". The definition of "ready" differs for every process. For example,
  - The payment upload process creates payments for every record that is pending
  - The overdue event monitor activates pending overdue events that have reached their trigger date

  Some processes of this type use a business date in their determination of what is ready. If the requester of the process does not supply a specific business date, the system assumes that the current system date should be used. If you need to use a date other than the current date, simply supply the desired date when you request the batch process.
- **Monitor Processes**. This is a subset of the "process what's ready" category. A periodic monitor batch process is provided for any maintenance object whose business object defines a *lifecycle*. In addition deferred monitor batch process is provided if a business object supplied in the base product required a deferred process for one of its states. Note that monitor processes can be an important part of your implementation. For example, processing forms requires executing the monitor processes for form batch header, form upload staging, tax form and registration form.
- **Extract Processes**. These 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 can. Simply supply the respective run number when you request the batch process.
- **Adhoc Processes**. These are background processes that are run on an ad hoc basis based on business needs.
- **To Do Entry Processes**. These are background processes whose main purpose is to generate To Do Entry records based on a certain condition. Refer to *To Do Entries Created By Background Processes* for the details.
- **Purge Processes**. There are a small number of background processes provided to purge historical records from certain objects that generate a large number of entries and may become unwieldy over time.
- **Object Validation Processes**. These background processes are used to validate the master data objects. These programs are typically only run as part of the conversion and upgrade processes.

  > **NOTE: Another use for these programs.** In addition to validating your objects after conversion or an upgrade, the validation programs listed below have another use. For example, you want to experiment with changing the validation of a person and you want to determine the impact of this new validation on your existing persons. You could change the validation and then run the person validation object - it will produce errors for each person that fails the new validation.

FASTPATH: Refer to *Validate Information In The Staging Tables* for more information about these processes and where their errors appear.

- **Referential Integrity Validation Processes**. These background processes check the validity of foreign keys on various objects. These programs are typically run as part of the conversion and upgrade processes.

  FASTPATH: Refer to *Validate Information In The Staging Tables* for more information about these processes and where their errors appear.

- **Conversion Processes**. There are a series of background processes provided for loading historical data into your production database.

  FASTPATH: Refer to *The Conversion Process* for more information about these processes.

Refer to *Batch Process Dependencies* for guidelines on setting up your production schedule for the base background processes.

Batch Process Dependencies

The topics in this section illustrate the periodicity and dependencies between the various background processes described above.

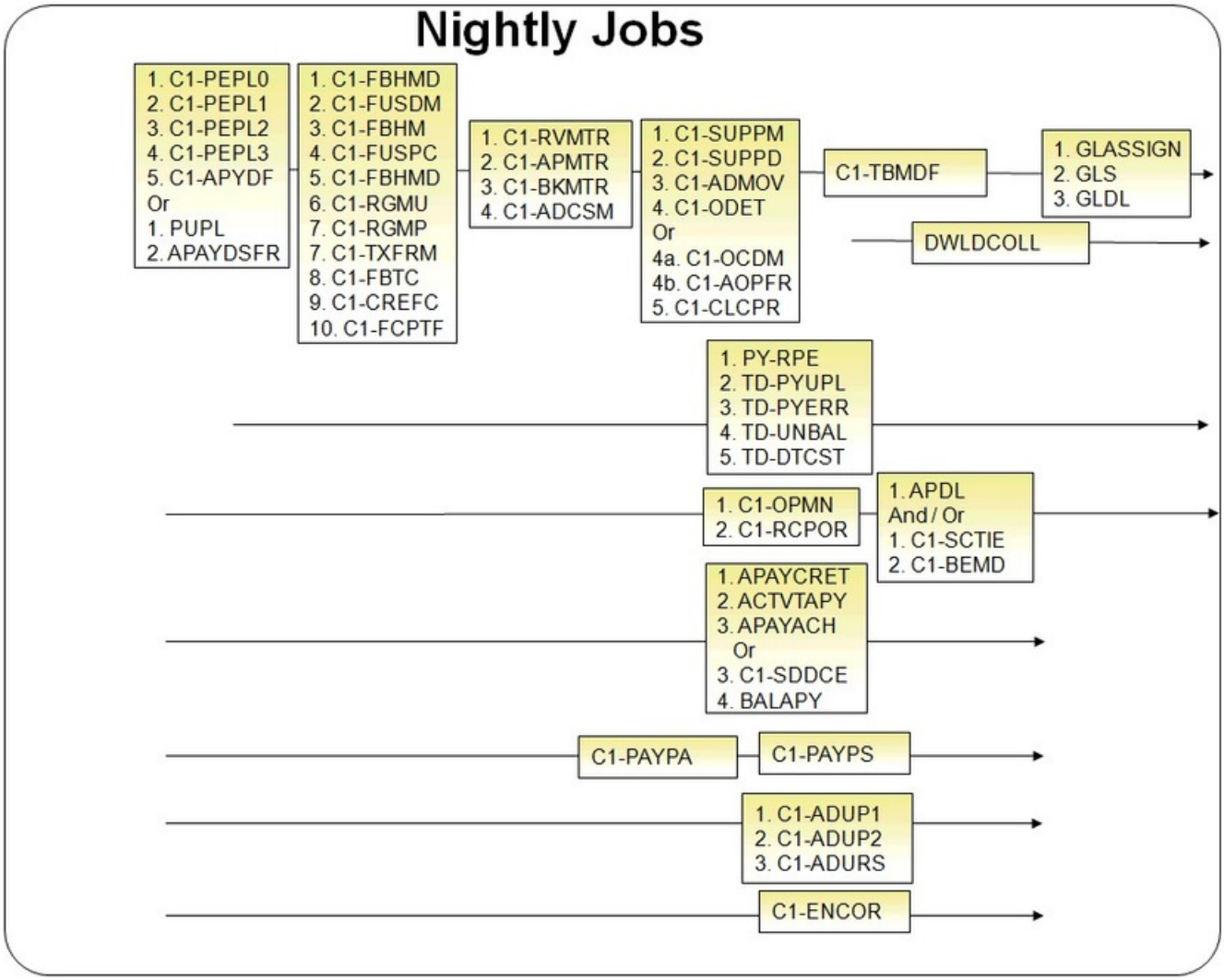
Batch Schedulers and Return Codes

If you use a batch scheduler (e.g., Control-M, Tivoli) to control the execution of your batch processes, it will be interested in the possible values of each process's return code. The return code is a number that indicates if the process ended successfully. All product processes will return one of the following return code values:

- **0** (zero). A value of zero means the batch process ended normally.
- **2**. A value of 2 means the batch process detected a fatal error and aborted.

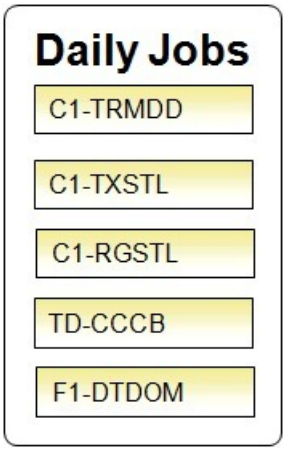
The Nightly Processes

The following diagram illustrates the dependencies between the batch processes.



The mnemonics in the boxes refer to the batch control code. Use the application viewer or the Batch Control page in the application to review the details of each batch. When a box contains multiple processes, these processes must be run sequentially. When multiple boxes exist on a timeline, all processes in an earlier box must execute before the subsequent box is executed. Those timelines that appear beneath the first job stream's timeline indicate when the timeline's respective processes can be executed in respect of the first job stream.

The following diagram illustrates the daily batch processes for which there are no dependencies.

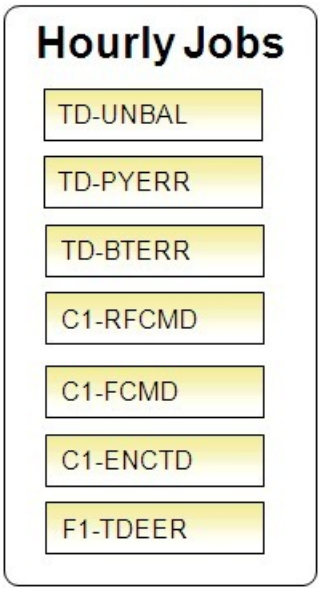


The mnemonics in the boxes refer to the batch control code.

NOTE:
No dependencies exist. As you can see, there are no dependencies between the boxes (meaning they may be run in parallel).

The Hourly Processes

The following diagram illustrates the dependencies between the hourly batch processes.



The mnemonics in the boxes refer to the batch control code. Use the application viewer or the Batch Control page in the application to review the details of each batch.

NOTE: No dependencies exist. As you can see, there are no dependencies between the boxes (meaning they may be run in parallel).

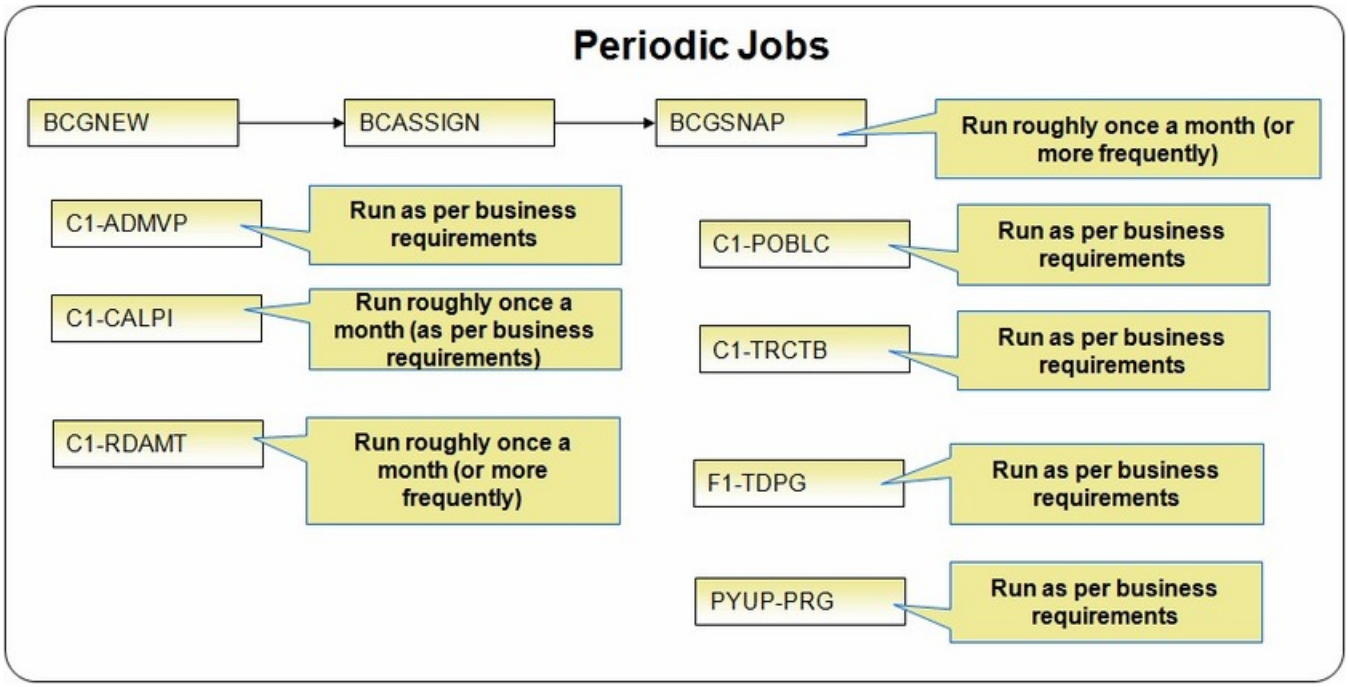
The Letter Processes

To extract information for your various letters, only one background process, **LTRPRT**, is required regardless of the different types of letters you have. This process simply calls an algorithm plugged-in on the respective letter template to construct its flat-file content.

While this process should be run at least on a daily basis, you may want to consider running it more frequently (depending on how frequently you produce letters).

The Periodic Processes

The following diagram illustrates the dependencies between the periodic background processes. While many of these processes should be run at least on a monthly basis, you may want to consider running them more frequently (depending on business requirements).



The mnemonics in the boxes refer to the batch control code. Use the application viewer or the Batch Control page in the application to review the details of each batch.

NOTE: Few dependencies exist. As you can see, there are few dependencies between the boxes (meaning they may be run in parallel).

The Big Picture of Sample & Submit

Sample and Submit refers to the ability to create Activity Requests. This is functionality that enables an implementer to design an ad-hoc batch process using the configuration tools.

Some examples of such processes are:

- Send a letter to customers that use credit cards for auto pay and the credit card expiration date is within 30 days of the current date.

- Stop auto pay for customers that use credit cards as the form of payment if the credit card has already expired. Notify the customer that their auto pay agreement has been terminated and that they need to call to reinstate.
- Select auto pay accounts that have more than X non-sufficient fund penalties, stop the auto pay agreement and notify the customer.

NOTE: The terms activity request and sample & submit request may be used interchangeably.

Activity Type Defines Parameters

For each type of process that your implementation wants to implement, you must configure an activity type to capture the appropriate parameters needed by the activity request.

Preview A Sample Prior To Submitting

To submit a new activity request, a user must select the appropriate activity type and enter the desired parameter values, if applicable.

After entering the parameters, the following actions are possible

- 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 **Save** to submit the request, go **Back** to adjust the parameters or **Cancel** the request.
- Click **Cancel** to cancel the request.
- Click **Save** to skip the preview step and submit the request.

When an activity request is saved, the job is not immediately submitted for real time processing. The record is save in the status **Pending** and a monitor process for this record's business object is responsible for transitioning the record to **Complete**.

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 activity request, such as generating customer contact records to send letters to a set of customers, is performed when transitioning to **Complete** (using an enter processing algorithm for the business object).

Credit Card Expiration Notice

The base product supplies a sample process to find customers that use credit cards for auto pay and the credit card expiration date is within x days of the current date.

To this functionality the following configuration tasks are needed:

- Define an appropriate *customer contact class* and *type* to use.
- Define appropriate activity request Cancellation Reasons. Cancellation reasons are defined using a customizable *lookup*. The lookup field name is **C1_AM_CANCEL_RSN_FLG**.
- Define an activity type for the business object **C1-NotifyExpiringCreditCardTyp**. You may define default parameter values for the number of days for expiration and customer contact class and type.

Exploring Activity Request Data Relationships

Use the following links to open the application viewer where you can explore the physical tables and data relationships behind the activity request functionality:

- Click *C1-ACM-ACTTY* to view the activity type maintenance object's tables.
- Click *C1-ACM-ACTRQ* to view the activity request maintenance object's tables.

Defining a New Activity Request

To design a new ad-hoc batch job that users can submit via Sample and Submit, first create a new Activity Type business object. The base product BO for activity type **C1-NotifyExpiringCreditCardTyp** may be used as a sample.

The business object for the activity request includes the functionality for selecting the records to process, display a preview map for the user to review and to perform the actual processing. The base product BO for activity request **C1-NotifyExpiringCreditCardReq** may be used as a sample. The following points highlight the important configuration for this business object:

- Special BO options are available for activity request BOs to support the *Preview Sample* functionality.
  - Activity Request Preview Service Script. This script is responsible for retrieving the information displayed when a user asks for a preview of a sample of records.
  - Activity Request Preview Map. This is the map that is invoked to display the preview sample results.
- The enter algorithm plugged into the **Complete** state is responsible for selecting all the records that satisfy the criteria and processing the records accordingly.

Setting Up Activity Types

Activity types define the parameters to capture when submitting an activity request via Sample and Submit. To set up an activity type, open **Admin** > **Activity Type**.

The topics in this section describe the base-package zones that appear on the Activity Type portal.

Activity Type List

The Activity Type *List zone* lists every activity type. The following functions are available:

- Click a *broadcast* button to open other zones that contain more information about the adjacent activity type.
- The standard actions of **Edit, Duplicate** and **Delete** are available for each activity type.
- State transition buttons are available to transition the activity type to an appropriate next state.

Click the **Add** link in the zone's title bar to add a new activity type.

Activity Type

The Activity Type zone contains display-only information about an activity type. This zone appears when an activity type has been broadcast from the Activity Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Maintaining Sample & Submit Requests

Use the Sample and Submit transaction to view and maintain pending or historic activity requests. Navigate using **Menu** > **Batch** > **Sample & Submit Request**.

Sample & Submit Request Query

Use the *query portal* to search for an existing sample & submit request. Once a request is selected, you are brought to the maintenance portal to view and maintain the selected record.

Sample & Submit Request Portal

This portal appears when a sample & submit request has been selected from the Sample & Submit Request Query portal.

The topics in this section describe the base-package zones that appear on this portal.

Sample & Submit Actions

This is a standard actions zone. Use the **Edit** button to modify the parameters. Refer to *Preview A Sample Prior to Submitting* for more information.

If the activity request is in a state that has valid next states, buttons to transition to each appropriate next state are displayed.

Sample & Submit Request

The Sample & Submit zone contains display-only information about an activity (sample & submit) request.

Please see the zone's help text for information about this zone's fields.

Sample & Submit Request Log

This is a standard *log zone*.

Security Addendum

This chapter is an addendum to the general *Defining Security and User Options* chapter. This addendum describes security functionality that is specific to Oracle Public Sector Revenue Management.

Implementing Account Security

CAUTION: Important! This section assumes you understand *The Big Picture of Row Security*.

When you create an account, you must define which users can access the account's information. For example,

- If you have taxpayers in two geographic territories, you may need to restrict access to accounts based on the office that manages each territory. For example, only users in the northern office may manage accounts in the northern territory.
- If you have businesses and individual taxpayers, you may need to restrict access to these different taxpayer segments based on the skill set of the users. For example, some users are skilled in dealing with business taxpayers, while others are skilled in dealing with individual taxpayers.

By granting a user access rights to an account, you are actually granting the user access rights to the account's bills, payment, adjustments, etc.

FASTPATH:
Refer to *If You Do Not Practice Account Security* for setup instructions if your organization doesn't practice account security.

NOTE: Account security may also affect persons and locations. Refer to *Persons Can Also Be Secured* for how access to person information is also restricted by account security. Refer to *Locations Can Also Be Secured* for how access to location information is also restricted by account security.

The topics in this section describe how to implement account security.

Persons Can Also Be Secured

It's important to be aware that persons can also be secured as a result of "account security". It works like this:

- If a person is linked to at least one account, users will not be allowed access to the person (or the person's related information) unless they have access to at least one of the person's accounts.
- If a person is not linked to any accounts (a rare situation), any user may access the person.

Locations Can Also Be Secured

It's important to be aware that locations can also be secured as a result of "account security". It works like this:

- If a location is linked to at least one account, users will not be allowed access to the location (or the location's related information) unless they have access to at least one of the location's accounts.
- If a location is not linked to an account (a rare situation), then all users may access the location.

NOTE: This is only applicable to implementations that continue to use *legacy address* functionality.

Data Becomes Invisible When Access Is Restricted

The following points summarize the impact of a user not having access to an account.

Account Security and Searches (and Maintenance Pages)

Searches are the gateway to the information that appears on maintenance pages. In general, account-related information is suppressed when a user doesn't have access rights to the account. This suppression is true for rows that directly reference an account AND for rows that indirectly reference an account. For example:

- A user can only see obligations associated with accounts to which they have access rights.
- A user can only see financial transactions associated with obligations that are, in turn, associated with accounts to which they have access rights.

NOTE:
Person and location searches are also impacted. Keep in mind that information will be suppress from both person and location-oriented searches if the person / location is related to accounts. Refer to *Persons Can Also Be Secured* for how access to person information is also restricted by account security. Refer to *Locations Can Also Be Secured* for how access to location information is also restricted by account security.

Account Security and To Do Lists

Account security does NOT impact the information that appears in a user's To Do list. Rather, we have assumed that your To Do roles (and the users assigned to these roles) are consistent with your account security requirements. This can result in anomalies. For example, it's possible for a supervisor to assign a payment in error to a user who doesn't have access to the payment's account. This user will then see the related To Do entry in their Payment Segments In Error To Do list. However, when they drill down on the entry, account security will manifest itself (i.e., the user won't be able to display the payment segment that's in error). This happens because the drill down causes the payment segment search logic to execute. This logic inhibits the selection of payment segments if the user can't access the related account.

To minimize these anomalies, we recommend the following:

- Setup *To Do Roles* consistent with your Data Access Roles.
- Setup *Account Management Groups* that are consistent with your Access Groups.
- Setup default To Do Roles on your Account Management Groups for each *To Do type*.

Restricted Transactions

The following table lists all transactions that have some type of account security. The following notation is used to describe the type of account security:

- **Account-oriented.** This notation is used if the respective transaction uses basic account security (i.e., the user must belong to at least one data access role that has access to the account's access group in order to see the information).
- **Person-oriented.** This notation is used if the respective transaction uses person-oriented account security. Refer to *Persons Can Also Be Secured* for more information.
- **Location-oriented.** This notation is used if the respective transaction uses location-oriented account security. Refer to *Locations Can Also Be Secured* for more information.
- None of the above. Some unusual transactions have unusual implementations of account security. These are described below.

Transaction	*Type of Account Security*
360 Degree Search	Account-oriented and Person-oriented
Account	Account-oriented
Account Bill / Payment History	Account-oriented
Account Financial History	Account-oriented
Account Payment History	Account-oriented
Account Person Replicator	Account-oriented
Adjustment	Account-oriented
Adjustment Calculation Line Characteristics	Account-oriented
Bill	Account-oriented
Bill Segment	Account-oriented
Case	Account-oriented, Person-oriented and Location-oriented
Collection Agency Referral	Account-oriented
Customer Contact	Person-oriented
Financial Transaction	Account-oriented
Financial Transaction on a Payment	Account-oriented
Match Event	Account-oriented
Overdue Process	Account-oriented
Pay Plan	Account-oriented
Payment	Account-oriented
Payment Event	The user must have access to ALL accounts linked to the payment event.
Payment Event Quick Add	The user must have access to ALL accounts linked to the payment event(s).
Payment Quick Add	Account-oriented
Payment / Tender Search	Account-oriented
Person	Person-oriented
Location	Location-oriented
Obligation Billing History	Account-oriented
Obligation Cash Accounting Balance	Account-oriented
Obligation Financial History	Account-oriented

Transaction	*Type of Account Security*
Obligation	Account-oriented
Tax Role	Account-oriented

Account Security Case Study

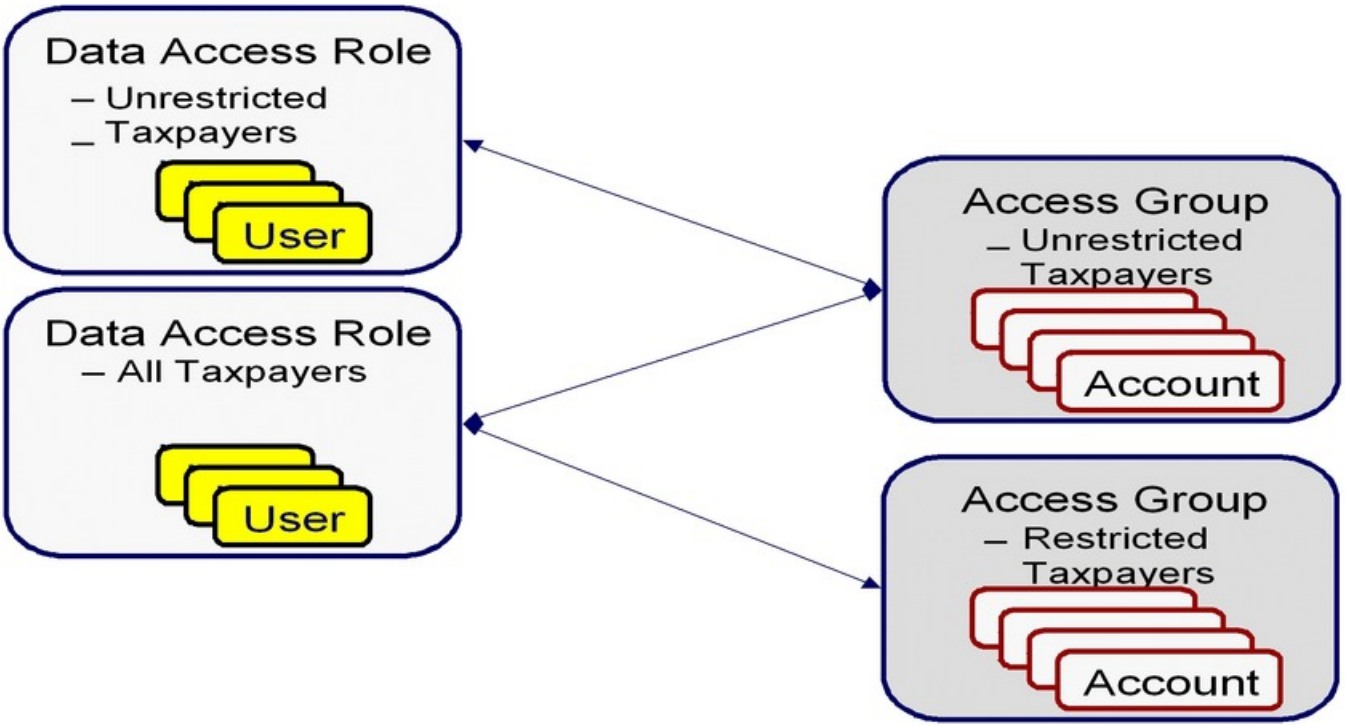
This section contains an example of how to implement account security. Use this example to form an intuitive understanding of these objects. Once this intuition is obtained, you'll be ready to design the account security objects for your own company.

Securing Accounts Based On Account Type

Assume the following security requirement exists:

- You have two broad groups of accounts:
  - Unrestricted Taxpayer accounts for the general public.
  - Restricted Taxpayer accounts for individuals whose tax information is highly sensitive (politicians, celebrities, employees of the tax authority, etc.).
- Users can be classified as have one of the following access rights:
  - May access all accounts.
  - May only access the Unrestricted Taxpayer accounts.

The following diagram illustrates the access groups and data access roles required to implement these requirements:



Notice the following about the above:

- There are two access groups because access to accounts is based on whether the taxpayer's account is unrestricted or restricted.
- The Unrestricted Taxpayers data access role is only linked to the Unrestricted Taxpayers access group.

- The All Taxpayers data access role is linked to both the Unrestricted Taxpayers and Restricted Taxpayers access groups. Users with this role can therefore access all accounts.

The Default Access Group

The base package defaults an account's access group based on the user who adds the account. It uses the user's *default access group* to do this.

CAUTION:
Please be aware that the user who adds an account must have access to this access group.

NOTE:
Subsequent changes to an account's access group. A user may change an account's access group to any access group to which they have access.

If You Do Not Practice Account Security

If you do not restrict access to accounts (i.e., all users can access all accounts), you must set up one access group and one data access role and then indicate all users are part of this role. You should also define the access group as the default access group on all of your users (so that new accounts are all labeled with this access group).

Masking Sensitive Data

Refer to *Masking Data* for instructions describing how to configure the system to mask sensitive data like a taxpayer's social security number or bank account number. If your implementation intends to mask any of the information that appears in the *Taxpayer Information Zone*, please navigate to this zone's documentation for special instructions.

Inquiry Audit

There are times when an organization needs to capture audit information when a user views certain information. Examples of these scenarios include:

- A user is under investigation or disciplinary action, and supervisors need to find out what information the user has been looking at.
- Although VIP accounts may be protected from users by account security, supervisors and fraud investigators may still want to know who has been trying to look for forms or other records with a given criteria.
- Sometimes information about a taxpayer is leaked to the newspaper. For example "Town Councilman Smith didn't pay his taxes on time for the last n years". Supervisors want to know who has recently viewed Councilman Smith's tax returns.

The audit information captured includes:

- What - the specific record that was viewed.
- Who - the user viewing the record.
- Where the user performed the inquiry - which portal, zone or page was used.
- How - which search criteria the user entered for a specific query.

For more on the information provided for the audited records, see *Inquiry Audit Query*.

As part of implementing inquiry audit, you will need to decide which portals, zones and pages require inquiry audit. The following section describes how to configure inquiry audit based on how the page or portal is implemented.

Setting Up Inquiry Audit

The topics in this section describe how to set up inquiry audit for the various types of queries.

Setting Up Audit for Portals and Zones

The zone parameter **Audit Service Script** controls if information about the record being inquired upon will be captured for audit. In order to turn on inquiry audit for a zone, you will need to update the **Override Parameter Value** with the following:

- The name of the service script responsible for capturing the audit data and storing it on the Inquiry Audit table.
  - The base includes the service script **C1-ZoneAudit**
  - Additional scripts can be developed if your implementation requires something more specific such as add audit records only if VIP records are viewed or where certain criteria is used.
  - The mnemonic **ss=** is used to define the name of the service script. For example ss='C1-ZoneAudit'.
- Define the input elements to the service script by using the mnemonic **input=**. These can include the user id, zone, portal, user filter values, hidden filter values, any literal value, any portal or global context field.

NOTE: If a zone is called as a pop-up search, the portal is not available to provide to the script. The portal is available to provide to the script when the zone is linked directly to the portal when it is invoked.

See the zone's help on more information.

Setting Up Audit for a Search Page

A **user exit** is needed to turn on inquiry audit for an old style search page or control central. You will need to do the following:

- Determine the service name of the page.
- Create a search page extension to capture the audit information. . The following extension codes are provided as samples:
  - **ext_ multiSearchNameData.jsp** - Control Central Search by Name
  - **ext_ multiSearchAddressData.jsp** - Control Central Search by Address
  - **ext_ accountSearchData.jsp** - Account Search
- The search pages have grid elements that display the result rows. To capture the search criteria, the service script **C1-PageAudit** should be called upon load of the grid element, to add the inquiry audit record.
- The business object to use when calling the service script is **C1-PageAuditInquiry**

NOTE: Control central is not longer recommended for use because of its limitation in the ability to be extended. 360 Degree Search is the product recommended 'central' searching portal. 360 Degree search supports defining inquiry audit using the override zone parameter.

Setting Up Audit for a Maintenance Page

A **user exit** is needed to turn on inquiry audit for an old style maintenance page. You will need to do the following:

- Determine the service name of the page.
- Create a page maintenance page extension to capture the audit information. . The following extension code is provided as a sample:

- **CMAccountMaintenanceExtension.java** - Account Page Maintenance

- The page maintenance extension method **afterRead** should be overridden to call the service script **C1-PageAudit** to add the inquiry audit record.
- The business object to use when calling the service script is **C1-PageAuditInquiry**

Inquiry Audit Restrictions

Certain portals are designed to include a zone with a list of records and buttons that allow quick editing of a record. This technique invokes a BPA script that displays the data in a UI map, rather than broadcasting a value from a query or info zone. This bypasses the ability to capture the audit for this record. There is currently no ability for an implementation to include a user exit in a BPA script to allow storage of an audit record.

The above applies to any administrative portal that uses the "all in one" portal design that includes a list zone showing all existing records. The list zone typically includes edit, duplicate and delete buttons.

Note For customized portals that call a customized BPA script, an implementation has the ability to include a step to store an Inquiry Audit record.

Inquiry Audit Query

Use the *query portal* to search for the inquiry audit records.

The inquiry audit search allows you to search for inquiry records using various criteria such as:

- Date that the inquiry occurred.
- Portal and/or Zone - you can search on inquiries made in a specific portal or a specific zone.
- Service name (used for page inquiries)
- User or User Group - you can search on inquiries made by a specific user or see inquiries made by a group of users.
- The object inquired on, e.g. Account.
- Specific field inquired on, e.g. Name
- Specific field value used in the inquiry. For example, you can look at inquiries made for a specific name, a certain amount, a specific address.
- A combination of the above criteria.

Once a inquiry audit record is selected from the list, the information displayed depends on the type of inquiry that was performed and may differ based on the business object used for capture. Refer to the zone's help text for more information.

Self Service Integration

Oracle Public Sector Revenue Management ("the product") provides integration with Oracle Public Sector Revenue Management Self Service ("the self service product"). The topics in this section describe the functionality provided in the product to support the integration and outlines the configuration required to support the self service functionality.

The Big Picture

This section describes high level topics related to the integration.

Message Processing Overview

Public Sector Revenue Management interacts with the self service product via web services. An appropriate inbound web service is invoked from the self service product via BPEL. The inbound web service is configured with a processing service script that knows how to process the request. Requests fall into one of the following categories:

- A taxpayer request. These types of requests fall into one or more sub-categories:
  - A taxpayer inquiry. If the taxpayer requests information like to find out the status of a refund, the inbound web service references a service script that performs the appropriate logic. Most of the time the service script associated with the inbound service can perform the logic needed to retrieve the information to present to the taxpayer. However, there may be cases where the service script creates a real time Service Task to retrieve the requested information and return it.

    FASTPATH: Refer to the *Refund Status* for an example of a request for information that results in the creation of a service task.

  - A request to perform some transaction processing. For example, the taxpayer may submit a payment via self service. In this case, the service script associated with the inbound web service creates a Service Task record that will subsequently perform the necessary validation and processing. The taxpayer does not wait for the service task to complete its lifecycle.
- An internal web service request submitted by the self service product to get information. For example, before submitting a payment the self service product may require the taxpayer to provide proof of identity to verify that the taxpayer is known to the system. The taxpayer identification information is sent to this product via a web service and is processed real time.

Naming convention: The product's inbound web services require that the service name starts with 'TS%'. Specific inbound web services are mentioned throughout the supported functionality.

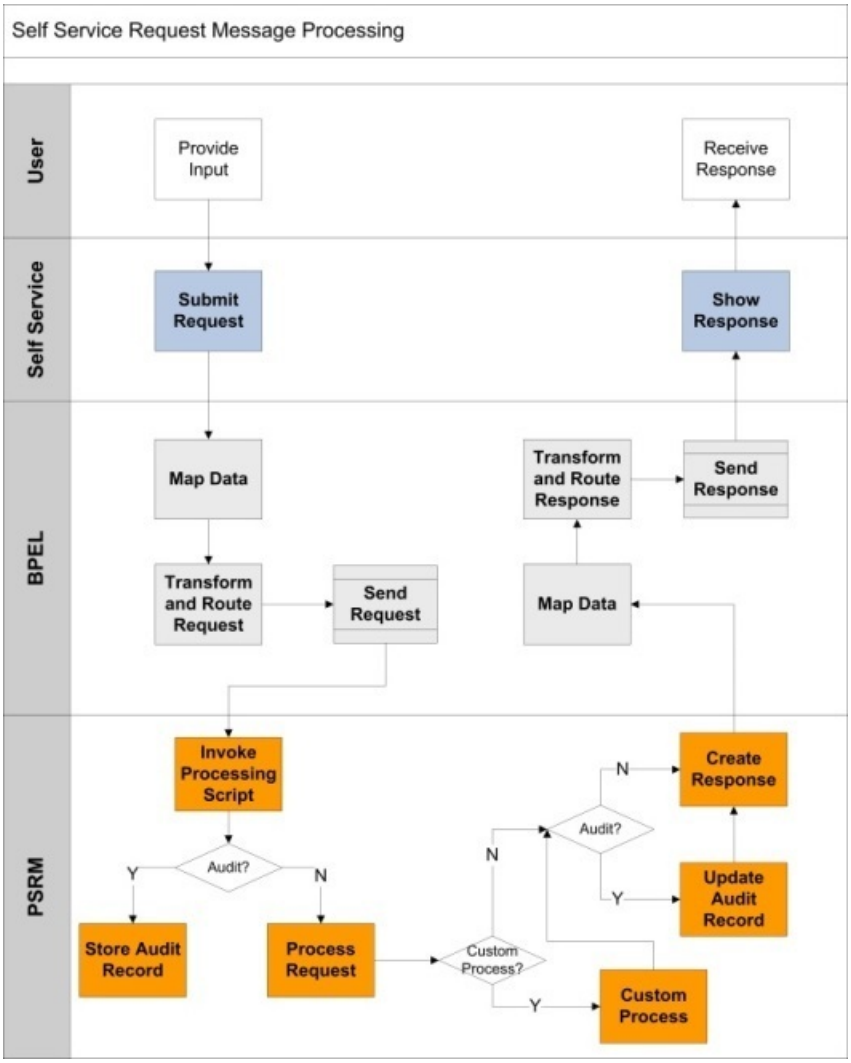


Figure 7: Message Processing

User Identity Verification

The self-service product allows the taxpayer to register as a website user, and enroll to manage taxes online.

A person may work with the self-service portal application in two modes:

- **Casual User.** There is no need to sign in when casually viewing website content or seeking tax-related advice. Certain online services and features are available for casual users.
- **Enrolled User.** A user must log in and be properly authenticated and authorized in order to access sensitive personal and financial information such as historical tax returns, payment history, and other items.

XML request contents are affected as follows:

- Requests initiated by a casual user contain no user or tax account information.
- Requests initiated by an enrolled user contain tax account identifiers.

NOTE: See the *Tax Account Access Information* topic for a detailed explanation of tax account access.

Some online services include an optional taxpayer identification step:

- For casual users, the identification is performed if it's required by business rules.
- For signed-in users, the identification is not performed.

Tax Account Access Information

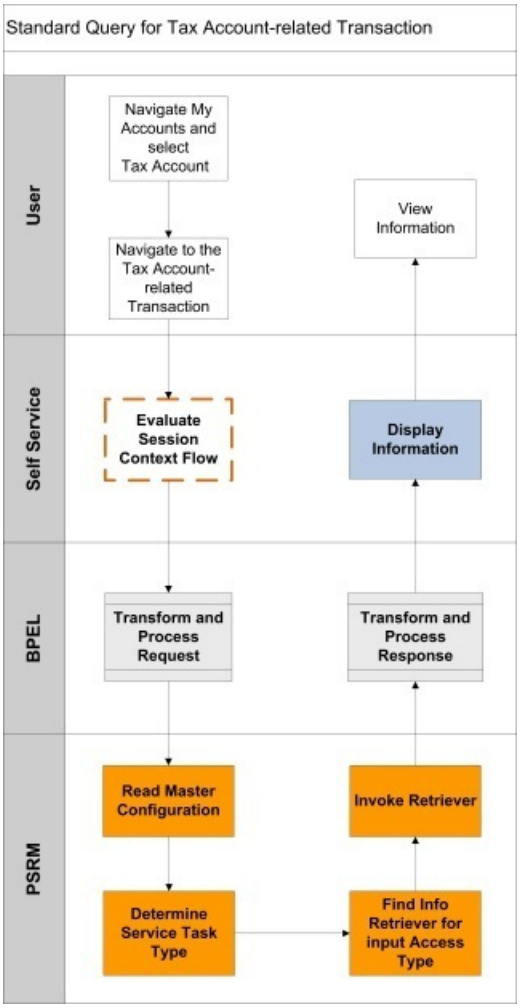
The revenue management authority grants s user access to his/her taxes. The single access “unit” could be a tax role, an account, a tax type, or other entity.

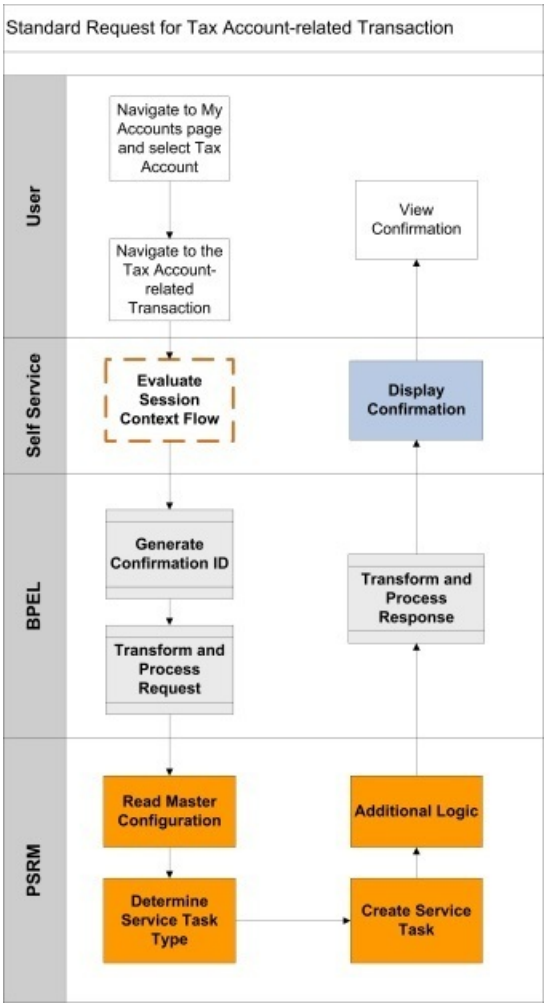
Users can be granted access for many different purposes, including management of a user's tax role, account management, or managing an account for a limited period of time.

When a user is registered and enrolled into online services, the enrollment summary ("tax accounts") is displayed on the user's **My Accounts** portal page. The summary can include tax role(s), accounts, obligations, and other entities.

The request message captures the identifiers of a tax account that is currently being viewed by the self service portal user.

The following diagrams illustrate the process flow for tax account-related inquiry and service requests.





Access Type

Access type describes the scope of a single tax account managed via the self service portal. An example of access type is **Tax Role**.

The access type is referenced in various self service-related configurations; when the request is processed the system uses the access type to determine the appropriate logic to execute. For example, an outstanding balance for a tax role is retrieved in a different way than the outstanding balance for an account.

The <access type> element is included in every message. Supported access types are represented in the product by the lookup **USER_ACCESS_TYPE_FLG**.

Access Keys

The tax account is identified by the access type and a set of keys. The integration supports an ability to identify the account with up to 10 keys.

The first key is always reserved for the taxpayer ID associated with the tax account.

Line of Business

In the web self-service application, Line of Business is used to broadly group areas of interest. The web pages found within a defined line of business are related to the information and tasks appropriate for that area of interest. Some examples of lines of business for an implementation may include Individual taxpayers, Business taxpayers and Tax Preparers. Another implementation may use even more granularity, to include, for example, charitable or non-profit organizations.

In terms of the product, Line of Business can be viewed as a broad category of taxes managed by the tax authority, but also as a way to define a target audience spanning several taxpayer types. Line of business is referenced in self service-related configurations and allows processes to invoke specific logic when needed. For example, different rules may apply when the system identifies tax accounts owned by individuals and businesses during enrollment.

The <lineOfBusiness> element is included in the requests whose processing logic may depend on its value. Supported lines of business are represented in the product by the lookup **LINE_OF_BUSINESS_FLG**.

Confirmation Message

All web services that represent a taxpayer request and result in the creation of a service task within the product are designed to provide the taxpayer with a confirmation ID and a confirmation message. Additional confirmation details may be added by logic in the product that performs actions. This may be used when a taxpayer wants to inquire about the status of an action or request using the confirmation ID. A web service inquiring on the status of a task can retrieve the confirmation details to display to the taxpayer. In addition, if the taxpayer has questions at a later date about a request, the confirmation ID may be used when contacting the tax authority about the request.

The common structure captured with each message (stored in the data area **C1-SelfServiceConfirmMessage**) is as follows:

- Confirmation ID. This may be generated prior to sending the web service to the product. For example, in many cases BPEL generates a confirmation ID and adds it to the message.
- Confirmation Header. This is populated with the message category / message number used as the acknowledgement message. For example: 'Your request has been submitted successfully, reference ID 1238098'. It is defined on the service task's task type.
- Confirmation Details. This is a collection of messages (message category / message number) that may be added while processing the transaction. For example: 'Tax Clearance Certificate approved', and 'Mailed to the taxpayer on 01-02-2012'

Task Confirmation Inquiry

A taxpayer may inquire on the status of a transaction or request using a confirmation number. If so, a web service is sent to the product. The product provides the inbound service **TSGetConfirmationInformation** to process this web service. It uses the script **C1-GetCnfmID** to process the request. This service script finds the service task associated with the confirmation ID, retrieves the confirmation details stored with the task, and returns the information to the calling system.

Confirmation Email

The product provides an algorithm to allow a tax authority to send an email to the taxpayer once a task that is performing maintenance actions has completed. For example, when a taxpayer submits a payment, the service task business object that processes the payment can be configured to send an email to the taxpayer once the payment is successfully created. The base algorithm includes the confirmation details from the service task in the email along with general email text that is configurable.

FASTPATH: Refer to the algorithm section of *General Configuration Tasks* for more information about this algorithm.

Error Handling

All web services include standard error message elements. If any errors are found in processing a web service, a response is returned with the error message.

NOTE: The system error messages may not be appropriate to display to the web self service user. The message can be translated to one that is more appropriate in the BPEL layer.

Configuration Errors

If the processing script used to process any of the messages finds a configuration problem or unrecognized information from the message, it returns a generic error to the self service application like "Your request can not be processed at this time, please try again later". In addition, a To Do entry and/or an email are sent to an appropriate responsible user.

FASTPATH: Refer to the algorithm section of *General Configuration Tasks* for more information about this algorithm.

Extending the Base Logic

All web services include a "custom information" area that allows an implementation to configure up to 10 additional fields using field name and value pairs that may be populated using a custom service script.

FASTPATH: Refer to the master configuration section of *General Configuration Tasks* for more information.

Standard Message Format

All web services which communicate with the self service application follow a common structure that includes the following information:

- Common data used to track the web user access details: User ID, Name, IP Address and email address. Note that in the base business objects this information is captured in the business object data area as well as in characteristics to allow searching by these values.
- Access keys. The web service supports capturing up to 10 key fields defined with field name and value pairs.
- Access type. In conjunction with access keys, the type identifies the tax account in the system.
- Error Details data area that contains an error message.
- A custom information area for implementation specific values.
- For the requests that perform transaction processing, there is also a standard data area that defines Confirmation Details.
- Additional optional elements included in multiple messages.
  - Action indicates what type of special processing is requested.
  - Linked request element contains the confirmation number of the related web service request.
  - Line of business.

Viewing Raw XML

The 'raw XML' of the web service is captured for audit purposes on any resulting service task. It's possible that a user may need to review the raw XML to troubleshoot problems. Because the data may contain personal and sensitive information from the taxpayer, such as a person identifier, the product provides additional security configuration for viewing the raw XML on service tasks.

NOTE: Refer to the business object descriptions for the base parent business objects **C1-StandardDeferredSSTask** and **C1-StandardRealTimeSSTask** for more information about securing this logic.

Settings in Master Configuration

Many implementation wide settings are needed when configuring the product to work with the web self service application. The product captures these settings in the Self Service Master Configuration record.

In the sections in this document that explain how to configure the system to use the base self service functionality, any settings in the self service master configuration record are noted.

Inquiry Audit

The product supports the ability for implementations to capture audit records of what data users are viewing. The integration with a self service application extends this capability so that audit records may be captured when the system receives requests for information from the self service application.

A special inquiry audit business object (**C1-WebAuditInquiry**) has been provided to capture audits of information requests from the self service product. The business object captures the web user id, the web user name, the email address, the IP address and, if configured, a snapshot of the actual request XML including any response.

NOTE: The user interface for this type of inquiry audit allows a user to view the request / response XML for those inquiry audit records that capture it. Because the data may contain personal and sensitive information from the taxpayer, such as a person identifier, the product provides additional security configuration for viewing the raw XML on inquiry audits. Refer to the business object description for the base business objects **C1-WebAuditInquiry** for more information about securing this logic.

Configuring Inquiry Audit

An implementation configures which web services should cause an inquiry audit record to be created. For example, perhaps web services for a refund status inquiry are audited, but web services for inquiring on the status of a task via the confirmation ID are not. The self service master configuration record allows an implementation to configure the web services that should be audited by indicating an appropriate audit service script to invoke when the web service is processed.

FASTPATH: Refer to the master configuration section of *General Configuration Tasks* for more information.

General Configuration Tasks

This section describes the general tasks required to configure the system to support the integration. It also describes the service task type portal.

Refer to the Supported Functionality section for addition details about configuration required for specific business functionality.

Messages

Review the base messages provided for communication of positive and negative responses to the self service user. These are configured on self service task types.

- Confirmation Header message. The product provides a base message that may be used, with message category 11126 and message number 11723. The base message text may be overwritten. Or a new message in a message category reserved for implementations may be created.

- Error Header message. The product provides a base message that may be used, with message category 11126 and message number 11010. The base message text may be overwritten. Or a new message in a message category reserved for implementations may be created.

NOTE: In the BPEL layer the product's Message Category / Message Number combination is translated into message codes understood by the self service product.

Managed Content

Create a managed content record to define the HTML to use for the various general emails.

- Create one for emails routed to a responsible user when problems are found with the master configuration table.
- If confirmation emails should be sent to taxpayers when tasks with multiple steps are complete, create a managed content entry for that email text. If different service tasks should have different general text in the confirmation email, create a separate record for each variation.

The Managed Content Type should be HTML. Navigate to the Schema tab and enter the following tags and type the appropriate text for the email within the "" tags.

```
<html>
  <body>
    <span> </span>
  </body>
</html>
```

XAI Sender

Verify that an XAI sender is configured for routing email real time.

- Invocation Type should be set to **Real-time**
- XAI Class should be set to **RTEMAILSNDR**
- On the Context tab, the context type **SMTP Host name** should be defined with a valid context value.

NOTE: The XAI Options includes an option for a default Sender for real-time emails that can be configured with this XAI sender.

Field

Define a field that includes the text for the email subject for the notification of master configuration errors email.

Define one or more fields that include the text for the email subject for the confirmation emails to send for the various service tasks.

Algorithm

If any service task should send a confirmation email after all steps are complete, for example once a payment is processed, configure one or more appropriate algorithms for the **C1-SSCONFREM** algorithm type.

- Set the Email Subject field created above for the confirmation email.
- Set the Predefined Text to the Managed Content created above for the confirmation email.
- Enter the From Address that should be used in the generated email
- Enter the XAI Sender for Email defined above.

NOTE: This algorithm must be plugged into appropriate business objects as an enter algorithm on a state where actions done by the task are complete.

Access Type

Base product is provided with the implementation of access type *Tax Role* with keys **PER_ID** and **TAX_ROLE_ID**. If required, additional *access types* should be added to the lookup **USER_ACCESS_TYPE_FLG**.

Line of Business

Base product is provided with the implementation two Lines of Business: **Individual** and **Business**. If required, additional *line of business* entries should be added to the lookup **LINE_OF_BUSINESS_FLG**.

Self Service Master Configuration

Create a Self Service Master Configuration record that holds system wide configuration needed for the self service integration.

The Configuration Support section defines information needed to alert a user that problems were found with configuration. The alert may be sent using a To Do entry or an email or both.

- Define the user that is responsible for technical issues related to self service who should receive an email if there is an issue.
- To Do Type should be set to a standard error To Do type to use when issues are found with the master configuration table. The base product To Do Type **Self Service Master Configuration Issues (C1-SSMCI)** is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type.

Populate the following fields if an email should be generated when configuration problems exist.

- Enter the From Email Address that should be used in the email.
- Enter the From Name that should be used in the email.
- Enter the XAI Sender created above or leave it blank to use the default from XAI options.
- Set the Email Content to the Managed Content record created above.
- Set the Email Subject field created above.
- Provide the Configuration Support Email Script that produces the email. The product has supplied **C1-SSIssueEm** which may be used here.

The Request Processing Control information allows an implementation to define special logic that should occur when a web service is processed. The special logic may be causing an inquiry audit record to be created or it could be to indicate a custom extension to a base product service by retrieving additional details to return in a web service call.

- To Do Type for Audit Script Errors should be set to an appropriate To Do type. The base product To Do Type **Self Service Task Audit Issues (C1-SSAI)** is provided for this purpose.
- To Do Role for Audit Script Errors should be configured to an appropriate default To Do role for the above To Do type.
- To Do Type for Custom Extension Errors should be set to an appropriate To Do type. The base product To Do Type **Self Service Task Custom Extension Issues (C1-SSCSI)** is provided for this purpose.
- To Do Role for Custom Extension Errors should be configured to an appropriate default To Do role for the above To Do type.

For any web service that requires inquiry audit or custom extension, determine the schema associated with the XAI inbound service that processes the web service.

- Schema Type and Schema Name should be set to the appropriate object that the XAI inbound service references.
- For enabling inquiry audit, check the Inquiry Audit Enabled button. If the raw XML of the request and response should be captured, check the Store Response Data checkbox. Indicate the Audit Script. The base product provides the script **C1-AddWebAI** that may be used.

- For providing additional data in a web service response, provide a Custom Extension Script. The schema for the custom extension script should match the schema that it is extending. It populates data in the data area **C1-SSCustomExtensionFields**.

Setting Up Taxpayer Identification

Base product functionality uses a person's birth date as one of the identification details. If your implementation captures the birth date on the person record and would like that to be part of the taxpayer identification logic, the setup described in this topic is required.

NOTE: The product does not provide any functionality for populating the birth date characteristic on the person.

Characteristic Type

Create a business object for individual person that supports display and maintenance of the birth date characteristic.

Business Object for Individual Person

Create a business object for an individual person that supports display and maintenance of the birth date characteristic:

1. Add a child business object for **C1-PersonIndividual**.
2. Copy the schema.
3. Add the element representing a flattened characteristic of the type created above, placing it in the desired location for the rendered user interface. In addition, include the appropriate **startSection** and **endSection** definitions.

The following example illustrates the schema for a child business object created for the base business object **C1-PersonIndividual** and characteristic type **BIRTHDAT** so that the birth day appears in a new ***Additional Information*** section after the ***Contact Information***.

```
<schema xmlns:uiHint="http://oracle.com/ouafUIHints">
<includeDA name="C1-PersonCommon"/>
<includeDA name="C1-PersonExtendedNameDetails"/>
<includeDA name="C1-PersonId"/>
<includeDA name="C1-PersonPhone"/>
<includeDA name="C1-PersonAddress"/>
<includeDA name="C1-PersonContactInfo"/>
<uiHint:startSection mdField="ADDITIONAL_INFO" sectionColumn="right"/>
    <birthDate mdField="C1_SS_BIRTHDATE" dataType="date" mapField="ADHOC_CHAR_VAL">
        <row mapChild="CI_PER_CHAR">
            <CHAR_TYPE_CD is="BIRTHDAT"/>
            <EFFDT is="%effectiveDate"/>
        </row>
    </birthDate>
    <effectiveDate dataType="date" default="1950-01-01" mapField="EFFDT" rowRef="birthDate" suppress="true"/
>
<uiHint:endSection/>
<includeDA name="C1-PersonPerson"/>
</schema>
```

Person Type

Specify the business object created above on person type(s) that represent individuals in your implementation.

Setting Up Service Task Types

Service Task Types contain the rules that control how service tasks are processed.

To set up a service task type, select **Admin** > **Self Service Task Type**.

The topics in this section describe the base-package zones that appear on the Service Task Type portal.

Self Service Task List

The Service Task Type List Zone lists every self service task type. The following functions are available:

- Click the broadcast button to open other zones that contain more information about the adjacent service task type.
- The standard actions of **Edit, Delete** and **Duplicate** are available for each service task type.
- Click the **Add** link in the zone's title bar to add a new service task type.

Self Service Task Type

The Self Service Task Type zone contains display-only information about a service task type. This zone appears when a service task type has been broadcast from the Self Service Task Type List zone or if this portal is opened via a drill down from another page.

Please see the zone's help text for information about this zone's fields.

Supported Functionality

This section describes the out of the box functionality provided for the integration along with the required configuration tasks.

Enrollment

After registering on a self-service portal and establishing a secure login, the user should explicitly request access to his/her taxes. The request is evaluated, and the user/tax account association(s) are recorded in the system and become available for account access verification.

A single web portal login provides the self service user with access to all tax accounts. In other words an individual who also happens to be a business owner may log in once and view and manage both individual and corporate taxes.

A user enrolled into a tax account is able to view account financial information, file tax returns and make payments related to this account, update contact and correspondence information, and request services.

NOTE: See the *Tax Account Access Information* section for a detailed explanation about tax account access.

User Access Store

The User Access store is a table in which the link between users and tax accounts is stored. It is maintained and accessed exclusively from the integration layer via SOA composites. The integration provides the information to the self service product and other solution components.

- The following information is stored:
- Enrollment ID
- Web User ID
- Line of Business
- Access Type
- Access keys 1 - 10 (Key Name and Key Value)
- Revenue Management System Name
- Status

The records marked with same enrollment ID/web user ID/line of business comprise an enrollment "event".

The possible statuses of the user access records are represented in the product by the lookup **ENROLLMENT_STATUS_FLG.**

Initial Enrollment and Enrollment Event

The self service user is asked to provide identification details sufficient to determine tax accounts that this user owns. A separate enrollment request is made for each line of business.

The initial enrollment request creates an enrollment "event" that is "known" to two solution components: the integration layer and the revenue management system(s). Service task represents an enrollment event in the base product. User account access data captured in the user access store includes enrollment ID, web user ID, and line of business, thus associating it with a specific enrollment event.

The solution supports configurable identification details and algorithm-based enrollment request processing. In the base product, initial enrollment is implemented using an *Enrollment Service Request*.

The request is handled by a special web service TSEnrollmentServiceRequest. The results of a successful enrollment are:

- Creation of one or more records in the user access store. Each record is associated with enrollment ID. One record is created for each accessible tax account. The status of the record indicates that the access to a tax account is either approved or requires an additional review.

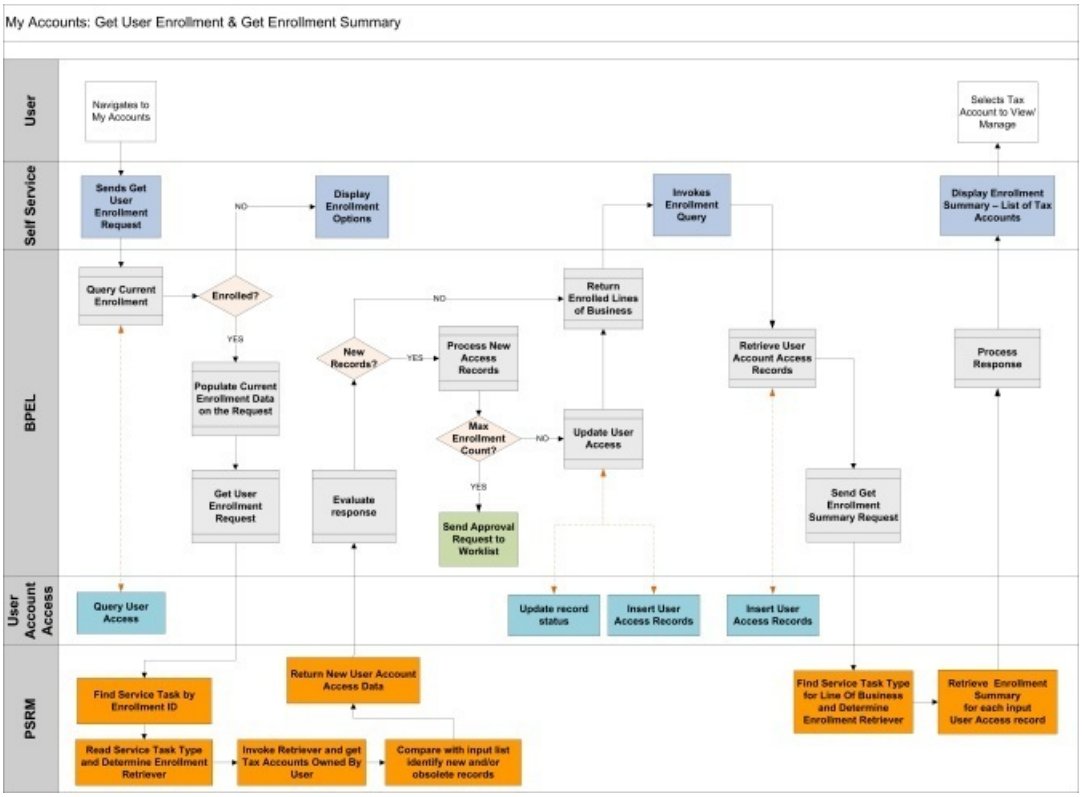
  NOTE: The status of the record is set according to service task type configuration.

- Creation of a service task associated with both enrollment ID and confirmation ID. The initial list of user access records is captured on the service task.

  NOTE: See the *Enrollment Request* section for detailed information about enrollment processes and related configurations.

Enrollment Refresh and Summary

The following diagram illustrates the process flow on the **My Accounts** (Enrollment Summary) portal page.



Implicit Enrollment Refresh

User access information is implicitly refreshed upon login. For example, a business owner that opened a new business and registered it with the tax authority would be automatically given an access to this new business account.

The request is handled by a special web service, **TSGetUserEnrollment**.

The integration has the following steps:

- The request is initiated from the self service product. The XML message contains web user ID.
- The SOA Composite is querying the user access store, retrieves all enrollment records and populates them on the request; each record includes tax account identifiers line of business and enrollment ID.
- The request is forwarded to the product. The processing service script finds enrollment request service task associated with each input enrollment ID. It reads service task type configuration under *Enrollment Instructions*, and invokes the enrollment retrievers associated with the input access type. The input list of tax accounts is compared with the retriever's response, and any new entries are added to the output. Entries that are no longer present on the list are added to the output with *Inactive* status.

  NOTE: See *New and Updated User Access* for more information. Also refer to the business service **C1-GetEnrollment** for additional details.

- The response is processed by the integration layer and new user's tax accounts are added to the user access store.

The results of a successful enrollment refresh may be a creation of one or more new records in user access store. Each record is stumped with the original enrollment ID/line of business combination.

Enrollment Summary

Upon login the self service product displays the user enrollment summary that contains a list of all tax accounts that the user is eligible to view and manage. This is an inquiry request that defines its own web service (**TSGetEnrollmentSummary**). The integration has the following steps:

1. The request is initiated from the self service product. The XML message contains the user ID.
2. The SOA Composite queries the user access store and retrieves all enrollment records. Each record includes tax account identifiers (access type and access keys), line of business, and enrollment ID.
3. The list of enrollment records is delivered to the system. The processing service script finds the enrollment service task associated with the input enrollment ID, reads the service task type, and calls the account summary retriever. The retriever also marks one enrollment record as a default. When the web service response reaches portal application, this record is automatically pulled into a self service session context.

Summary Contents

The self service product displays tax account highlights on the **My Accounts** portal page. The single tax account enrollment summary includes two components:

- **Title** - a short description of the tax account.
- **Details** - essentials about tax account status.

Both parts of the summary are composed using message text with the substitution parameters.

The base product is expected to supply the actual data items, including dates, numbers, and types. This information is used by the self service product as substitution parameters for the Summary messages.

The enrollment summary retriever is expected to deliver the following information:

- Summary Title parameters list.
- Summary Details parameters list.
- Taxpayer Name (required, used internally by the self service product).
- Account Name (optional, used internally by the self service product).

The enrollment summary retrievers provided with the base product return the following

- **Individual** enrollment summary - returns a summary title parameter *tax type* and summary details parameters: tax role's *start* and *end date* and an *outstanding balance* forecasted for the current date.
- **Business** enrollment summary - returns a summary title parameter *tax type* and summary details parameters: tax role's *start* and *end date* and an *outstanding balance* forecasted for the current date and a *formatted address*.

NOTE: Refer to the business service **C1-GetBusinessTaxRoleSummary** as an example of a tax account enrollment summary retriever.

New and Updated User Access

Enrollment retriever logic compares the result list of tax accounts with the initial enrollment data that is captured on the service task and performs the follows:

- Adds the new entries to the output new keys list.
- If an entry exists on the initial enrollment list but no longer returned by the retriever, the logic interprets it as if the taxpayer is no longer owns the tax account. Such record is added to the new keys list with an **Inactive** status.

NOTE: Refer to the business service **C1-EnrolIndividualAccntTaxRole** as an example of an access type-specific enrollment retriever.

Failed Enrollment Attempts

The self service solution provides a mechanism to monitor enrollment attempts and block suspicious and fraudulent web user activities.

A service task "in error" is created every time an enrollment process ends in error. This allows tracking and auditing of the failed attempts. The results of unsuccessful enrollment attempt are:

- A service task in error is created. It is associated with the enrollment ID.
- The preceding failed enrollment attempts determined as service task(s) in error with the same enrollment ID. If found, they are linked to the current service task as related objects.
- A single record in error status is created in the user access store (this is handled by a SOA Composite in the integration layer).

Enrollment Review

The self service product allows manual review of the problematic enrollment requests. Under certain conditions the SOA Composite may place one or more records in the user access store on hold and create a **Worklist** task.

See the *Oracle Public Sector Revenue Management Self Service Implementation Guide* for more information about how problem enrollment requests are handled.

Configuration Tasks for Enrollment

The following sections list the configuration tasks required to implement the base user enrollment functionality.

Master Configuration

The self service master configuration record includes settings required for enrollment processing.

- **Revenue Management System**. Define the alphanumeric code that will be referenced by records in the user access store.

  NOTE: See the *User Access Store* section for more details.

Service Task Type

Configure Enrollment Request service task type for every line of business supported by your implementation. This service task type contains definitions used by *Initial Enrollment Request*, *Implicit Enrollment Refresh* and *Enrollment Summary* functionality.

See *Configuration Tasks for Enrollment Request* for detailed information on enrollment configurations.

Integration Mapping

Tax types and **taxpayer types** used by the product should have corresponding values defined in the self service product.

Your implementation may decide to use exactly the same values in both products or configure the mapping using domain value mapping in the SOA Composer application

Customizing Enrollment

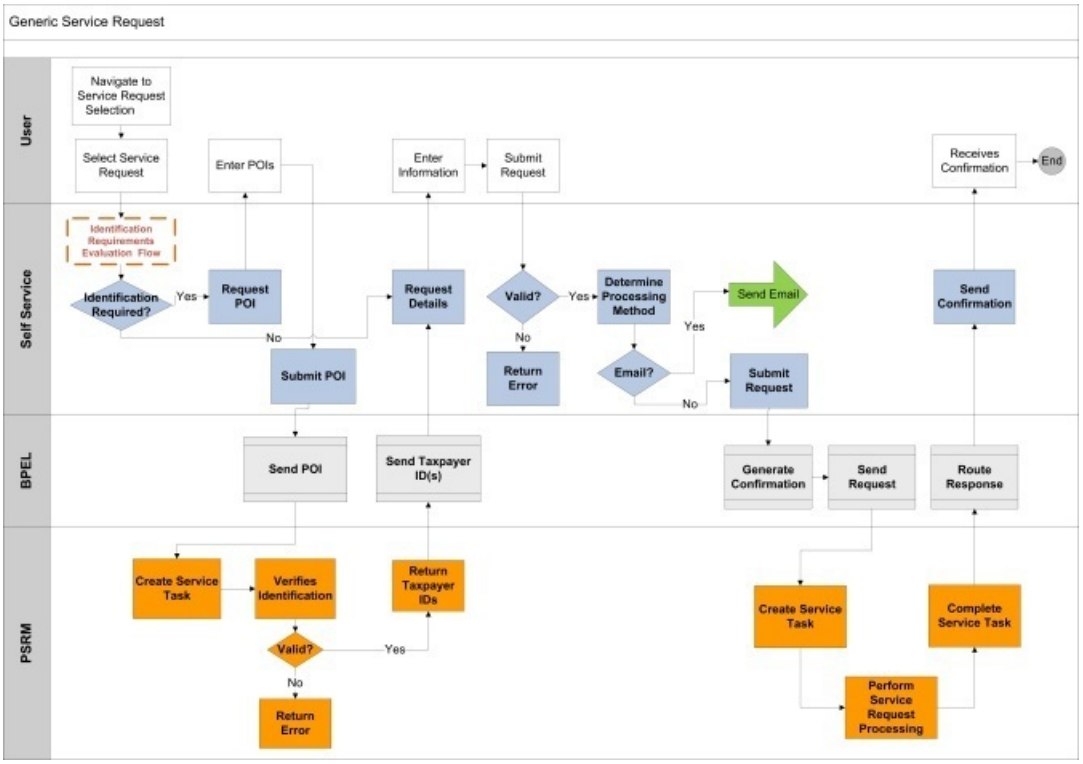
If your business requirements are not satisfied by the functionality provided by the base product consider the following customization options:

- **The information displayed on My Accounts**. To customize the contents of a tax account summary you should create custom Access Type Summary Retriever and adjust the enrollment request service task type configurations and also the corresponding configurations in self service product (message).
- **The way tax accounts owned by the user are determined**. Create custom User Access Type Summary retriever(s) and adjust the corresponding enrollment request service task type configurations.
- **The information required in order to verify self service user identity and credentials** If different from what is supported by a base product, you should create new enrollment service task business object to capture the information and implement an alternative User Enrollment Retriever(s). Reconfigure the corresponding enrollment service task types to reference the new business object and set up new request field mapping.
- **Additional steps should be included in the initial enrollment handling**. Utilize standard business object plug in spots available the enrollment service task.
- **New access type**. Implementation of a new access type should be closely coordinated with the self service product.
  - Define access keys to be used for the new access type. **Note**: key 1 is always reserved for the Taxpayer ID.
  - Determine the lines of business that are applicable for this access type.
  - Implement User Enrollment Retrievers and Access Type Summary Retrievers for all applicable lines of business.
  - Configure enrollment service task types.
  - If the implementation should support an option to pay a balance for the tax account defined by this new access type, implement a new payment destination, including distribution rule, if needed.
  - Create corresponding configurations for Access Type in the self service product and add mapping in the integration layer

NOTE: See *Configuration Tasks for Enrollment Request* for detailed information on enrollment configurations.

Taxpayer Service Request

The self service product supports service requests by the taxpayer. Some requests may be fulfilled by the self service product, such as information about when to file or technical support requests. Other requests may require information from this product. The following diagram illustrates an expected process flow.



The following points highlight the process:

- The service request may or may not require taxpayer identification up front. If it does, the initial processing works as follows:
  - **For a casual user**: The self service application captures information about the taxpayer and sends a web service request to this product to validate the taxpayer (proof of identity - POI).
  - **For an enrolled user**: The identification is not performed.

    NOTE: For additional information, see *User Identity Verification*.

- The product receives a web service request to identify the taxpayer. The product provides the inbound web service **TSTaxpayerIdentification** to process the message. It uses the script **C1-IdentTaxp** to process the request. This should cause an appropriate service task to be created based on the type and populate the relevant data for the service task. The service task should include algorithms to identify the taxpayer and immediately respond to the web service call.

  NOTE:
  For additional information see *Configuration Tasks for Taxpayer Service Request*.

- For any service request that requires action by the product, another web service request is received with information about the request, including the task type to create. The product provides the inbound web service **TSTaxpayerServiceRequest** which uses the script **C1-TaxSvcReq** to process the request. This should cause an appropriate service task to be created based on the type and populate the relevant data for the service task. Depending on the requirements for a particular service request, the service task may be designed to do the following:
  - Give real-time feedback/results (if the request simply involves information retrieval)
  - Perform the task as a separate step without the taxpayer waiting for a reply. In this case the taxpayer should receive a confirmation ID related to the request that is provided in the web service so that at a later date the progress of the service request can be queried by the taxpayer.

NOTE: See *Implementing A New Service Request* for more information.

The base product provides functionality out of the box for various categories of service requests, including a taxpayer's request for a tax clearance certificate. The topics below describe more information about the provided functionality, followed by configuration tasks.

Configuration Tasks for Taxpayer Identification Service Request

The following sections list the configuration tasks required to implement the base taxpayer identification functionality.

Algorithms

Create the following algorithms:

- Create an algorithm for algorithm type **C1-IDTXPSR**. Populate the Birth Date Required parameter as per business rules. Define the characteristic type for the birth date that was created above (also see *Setting Up Taxpayer Identification* in the topic, *General Configuration Tasks*.

Business Object

Update the business object **C1-TaxpayerIdentSvcReqSSTask** to include this algorithm. Navigate to the Lifecycle tab and on the **In Progress** state, add an entry to the Algorithm collection: System Event is **Enter**, Algorithm is the one created above.

Service Task Type

Create a service task type for taxpayer identification to use for service requests. Use the business object **Taxpayer Service Request Self Service Task Type**.

- The related transaction BO should be set to **C1-TaxpayerIdentSvcReqSSTask**.
- Service task class should be set to **Service Request**.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type **Self Service Task Issues (C1-SSTTD)** is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

FASTPATH: Refer to the Messages section of the *General Configuration Tasks* for more information.

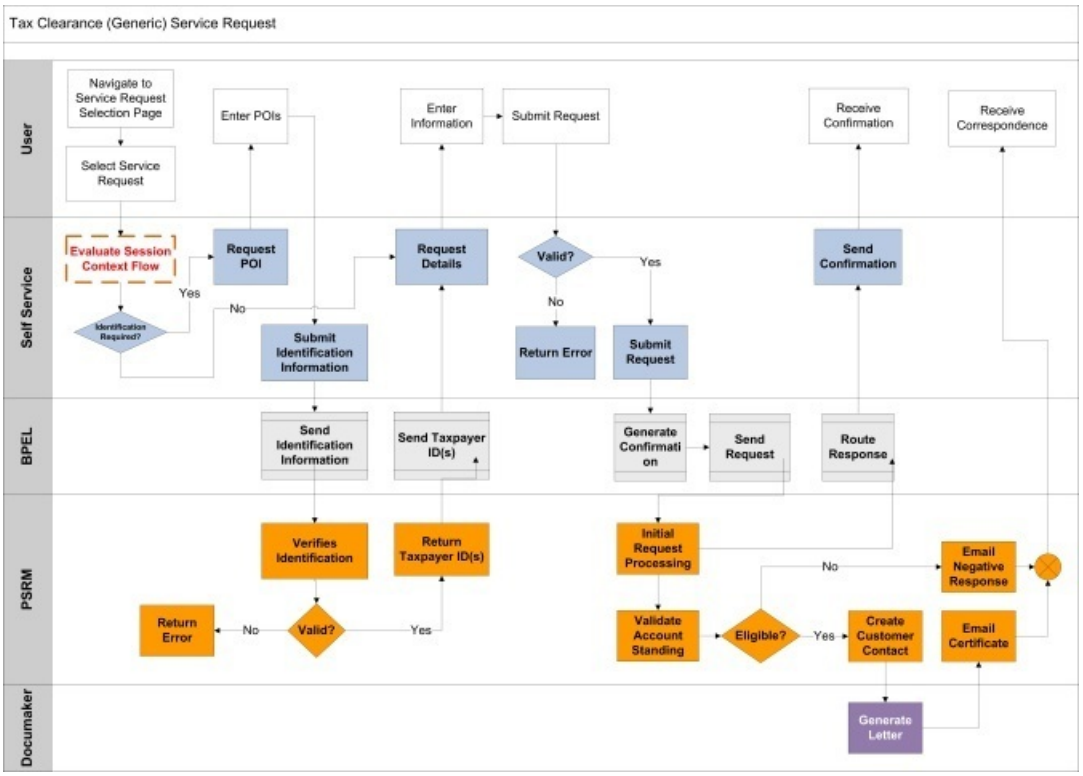
- The service request fields mapping is used when creating the target service task to correctly populate the requestField list from the list of fields passed in on the web service request XML. For the base transaction business object, the following fields are expected:

Sequence	Transaction BO XPath
1	requestData/legalName
2	requestData/birthDate
3	requestData/personType
4	requestData/idType

FASTPATH: Service Task Type Mapping. The service task type defined here must be configured in the service task domain value mapping in the SOA Composer application. Refer to the self service product documentation for details.

Tax Clearance Certificate

On occasion a taxpayer may be required to produce a Tax Clearance Certificate to a third party. This must be requested from the tax authority as a written confirmation that a taxpayer is considered in good standing as of the date of issue of the Certificate. The following diagram illustrates the process flow supported for issuing a tax clearance certificate.



The following points describe in more detail the functionality provided

- This type of service request requires taxpayer identification first.
- The product provides a base service task business object called **C1-TaxClearCertSvcReqSSTask** that processes the request. It calls an algorithm to determine if the account is in good standing. If so, it creates a customer contact to issue the certificate that may be emailed. If not, it creates a customer contact to inform the taxpayer that a certificate is not possible.
- The product provides a letter extract for a sample tax clearance certificate. In addition a letter template for Documaker is included in this functionality.

Configuration Tasks for Tax Clearance Certificate

The following sections list the configuration tasks needed to implement the tax clearance certificate functionality.

Lookup

Using the lookup **C1_TAX_CLEARANCE_PURPOSE_FLG** define the values that are valid for your implementation.

Characteristic Types

Create the following characteristic types:

- **Tax Clearance Purpose**. This char type is used to capture the tax clearance purpose on the customer contact for audit purposes. Define Customer Contact as a characteristic entity. The tax clearance purpose is defined in a lookup field (**C1_TAX_CLEARANCE_PURPOSE_FLG**). The characteristic type should be defined as a predefined characteristic with the valid values from the lookup repeated.

Letter Template

Create a letter template to represent the tax clearance certificate. Reference the extract algorithm **C1-LTR-TCSDC**. Batch control is required and **LTRPRT** can be entered here.

Customer Contact Class / Type

Define or identify an appropriate Customer Contact Class for the tax clearance certificate customer contact types.

Create a Customer Contact Type for issuing the tax clearance certificate.

- Customer Contact Business Object is not required.
- Contact Shorthand is not applicable.
- Set the Contact Action to **Send Letter** and indicate the letter template created above.
- For the template characteristics, define the Characteristic type created above for Tax Clearance Purpose. In addition, define the (base) characteristic type Expiration Date.

Create a Customer Contact Type for declining the Tax Clearance Certificate.

- Customer Contact Business Object is not required.
- Contact Shorthand is not applicable.
- Leave Contact Action blank.
- For the template characteristics, define the Characteristic type created above for Tax Clearance Purpose.

Managed Content

Create managed content records to define the HTML to use for the email related to the tax clearance certificate. Define one for the email that is sent when issuing the certificate. Define another for the email that is sent when the request is denied.

For both records, the Managed Content Type should be HTML. Navigate to the Schema tab and enter the following tags and type the appropriate text for the email within the "" tags.

```
<html>
  <body>
    <span> </span>
  </body>
</html>
```

Field

Define a field that includes the text for the email subject.

Algorithms

Create the following algorithms:

- Evaluate Outstanding Debt. Create an algorithm for the algorithm type **C1-EVALDEBT**. Populate the Max Outstanding Debt Allowed parameter.

- Evaluate Gap in Filing. Create an algorithm for the algorithm type **C1-EVALGAP**. Populate the Overdue Process Template and the No-gap Filing Period parameters.
- Email Tax Clearance Certificate Letter. Create an algorithm for the algorithm type **C1-EMTXCL**. Populate the parameters:
  - Set the Customer Contact Class created above.
  - Set the Customer Contact Types for Issue Tax Clearance Certificate and for Decline Tax Clearance Certificate created above.
  - Set the Characteristic Type for Tax Clearance Certificate Purpose
  - Set the Predefined Email Text for the Issuing Certificate Email and the Decline Request Email configured as Managed Content above.
  - Set the Email Subject field created above.
  - Enter the Characteristic Type for Certificate Expiration Date: C1-EXPDT
  - Enter the number of days that is the Certificate Valid Period
  - Enter the XAI Sender for Email created as part of the general configuration options.
  - Enter the From Email Address that should be used in the generated email
  - Enter the From Name that should be used in the generated email

Business Object

Update the business object **C1-TaxClearCertSvcReqSSTask**. Navigate to the Lifecycle tab.

- On the **In Progress** state, add an entry to the Algorithm collection: System Event is **Enter**, Algorithm is set to the one created above for Evaluate Outstanding Debt.
- On the **In Progress** state, add an entry to the Algorithm collection: System Event is **Enter**, Algorithm is set to the one created above for Evaluate Gap in Filing.
- On the **Complete** state, add an entry to the Algorithm collection: System Event is **Enter**, Algorithm is set to the one created above to Email the Tax Clearing Certificate Letter.

Service Task Type

Create a service task type for the tax clearance certificate service task with the business object **Taxpayer Service Request Self Service Task Type**.

- The related transaction BO should be set to **C1-TaxClearCertSvcReqSSTask**.
- Service task class should be set to **Service Request**.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type **Self Service Task Issues (C1-SSTTD)** is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

  FASTPATH: Refer to the Messages section of the *General Configuration Tasks* for more information.

- The service request fields mapping is used when creating the target service task to correctly populate the requestField list from the list of fields passed in on the web service request XML. For the base transaction business object, the following fields are expected:

Sequence	Transaction BO XPath
1	requestData/emailAddress
2	requestData/phoneNumber
3	requestData/taxClearancePurpose
4	requestData/isPaperCopyReq

FASTPATH: Service Task Type Mapping. The service task type defined here must be configured in the service task domain value mapping in the SOA Composer application. Refer to the self service product documentation for details.

Scheduled Reminder

A self-service user may schedule an automatic email reminder. The reminder can be scheduled for an infinite time or expire on a certain date. The monthly reminder functionality is provided by the product. This is a standard taxpayer service request.

NOTE: See *Taxpayer Service Request* for details on the request flow.

The following points describe the functionality provided:

- This type of service request does not require taxpayer identification.
- The product provides a base service task business object called C1-SchedMonthlyReminderSSTask that processes the request. It creates a reminder service task in active state. Periodic monitor batch process selects the active reminder tasks and triggers an algorithm to determine if the expiration date is reached. If not yet, the subsequent algorithm checks if the scheduled day of the month is reached and if so, sends an email reminder. If the expiration date id reached or in the past, the reminder task becomes inactive.

Configuration Tasks for Scheduled Reminder

The following sections list the configuration tasks needed to implement the scheduled reminder request functionality.

Managed Content
Create managed content records to define the HTML to use for the email reminder.

The Managed Content Type should be HTML. Navigate to the Schema tab and enter the following tags and type the appropriate text for the email within the "" tags.

```
<html>
  <body>
    <span> </span>
  </body>
</html>
```

Field
The product is provided with field C1_SCHED_REMINDER_SUBJ Tax Payment Reminder. Use it for the reminder email subject or define a new field that includes the text for the email subject.

Service Task Type
Create a service task type scheduled monthly reminder request. Using the business object Scheduled Reminder Request Task Type:

- The related transaction BO should be set to C1-SchedMonthlyReminderSSTask.
- Service task class should be set to Service Request for To Do.

- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type Self Service Task Issues (C1-SSTTD) is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

NOTE: Fastpath: Refer to the Messages section of the *General Configuration Tasks* for more information.

- The service request fields mapping is used when creating the target service task to correctly populate the requestField list from the list of fields passed in on the web service request XML. For the base transaction business object, the following fields are expected:

Sequence	Transaction BO XPath
1	requestData/name
2	requestData/emailAddress
3	requestData/phoneNumber
4	requestData/dayOfMonth
5	requestData/expirationDate

Configure Email Notification Instructions:

- Set the Email content configured to Managed Content created above.
- Set the Email Subject to Field created above.
- Enter the From Email Address that should be used in the generated email
- Enter the From Name that should be used in the generated email
- Enter the XAI Sender for Email created as part of the general configuration options

NOTE: Service Task Type Mapping. The service task type defined here must be configured in the service task domain value mapping in the SOA Composer application. Refer to the self service product documentation for details.

Generic To Do Service Request

Some services requested by the taxpayer may require manual review and idiosyncratic processing. The integration supports the scenario where the incoming service request results in creation of a service task which simply stores request fields (name-value pair collection) and creates a To Do entry that is referencing the service task.

NOTE: See *Taxpayer Service Request* for details on the request flow.

This approach allows utilizing single service task business object to capture different types of requests.

Configuration Tasks for Generic To Do Request

The following sections list the configuration tasks needed to implement the generic service request functionality.

Service Task Types
Create a service task type for each generic create-To-Do service request. Use the business object Generic Create To Do Request Task Type.

- The related transaction BO should be set to C1-GenericToDoSSTask.
- Service task class should be set to Service Request for To Do.

- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type Self Service Task Issues (C1-SSTTD) is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

  FASTPATH: Refer to the Messages section of the *General Configuration Tasks* for more information.

- Request processor should be set to C1-PopSvRqDt.
- The service request fields mapping is used when creating the target service task to correctly populate the requestField list from the list of fields passed in on the web service request XML. For the base transaction business object, the following fields are expected:

Sequence	Transaction BO XPath
1	requestData/requestComments

To configure request processing instructions:

- Create To Do Type should be set to a To Do type to use when processing the request. The base product provides Generic Service Request To Do (C1-GSRTD) for this purpose.

  NOTE: To distinguish between various generic requests you may prefer to create a designated To Do Type for each one.

- Create To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.

NOTE: Service Task Type Mapping. The service task type defined here must be configured in the service task domain value mapping in the SOA Composer application. Refer to the self service product documentation for details.

Refund Status

In this release, the integration supports the ability for a taxpayer to inquire on the status of a tax refund. This is a special kind of taxpayer service request that defines its own web service. The integration has the following steps:

- The self service application captures information about the taxpayer, a way of identifying the filing period for the refund in question and a "shared secret" that ideally only the taxpayer and the tax authority would know (such as the expected refund amount).
- This information is sent to the system, which creates a Refund Status Inquiry service task.
- The task's lifecycle is designed to process the information immediately with no deferred monitor process so that the information can be returned to the self service application real-time.
- The base business object for the Refund Status Inquiry service task includes an algorithm to verify the taxpayer identification, confirm that a form has been received for the filing period, determine the status of the refund and compose an appropriate message to send back to the taxpayer immediately.

Note that the implementation of the refund status inquiry creates a service task for the following reasons:

- The creation of a service task with its business object architecture provides many plug-in spots to allow implementations to easily customize the logic for identifying the taxpayer and determining the refund status.

- The status of a refund is based on conditions in the system that can change over time. Instantiating a service task for the refund status inquiry provides a way of capturing the point in time that the request was received and being able to reconcile this with the information sent to the taxpayer.
- Creating a service task enables the tax authority to provide the taxpayer with a confirmation ID for possible follow up in the future. For example, imagine a taxpayer is told "Your refund has been processed. You should receive it shortly." and several weeks later the taxpayer has still not received the refund. If the taxpayer contacts the tax authority and provides the confirmation ID, the user can view the service task, verify the details and more easily investigate the situation.

The topics below describe more information about the provided functionality, followed by configuration tasks.

Refund Inquiry Service Task

The web service requesting the refund status is processed by the XAI Inbound Service **TSGetRefundStatus**, which invokes the service script **C1-RSISvcReq**. The appropriate service task type to use must be passed in with the other information received from the self service system.

Identifying the Shared Secret Amount

The logic provided in the base product assumes that the shared secret is an amount on the taxpayer's form. Form definition in the system is configurable and each form may be defined with different form lines that capture the amount used for the shared secret. For each form type, the system needs to know which form line is the one used for the shared secret. This information is defined in the self service master configuration.

FASTPATH: Refer to *Configuration Tasks for Refund Status* for information about configuring the system to support these payment destinations.

Determining the Status of the Refund

The lifecycle of creating a tax refund in the system includes the following steps.

- The taxpayer files the form, which is received by the system. The form gets processed and appropriate adjustments are created for the obligation for the filing period to record the affect on the balance.
- Once the taxpayer's obligation has a credit balance, an overpayment process is used to process the refund. How the overpayment process is created depends on the business practice. An account debt monitor may be used to detect obligations with a credit and can create the overpayment process. The form can include logic to immediately create the overpayment process based on the existence of a credit balance based on a form rule.

  NOTE: The base product does not currently supply a form rule to create the overpayment process at posting time. A custom form rule may be developed.

- The overpayment process may require approval. Once approvals are processed, the overpayment process may have logic to use the credit to apply to other debt. Or it may carry the credit forward to a future filing period (typically upon the taxpayer's request). When the overpayment process completes, it has a record of carry forward, offset and refund amounts. If there is any refund, the overpayment creates an accounts payable (A/P) adjustment if the refund should be provided using a paper check. It creates a credit payment with appropriate bank information to process the refund as a direct deposit.

An algorithm plugged into the refund status inquiry service task business object as an enter plug-in on the **In Progress** state is responsible for determining the status of the refund. Refer to the description of the algorithm for more information about the base logic provided.

Configuration Tasks for Refund Status

The following sections list the configuration tasks needed to implement the refund status functionality.

Service Task Type

Create a service task type for the refund status inquiry service task with the business object **Standard Self Service Task Type**.

- The related transaction BO should be set to **C1-RefundStatusInquirySSTask**.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type **Self Service Task Issues (C1-SSTTD)** is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

FASTPATH: Refer to the Messages section of the *General Configuration Tasks* for more information.

FASTPATH: Service Task Type Mapping. The service task type defined here must be configured in the service task domain value mapping in the SOA Composer application. Refer to the self service product documentation for details.

Master Configuration

The self service master configuration record includes several settings required for refund status functionality.

- Shared Secret Form Line. For each form type that is supported for a taxpayer to inquire about a refund, indicate the XPath of the form line reference. Note that there is an ability to view the schema of the form business object associated with the form type to find the correct XPath.

NOTE: Reported vs. Current. Because the configuration is related to information that the taxpayer has reported, consider whether the "current" element (asCurrent) or "reported" element (asReported) is used. If the taxpayer has made calculation mistakes, form rules or users may adjust the current value of the shared secret field. In this case the reported value is what the taxpayer knows and would enter.

- Overpayment Process Amounts. In order to be able to provide details related to the refund, it is necessary to report amounts that may have been used to offset other debt and amounts that are carried forward to future filing periods. The information is defined as elements in overpayment process business object. For each Overpayment Process Type, indicate the XPath values for the Refund Amount, the Offset Amount and the Carry Forward Amount. Note that there is an ability to view the schema of the overpayment process business object associated with the overpayment process type to find the correct XPath.

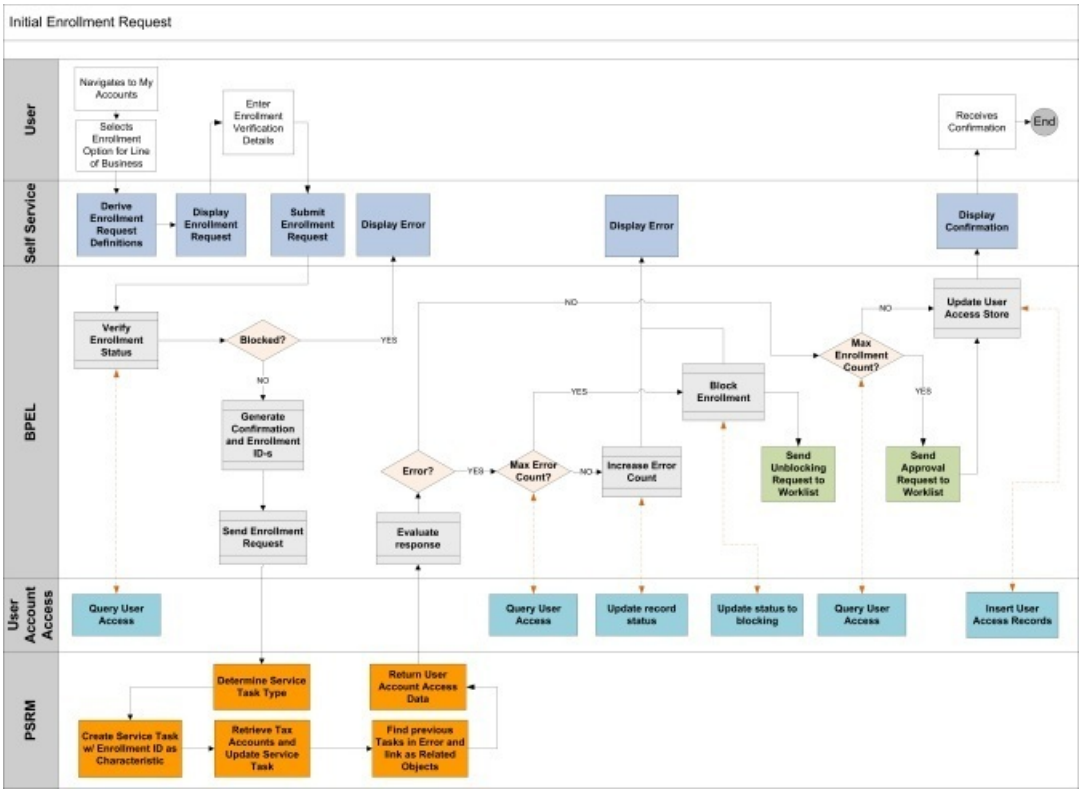
Enrollment Request

This special class of service request supports the ability for a user to request online access to multiple tax accounts and to perform various self-service operations.

One enrollment request is created per line of business.

NOTE: See the *Enrollment* section for more details about this functionality.

This is a special kind of a service request that defines its own web service, **TSEnrollmentServiceRequest**. The web service requesting the enrollment is processed by the XAI Inbound Service, which invokes the service script **C1-EnrSvcReq**. The appropriate service task type to use must be passed in with the other information received from the self service system.



The integration has the following steps:

- The self service application captures information about the taxpayer that is sufficient to identify tax accounts related to this taxpayer within the context of a specific line of business.
- The integration layer generates two unique IDs: **Confirmation ID**, which will be later presented to the self-service user, and **Enrollment ID**, which will be used internally between SOA/BPEL layer and the revenue management system.
- This information is sent to the system, which creates an Enrollment Request service task.
- The task's lifecycle is designed to process the information immediately, with no deferred monitor process, so that the information can be returned to the self service application in real-time.
- The base business object for the Enrollment Request Service Task includes an algorithm, **C1-ENR-INIT**, that reads enrollment service task type configurations and orchestrates the process. It invokes access type-specific logic to verify the taxpayer identity, determine what data this user should be able to access and manage, and populate the results on the response message. The response message contains the list of tax account identifiers (access type+access keys). Each entry also includes the enrollment status, revenue management system, and enrollment ID.

  NOTE: See *Tax Account Access Information* for a detailed explanation of tax account access, and *Configuration Tasks for Enrollment Request* information about enrollment task type configurations.

- The response is sent back to the self-service application immediately.
- Enrollment entries are processed by SOA Composite in the integration layer. They are captured in the user access store table.
- The final response to the self-service application contains confirmation details.

Note that the implementation of the enrollment request creates a service task for the following reasons:

- The creation of a service task with its business object architecture provides many plug-in spots to allow implementations to easily customize the initial enrollment logic.

- The service task type provides a facility for the various configurations related to enrollment handling.
- The enrollment request service task provides an audit tracking for the enrollment activities and is linked to the unique enrollment ID which is shared between the revenue management system(s) and the self service product. It also allows tracking of failed enrollments attempts.
- The enrollment request service task captures the initial list of tax accounts and provides future reference for the implicit enrollment refresh.

  NOTE: See *Implicit Enrollment Refresh* for more information.

- Creating a service task enables the tax authority to provide the taxpayer with a confirmation ID for possible follow-up . If the taxpayer contacts the tax authority and provides the confirmation ID, the user can view the service task, verify the details, and more easily investigate the situation.

Determining the Tax Accounts Owned by User

The base product supports the enrollment for access type *Tax Role* out-of-box. It is implemented for two lines of business: *Individual* and *Business*.

Access keys used for *Tax Role* are:

PER_ID - taxpayer

TAX_ROLE_ID - tax role

NOTE: See *Message Processing Overview* chapter for more information about access type and line of business.

The enrollment logic depends on the requested line of business.

- **Individual** enrollment - the logic searches for accounts where the identified taxpayer is listed as either a primary taxpayer or a financially responsible person. Non-cancelled tax roles linked to these accounts are returned.
- **Business** enrollment - the logic reads the taxpayer instructions on the service task type and determines the relationships between the requestor and the business. It then determines the business person and finds all accounts where this person is either a primary taxpayer or a financially responsible person. The non-cancelled tax roles linked to these accounts are returned.

For example, the *Taxpayer Instruction* on the service task type lists *Corporate Officer* person-to-person relationship type means that the taxpayer(person) requesting an access to the business tax account should be linked to this business (person) as a corporate officer.

An algorithm plugged into the enrollment service task business object as an enter plug-in on the In Progress state is responsible for determining the tax accounts. Refer to the description of the algorithm for more information about the base logic provided.

See *Configuration Tasks for Enrollment Request* for information about configuring the system to support enrollment requests.

Configuration Tasks for Enrollment Request

The following sections list the configuration tasks required to implement the base taxpayer enrollment request functionality.

Characteristic Type
If your implementation captures the taxpayer's birth date on the person record and would like that to be part of the taxpayer identification for enrollment service requests, create a characteristic type for Birth Date. It should be defined as ad-hoc and should reference Person as the characteristic entity.

Notes:

- It is recommended to use the same characteristic type as the one defined for *Taxpayer Identification Service Request.*
- The product does not provide any functionality for populating the birth date characteristic on the person.

Service Task Type
Create a service task type for the enrollment request service task for each line of business your implementation will support. Using the business object **User Enrollment Self Service Request Type**:

- Select the line of business from the drop-down list.
- The related transaction BO should be set as follows:
  - Line of Business ***Business*** - C1-BusinessEnrollmentRequest.
  - Line of Business ***Individuals*** - C1-IndividualEnrollmentRequest
- Service task class should be set to Service Request.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type Self Service Task Issues (C1-SSTTD) is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

  NOTE: See the Messages section of the *General Configuration Tasks* for more information.

- The service request fields mapping is used when creating the target service task to correctly populate the requestField list from the list of fields passed in on the web service request XML. For the base transaction business object, the following fields are expected:

Sequence	Transaction BO XPath
1	requestData/idType
2	requestData/idValue
3	requestData/birthDate

- **Enrollment Instructions**:
  - Char Type for Date of Birth - Specify the characteristic type defined above
  - **Name Type** - Specify what type of taxpayer's name should be displayed on enrollment summary. This configuration is used by enrollment summary retrievers.

    NOTE: See *Enrollment Summary* for more information.

  - **Enrollment status** - Specify the default status of the user access records. Permissible values are *Approved*, *Pending* and *On Hold*.

Business

- **Taxpayer Instructions:** List person-to-person relationships that may link a user requesting an access to the tax account owner. In other words, define who may be granted an online access to the account: business owner, corporate officer, legislative advisor. List all relationships that should be considered by enrollment logic.
- **Access Type Processors:**

  If your implementation wish to support user account access on the tax role level provided in the base product, configure this section as follows:

  - Select an access type Tax Role.

- Specify the business service **C1-EnrolIndividualAccntTaxRole** as a User Enrollment Retriever.
- Specify the business service **C1-GetBusinessTaxRoleSummary** as an Access Type Summary Retriever.

Individuals

- **Taxpayer Instructions:** if your implementation wish to utilize User Summary Retriever included in the base product, skip this section. The individual tax account determination logic is not considering these instructions.
- **Access Type Processors:**

  If your implementation wish to support user account access on the tax role level provided in the base product configure this section as follows:

  - Select an access type Tax Role.
  - Specify the business service **C1-EnrolIndividualAccntTaxRole** as a User Enrollment Retriever.
  - Specify the business service **C1-GetIndividualTaxRoleSummary** as an Access Type Summary Retriever.

NOTE: Service Task Type Mapping. The service task type defined here must be configured in the service task domain value mapping in the SOA Composer application. Refer to the self service product documentation for details.

Implementing a New Service Request

Your implementation may wish to provide support for additional service requests for your taxpayers. The following information outlines the steps required in the product to support a new service request.

Taxpayer Identification

First decide if the taxpayer must provide identification information as part of the service request. If so,

- Should the system validate the taxpayer before continuing with the actual request? In this case an initial web service call must be sent to the system with appropriate information to validate the taxpayer.
- Can the identification information be provided with the other service request details so that the taxpayer identification can be done with the service request processing?

If the taxpayer identification is done as a separate step, refer to *Configuration Tasks for Taxpayer Service Request* for the base taxpayer identification business object provided with the product. That may be used or a new one based on appropriate business rules may be introduced with this one as a sample.

Business Object

Each service request must have its own Service Task business object. This business object defines the information required for this type of request and defines the algorithms that validate and process the request. The product provides several business objects that may be used as a parent business object for a new service request.

- The Standard Deferred Self Service Task business object (**C1-StandardDeferredSSTask**) supports the ability to defer the full processing of the request to a subsequent step. Defining a service task business object as a child of this business object is recommended if any of the following are true:
  - A user needs to review the taxpayer's request.
  - The request is high volume such that processing the request real-time for many taxpayers may cause a lot of system traffic.
  - The logic required to process the request is such that it doesn't make sense for the taxpayer to wait until the processing is complete.
- The Standard Real Time Self Service Task business object (**C1-StandardRealTimeSSTask**) supports immediate processing of the service request to give a response to the taxpayer real time.

- The Standard Scheduled Reminder Self Service Task business object (C1-ScheduledReminderSSTask) supports the repeatable creation of the reminder, maintaining the reminder task in an active status and expire it at the specific date. Defining a service task business object as a child of this business object is recommended if any of the following are true:
  - A periodic reminder should be issued.
  - The date of the reminder may be derived from the request data or calculated based on some conditions.

Create the new business object defining the appropriate parent business object and navigate to the schema tab. Include the parent BO's schema. Define the additional elements required for this business object's functionality. Refer to the Tax Clearance Certificate business object for an example.

The business object must also include the appropriate algorithms to satisfy the request.

Service Task Type

Create a service task type for the new service request with the appropriate service task type business object; base product provides business objects for **Taxpayer Service Request Self Service Task Type**, **Generic Create To Do Request Task Type** and **Scheduled Reminder Request Task Type**.

- The related transaction BO should be set to the business object created above.
- Service task class should be set to **Service Request**.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type **Self Service Task Issues (C1-SSTTD)** is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

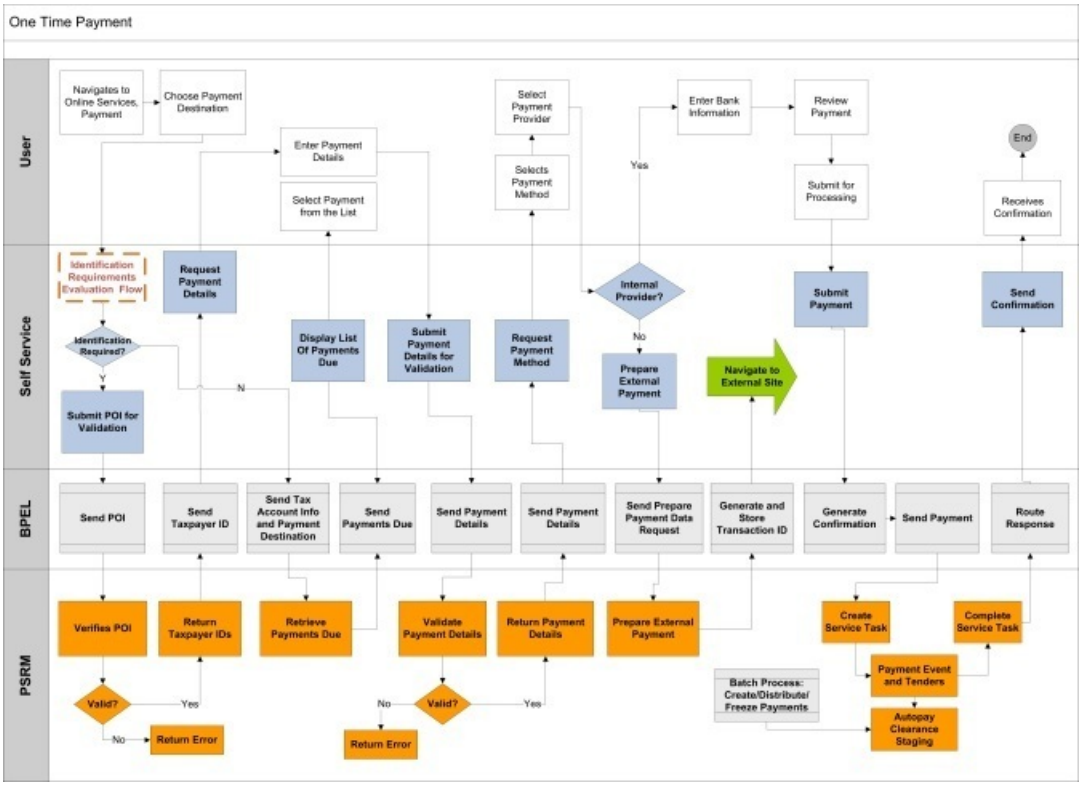
  FASTPATH: Refer to the Messages section of the *General Configuration Tasks* for more information.

- The service request fields mapping is used when creating the target service task to correctly populate the request data list from the list of fields passed in on the web service. Define the mappings appropriate for this service request as needed.
- Add request-specific configurations where needed.

  FASTPATH: Additional Configuration is required in the self service product and in the integration layer for new service requests. Refer to the self service product documentation for more information.

Online Payment

In this release, the integration supports payment by a taxpayer using a bank or credit card number. The following diagram illustrates an expected process flow.



The integration has the following steps:

- Initial processing works as follows:
  - **Casual user**. The self service application captures information about the taxpayer and sends a web service request to this product to validate the taxpayer (proof of identity, or POI).
  - **Enrolled user**. The identification is not performed.

    FASTPATH: Refer to the *User Identity Verification* topic for more information.

- Once identified, the casual user indicates what the payment is for. This is referred to as the target of the payment or the payment destination or the payment details. For example, is this a payment for a pay plan scheduled payment? If so, the taxpayer must provide the pay plan identifier. Once the taxpayer indicates the payment target details, another web service request is sent to this product to verify the details.
- When the enrolled user is browsing a specific tax account it becomes possible to retrieve payments that are currently due and present user with the pre-populated list so the user will choose what to pay rather than enter payment details manually.
- Next, the taxpayer indicates the method of payment:
  - If the method is via a credit card and the implementation uses an external payment vendor, the self service application sends a web service request to this product to retrieve any additional information about the taxpayer that may need to be sent to the external vendor (such as the taxpayer's address) and to determine if the external vendor's fee should be passed on to the taxpayer. At that point the taxpayer is taken to the external vendor's website to further process the payment details. Once that step is complete a final web service request is sent to this product to process the payment.
  - If the method is via a bank account or if the implementation does not use an external payment vendor for credit card payments, the self service application sends a web service to this product to create the payment. The standard Auto Pay logic in the product is used to process the payment.
- If the external vendor supports payment reconciliation, the subsequent reconciliation report is processed by the product.

The topics below describe more information about the provided functionality, followed by configuration tasks.

Identifying the Taxpayer

In this release the integration supports payments by an 'unregistered' taxpayer. The taxpayer does not need to log in using a user name and password in order to submit a payment. In addition, the product supports a person paying on behalf of another taxpayer.

The taxpayer must provide enough information to be identified by the system prior to proceeding. A special service task business object is provided for identifying a taxpayer for one-time payments (**C1-TaxpayerIdentifySSTask**).

FASTPATH:
Refer to *Configuration Tasks for Online Payment* for more information.

Payment Destination

When creating a payment, the product supports using distribution rules to determine where the payment should be targeted. The integration provides out of the box support for the following payment destinations.

- **Pay a filing period**. This method allows the taxpayer to provide their taxpayer ID, a tax type and a filing period to direct the payment to.
- **Pay a pay plan**. This method allows the taxpayer to provide a reference to a pay plan to pay one or more of the scheduled payments.
- **Pay a collection notice**. This method assumes that a collection notice has been issued from a customer contact in the system and that the customer contact ID has been provided to the taxpayer as an identifier.
- **Pay a Form (DLN Only)**. This method assumes that a tax or business registration form was processed by the system and the Document Locator Number has been provided to the taxpayer.
- **Pay an Obligation**. This method allows taxpayer to provide the exact ID of the obligation and pay obligation's balance.
- **Pay a Tax Role Balance**. This method allows taxpayer to provide the exact tax role ID and pay an outstanding tax role balance.
- **Pay a Tax Form**. This method allows the taxpayer to provide a DLN of the form that is not necessarily exists in the system yet. The assumption is that this method would be used for payments immediately following the on-line form submission for the scenario where the form submission web service request is queued by the integration while the payment request is processed immediately.

The business object provided by the product for processing one time payments has been designed to support different payment destinations. To do this, the business object must support receiving different types of information (for example, pay plan ID or collection notice ID) and use plug-ins that are specific to each payment destination that knows the type of data expected, how to use that data to identify the correct account and obligation(s) and process the payment successfully. At a high level it works as follows:

- The web service requests sent by the self service application to validate the payment target and to process the payment include an indication of the payment destination and a field/value pair collection to hold the values that represent the 'target' for the payment.
- The self service master configuration record includes a mapping between the payment destination and a self service task type.
- The service task type for each unique payment destination references a "processor" service, which can be a service script or a business service. This service should be specific for a given payment destination and expects the data appropriate for it. For example, the process to "pay a pay plan" expects the service task's destination details to specify a pay plan ID.
- The service task type includes a field mapping section. This mapping indicates which field value in the destination details list to populate in which target XPath in the "processor" service.

- The web service called to validate the destination details provided by the taxpayer invokes the "processor" to ensure that the data can be found.
- When processing the payment, the service task that processes payments includes an algorithm that uses the configuration on the task type to call the "processor" service, passing the details of the payment target.

FASTPATH: Refer to *Configuration Tasks for Online Payment* for information about configuring the system to support these payment destinations. Refer to *Implementing New Payment Destinations* for information about defining additional payment destinations for your implementation.

Account Verification Service

The processor is used to verify if the input account is valid for the entity identified by the current access information. If the account is invalid it returns an error.

When creating a new custom Processor, use any of the base business services or service scripts provided as an example of the type of functionality needed. All base components provided begin with **C1-OTPVAc%**. The processor may be implemented as a service script or a business service.

The custom service, whether it be a service script or a business service should include the data area **C1-SelfServiceKeys** along with an **<accountId>** element

Retrieving Payments Due

The web service used to retrieve the list of outstanding payments is processed by the XAI Inbound Service TSRetrievePaymentsDue, which invokes the service script **C1-RtPymtDue**.

The web service request contains:

- Access info: access type and access keys – Identifies the enrollment unit, for example Tax Role, Account or others
- Payment destination defines what type of payment is expected; for example, collection notice, obligation, etc.

The service script determines the service task type based on the payment destination (via master configuration). It then calls the retrieve payments due processor. The processor should return a collection of the prospective payments. Each entry contains:

- Payment amount due.
- Payment destination fields collection.
- Parameters collection used by self-service system to display the formatted info about this payment. Parameters are injected into the message defined in the self-service Payment Destination admin configuration.

The parameters for the obligation info display are obligation type and payment due date.

NOTE: Integration Mapping should be completed for proper display of obligation information.

Validating the Payment Destination

The web service used to validate the payment destination information entered by the taxpayer is processed by the XAI Inbound Service **TSPrepareExtPaymentData**, which invokes the service script **C1-PrExPyDta** with an action of **VALIDATEONLY**. The service script determines the service task type based on the payment destination (via master configuration). It then calls the payment destination details processor with an action of "validate only". The processor should return an error if the information provided by the taxpayer does not identify an appropriate related object for the payment destination.

If the enrolled user is making a payment, the service script calls an additional processor that checks if the account determined during the destination details validation is relevant for the tax account in context (access type+ access keys).

Creating the Appropriate Service Task

The web service request to create a payment is processed by the XAI Inbound Service **TSOneTimePayment**, which invokes the service script **C1-PyUnrgUsr**. The service script is responsible for creating a Service Task of the correct service task type based on the payment destination.

Processing Auto Pay Payments In the System

When a taxpayer provides bank account information for payment in self service, the payment detail is sent to this system and the integration with the customer's bank is handled through standard auto pay processing. This method may also be used to process credit cards. However, it's expected that an integration with an external vendor will most often be used for that. Refer to the section below for more information on external payment vendors.

Requiring an Auto Payment Agreement

Many tax authorities require taxpayers to sign an automatic payment agreement prior to allowing them to submit tax payments online. The product supports checking for a reference to an ACH agreement that is defined as a characteristic linked to the taxpayer's record.

Payment Processing Lifecycle

The one-time payment service task provided by the base product includes the following basic lifecycle states:

- **Pending**. When the web service request is processed, a service task is created in pending status. Initial validation is performed, including verifying that the information provided for the payment destination and determining the appropriate account to associate with the payment. If any issues are found, the service task is not stored and an error is returned. Once the record is validated, no further processing occurs at this time. When the service task monitor is run all pending records are further processed.
- **In Progress**. When transitioning to this status, the payment is processed. The data related to the payment destination is mapped to appropriate payment event distribution details and the payment is created. If any errors are encountered, the service task transitions to **Error**. If the payment was processed through an external vendor that requires reconciliation, it transitions to **Pending Reconciliation**. Otherwise, it transitions to **Complete**.
- **Error**. Any errors detected in payment processing or during reconciliation processing causes the service task to transition to this state and creates a To Do entry. A user must review and resolve the problem.
- **Error Resolved**. When a user resolves the error reported the service task can be transitioned to this state. Note that the assumption is that the user has manually corrected the error. This state does not cause any logic to occur.
- **Pending Reconciliation**. When a payment is made through an external vendor that requires reconciliation, the service task transitions to this state and waits for the reconciliation process. Refer to the external payment vendor section below for more information about reconciliation. Note that this state is configured with time out logic. The payment vendor can be configured with a number of days to wait for the reconciliation report. If that number of days passes, a To Do entry is created using an appropriate To Do type defined for the payment vendor.
- **Complete**. Service tasks transition to this state when the payment is fully processed.

External Payment Vendor

Many websites integrate with an external payment vender to process credit cards real-time. In this case, the following functionality is provided:

- Preparing External Payment Data. After the standard steps of identifying the taxpayer and validating the payment destination, when a taxpayer indicates payment using a credit card, the self service system sends a web service request to this product to determine whether a fee is applicable and to return additional payment data.

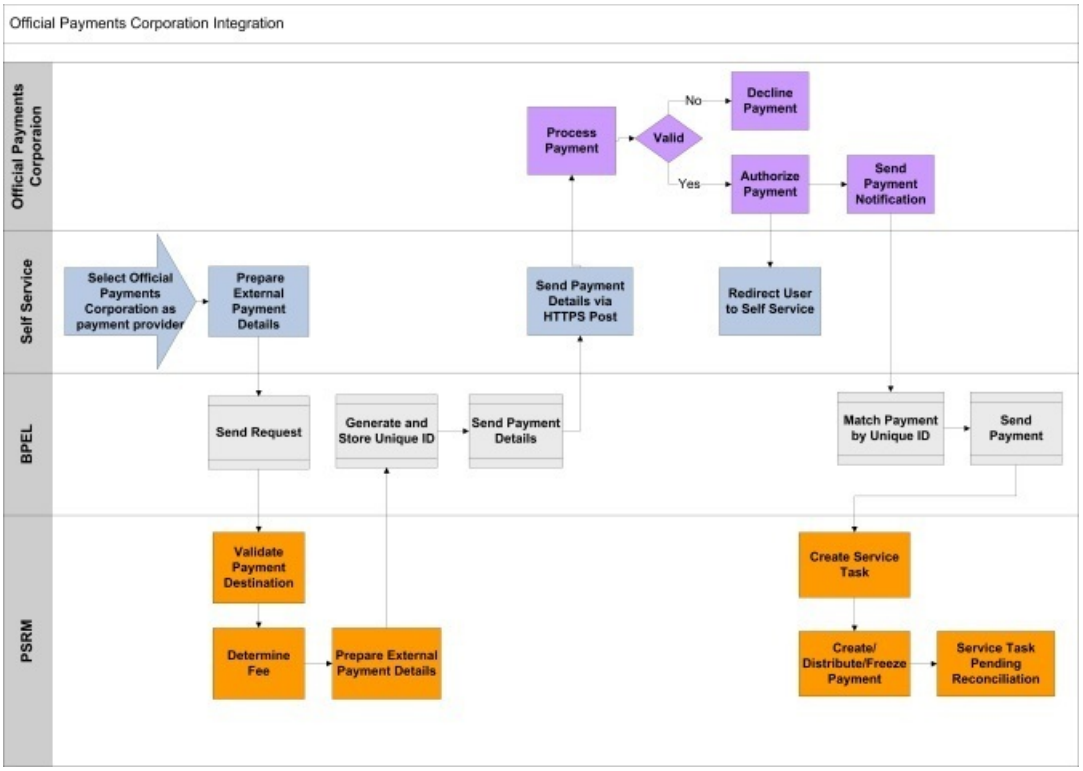
- Payment processing. Once the credit card information is processed by the external vendor, a web service request with the payment information is sent to this system. This causes an appropriate service task to be created to process the payment and apply it to the taxpayer's balance appropriately.
- Reconciliation. External vendors may supply reconciliation information for all the payments that were processed in a given time period. The product supports the ability to receive the reconciliation information, compare it against our records and highlight any discrepancies.

NOTE: Integration with Official Payments Corporation (OPC). The product provides functionality to integrate with OPC as an external vendor. The logic provided in the base product is based on that vendor's requirements.

Refer to the self service documentation for more information about configuring the system to work with external vendors.

The following topics provide additional detail about the integration functionality provided.

The following diagram illustrates the prepare external payment data and payment processing components for the integration with OPC.



Prepare External Payment Data

Once the taxpayer has indicated that payment will be made by credit card, the self service application sends a web service request to determine the fee requirement and to retrieve detail about the taxpayer to provide to the external vendor. These are processed by the XAI Inbound Service **TSPrepareExtPaymentData**, with an action of **PREPARE**, which invokes the service script **C1-PrExPyDta**. This script does the following:

- It uses the payment destination to determine the appropriate service task type (via the master configuration) and uses this information to determine the fee requirements. External vendors often charge fees for using their service. The tax authority may to choose to pass the fee onto the taxpayer or to absorb the cost of the fee. The product supplies configuration to allow the tax authority to define for each service task type whether taxpayers should be charged the fee based on the person's person type.

NOTE: Refer to the Service Task Types section of *Configuration Tasks for Online Payments* for more information.

- It retrieves additional information about the taxpayer, if required by the external vendor. It looks for a Prepare Data service script linked to the external vendor's record. If one is defined it is called. Refer to *Configuration Tasks for Payment Vendors* for more information.

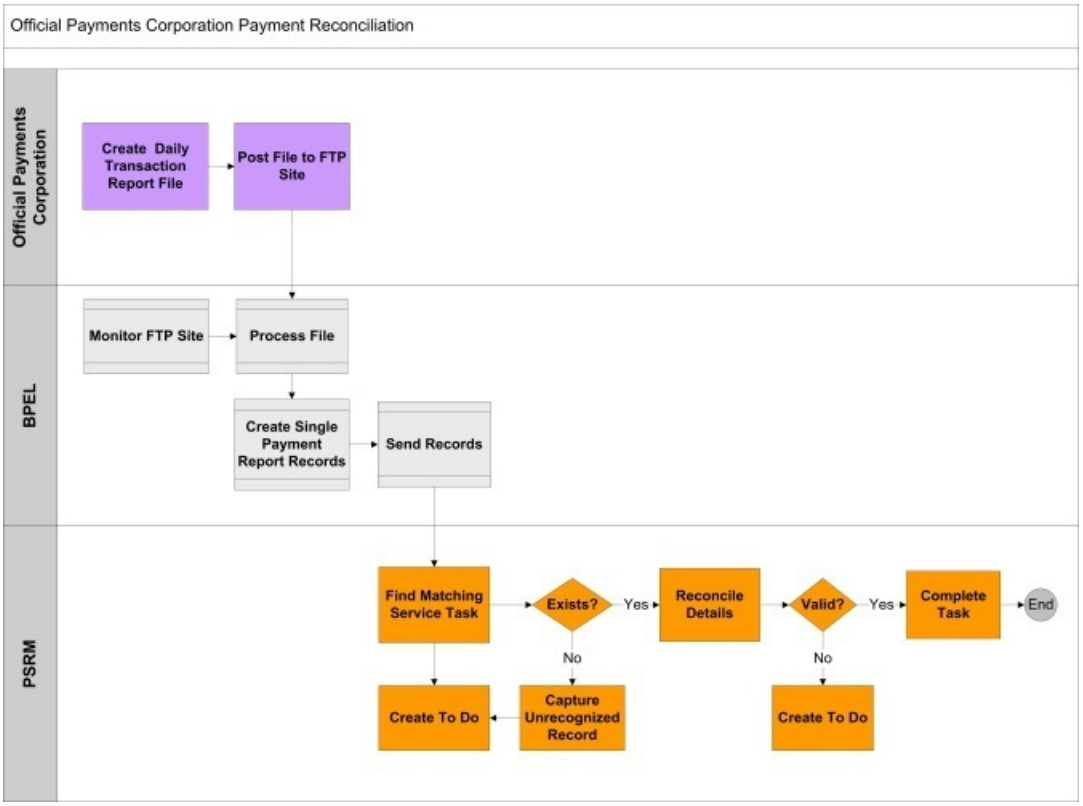
Payment Processing

For the most part, the payment processing for these payments is analogous to the processing done for bank payments. The tender type used should be one that is not configured to integrate bank details. And an external reference to the payment vendor's record should be recorded with the service task using a characteristic. This allows the reconciliation process to identify the record.

The product supports capturing additional information as defined by the requirements for the external vendor. The data is stored in a "raw" element on the service task called externalPaymentData. The structure of the information captured must be defined using the External Payment Data Area linked to the payment vendor lookup.

Reconciliation

The following diagram illustrates the reconciliation component for the integration with OPC.



Once the service task successfully creates the payment, it checks whether reconciliation with the payment vendor is applicable and if so, it transitions to the **Pending Reconciliation** state to wait for the reconciliation details.

When the reconciliation details are processed, individual web service calls are sent to the system for each payment. These are processed by the XAI Inbound Service **TSProcessExtPayReportRecord**, which invokes the service script **C1-PrcPyRpRc**. This script uses the external reference to find an existing payment service task in the **Pending Reconciliation** state with this reference linked as a characteristic.

- If one is found, it is updated with a snapshot of the payment report from the vendor. The payment report data is stored on the service task in a "raw" element called externalPaymentReport. The structure of the information captured must be

defined using the External Payment Report Data Area linked to the payment vendor lookup. In addition, it is marked as ready to reconcile. The next time the reconciliation monitor runs the service task's reconciliation algorithm is executed. The algorithm is configured to call logic that is specific for the payment vendor. It calls the Payment Reconciliation Script defined on the payment vendor lookup. If there are any issues it transitions to **Error**, otherwise it transitions to **Complete**.

- If one is not found, the system creates a new service task record using a special task type configured for logging an unrecognized external payment in the payment report. The service task BO provided by the product for this scenario **C1-UnrecognizedExtPymtRptTsk** provides a simple lifecycle that creates the record in the **Pending** state. The next time the service task deferred monitor runs, the record creates a To Do entry for a user to research and resolve the issue and sets this record to **Complete**.

FASTPATH:
Refer to *Configuration Tasks for Payment Vendors* for more information.

Configuration Tasks for Online Payments

The following sections list the configuration tasks needed to implement the online payment functionality.

Standard Payment and Automatic Payment Options

When the one-time payment service task processes the payments it relies on standard payment logic in the product. Refer to the payment configuration documentation for configuration options required for general payment processing as well as configuration options for automatic payment processing.

FASTPATH: Refer to the Defining Financial Transaction Options > Managing Payment Setup and Automatic Payment Options in the administration guide for more information.

Obligation Type for Excess Credit

The base product payment distribution rule algorithms that create payments support the ability to direct excess credit to a special obligation rather than crediting the obligation used to levy the taxes. If your implementation uses the base product algorithms, define an obligation type to use when directing excess credit to a special obligation for the account.

Suspense Obligation

In some cases when an account cannot be found for directing a payment, a payment is created in suspense, meaning that it is created for a suspense obligation. If your implementation does not already have a suspense obligation set up, create one.

Match Types

Define a match type for Obligation. This is used by the Pay a Pay Plan distribution rule.

Algorithms

Create a Distribution Rule - Create Payment algorithm for each supported payment destination.

- **Pay a Filing Period**. If your implementation supports the ability to direct a payment to a filing period, define an algorithm for the algorithm type **C1-PAYFRM**. In the parameters define the division / obligation type for the excess credit obligation along with the suspense obligation. Finally, define characteristic types for each of the payment details that are required by the algorithm. Note that the product supplies characteristic types that may be used for each one.
  - C1-DLN for document locator number. Note that this is not expected to be supplied by a taxpayer for web self service payments, but the parameter is required for the algorithm.
  - C1-TXPID for taxpayer ID

  - C1-TAXTY for tax type
  - C1-FLNGP for filing period
- **Pay a Collection Notice**. If your implementation supports the ability to direct a payment to a collection notice, define an algorithm for the algorithm type **C1-DR-PAYCC**. In the parameters define the division / obligation type for the excess credit obligation. In addition, define the characteristic type that the overdue process uses to log the creation of the customer contact. This allows the algorithm to determine the related overdue process to find the covered obligations.
- **Pay a Pay Plan**. If your implementation supports the ability to direct a payment to a pay plan, define an algorithm for the algorithm type **C1-DR-PAYPP**. In the parameters define the division / obligation type for the excess credit obligation. In addition, define the match type for referencing the pay plan's obligation.
- **Pay a Tax Role Balance**. If your implementation supports the ability to direct a payment to a tax role balance, define an algorithm for the algorithm type C1-DR-PAYTXR. In the parameters define the division / obligation type for the excess credit obligation.
- **Pay an Obligation**. If your implementation supports the ability to direct a payment to an obligation, you may use an algorithm C1-DR-PAYOBL delivered with the product.

Distribution Rules

Create a distribution rule for each supported payment destination.

- **Pay a Filing Period**. If your implementation supports the ability to direct a payment to a filing period, multiple distribution rules must be created, one for Taxpayer ID, one for Tax Type and one for Filing Period. Each should reference the appropriate characteristic type. Refer to the create payment algorithm above for details of the characteristic types to use. Note the following points related to configuring these distribution rules:
  - The payment distribution processing expects that the create payment algorithm is only linked to the last distribution rule.
  - The payment distribution processing expects that the Determine Tender Account is linked to all the distribution rules.
  - The payment details processor business service used by the payment service task may expect the definition of the distribution rules to be in a certain order. Refer to the business service description for **C1-PaymentDestinationTxTyFilPd** for more information.
- **Pay a Collection Notice**. If your implementation supports the ability to direct a payment to a collection notice, create a distribution rule referencing the characteristic type **C1-CUSCN** Customer Contact. It should also reference the Create Payment algorithm created above for paying a collection notice.
- **Pay a Pay Plan**. If your implementation supports the ability to direct a payment to a pay plan, create a distribution rule referencing the characteristic type **C1-PAYPL** Pay Plan. It should also reference the Create Payment algorithm created above for paying a pay plan.
- **Pay a Form (DLN Only)**. If your implementation supports the ability to direct a payment to a form using DLN only, create a distribution rule referencing the characteristic type C1-DLN GDocument Locator. It should also reference the Create Payment Algorithm created above for paying a filing period.
- **Pay an Obligation**. If your implementation supports the ability to direct a payment to an obligation, create a distribution rule referencing the characteristic type C1-OBLIG GObligation. It should also reference the Create Payment algorithm created above for paying an obligation.
- **Pay a Tax Role Balance**. If your implementation supports the ability to direct a payment to a tax role balance, create a distribution rule referencing the characteristic type C1-TAXRL Tax Role. It should also reference the Create Payment Algorithm created above for paying a tax role balance.

Business Object

Decide whether or not an email confirmation should be sent to the taxpayer once the payment is processed. If so, add an Enter plug-in to the In Progress state after the payment creation algorithm or perhaps the Complete state to generate the confirmation email.

FASTPATH: Refer to the algorithm section of the *General Configuration Tasks* for more information about configuring the confirmation algorithm.

Service Task Types

Taxpayer Identification Task Type

Define a task type to use for taxpayer identification with the business object **Taxpayer Service Request Self Service Task Type**.

- The Related Transaction BO should be set to **C1-TaxpayerIdentifySSTask**.
- Service Task Class should be set to **Taxpayer Identification**.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type **Self Service Task Issues (C1-SSTTD)** is provided for this purpose. Note that the algorithm plugged in on the error state for the base business object checks that there is not already a To Do for the record before creating one of this type. This allows algorithms that detect an error to also create a To Do with a specific type if desired.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

  FASTPATH: Refer to the Messages section of the *General Configuration Tasks* for more information.

- The service request fields mapping is used when creating the target service task to correctly populate the requestField list from the list of fields passed in on the web service request XML. For the base transaction business object, the following fields are expected:

Sequence	Transaction BO XPath
1	requestData/legalName
2	requestData/idType
3	requestData/personIdNumber
4	requestData/emailAdd
5	requestData/addressLine1
6	requestData/addressLine2
7	requestData/city
8	requestData/county
9	requestData/state
10	requestData/postal
11	requestData/onBehalfOfFlag
12	requestData/secondaryLegalName
13	requestData/secondaryIdType

14	requestData/secondaryPersonIdNumber
15	requestData/secondaryEmailAdd

FASTPATH: Service Task Type Mapping. The service task type defined here must be configured in the service task domain value mapping in the SOA Composer application. Refer to the self service product documentation for details.

Payment Destination Task Types

Create a service task type for each payment destination with the business object **One-Time Payment Self Service Task Type**. Each service task configured should include the following common configuration.

- The Related Transaction BO should be set to **C1-StandardOneTimePaySSTask**.
- Service Task Class should be set to **Self Service Payment**.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type **Self Service Task Issues (C1-SSTTD)** is provided for this purpose. Note that the algorithm plugged in on the error state for the base business object checks that there is not already a To Do for the record before creating one of this type. This allows algorithms that detect an error to also create a To Do with a specific type if desired.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

FASTPATH: Refer to the Messages section of the *General Configuration Tasks* for more information.

The following configuration differs based on the payment destination:

- Payment Distribution Rules. Link the appropriate distribution rule(s) created above for the payment destination represented by this service task type.
- Link an appropriate Processor business service or service script that knows how to receive the detail related to the payment destination and create the payment event distribution details correctly. The base product provides one Processor business service for each supported payment destination. Using the search look for business services that begin with **C1-PaymentDestination%**.
- Specify if taxpayer should exist in the system in order to process the payment. Typically this should be set to **Y**es ("Y") as the taxpayer record is necessary for account and other payment details verification. An example of the exception from this rule is a payment for a form by DLN. When payment is submitted immediately following online form filing the system should be able to accept payment from the self-service user who is a first-time filer. In this scenario the taxpayer record is created during form posting and that may actually happen after payment submission.
- Field mappings. For each payment destination detail captured on the service task, indicate the target XPath value in the above processor.

NOTE: Special note on payment destination Tax Form (C1OF): This payment destination represents a payment for a form that was submitted online but has not necessarily reached the system at time of payment. For a service task type for this payment destination use processor ***C1-PaymentDestOnlineFormFiling*** and the distribution rule **Pay a Form (DLN only)** created above.

Configure the appropriate Processors for access type-specific logic. For each access type:

- **Account Verification**. This processor verifies whether account determined based on payment destination details is valid for the service request access information. This verification is optional and should be performed according to the business requirements. Account verification is needed if the payment has to be made within the context of the current access entity.

Consider the following example: a self-service user is currently browsing a tax role and attempts to pay a collection notice. Configure account verification for access type **Tax Role** if you want user to be able to pay only for those collection notices associated with the tax role in context. Using the search look for business services or service scripts that begin with **C1-OTPVAc%**.

- **Payments Due**. This processor retrieves all pending items belonging to a payment destination within the context of the current access entity. For example, for payment destination Pay an Obligation and access type **Tax Role** it may retrieve all obligations with an outstanding balance. Using the search, look up business services or service scripts that begin with **C1-RetPaymentsDue%**.

  The examples of payments due retrievers provided out of the box:

  - ***Pay an Obligation*** and the access type ***Tax Role***. It retrieves all the obligations with an outstanding balance linked to the tax role identified by access key 2). If your implementation supports this payment destination, specify **C1-RetPymtsDueObligationTxRole**.
  - ***Pay a Tax Role Balance*** and the access type ***Tax Role***. It retrieves a single entry for an outstanding balance for the tax role identified by access key 2). If your implementation supports this payment destination, specify **C1-RetPymtsDueTaxRoleBalance**.

Finally, if external vendors are supported, indicate whether or not fees are appropriate based on the taxpayer type.

FASTPATH: Refer to *Implementing A Fee Requirement Script* for information.

NOTE:
The product supports two distinct methods of paying a form by DLN:

- Payment immediately following the online form filing, supporting first-time filers. For this task type, specify that the taxpayer does not have to exist in the system.
- Payment is made by a registered taxpayer for an existing form.

Master Configuration

The self service master configuration record includes several settings required for payment related processing.

- Char Type for Overdue Process Log. If your implementation supports the Pay a Collection Notice payment destination, define the characteristic type that is used to link the customer contact to the overdue process. The base product provides a value that may be used.
- Refer to the ACH Agreement Validation section below for information about the Char Type for ACH Agreement Verification.
- Tender Types. Indicate the tender types that are valid for paying online.
- Supported Payment Destinations. For each supported payment destination (as defined in the **C1_PAYMENT_TARGET_FLG** lookup), indicate the corresponding Service Task Type.
- Define the customer contact types that represent the collection notices that a taxpayer may pay online using the Pay a Collection Notice payment destination.

ACH Agreement Validation

If your implementation requires a pre-signed agreement from the taxpayer when submitting a payment through their bank account, define a characteristic type on the taxpayer, the following configuration is needed:

- Create an appropriate characteristic type for **ACH Agreement**. Define a valid characteristic entity of **Person**.
- Update the master configuration to indicate this characteristic type.
- Update the business object **C1-StandardOneTimePaySSTask** to plug in the validation algorithm to check for the existence of this characteristic. Navigate to the **Lifecycle** tab and expand the configuration for the **Pending** state. Add

an entry in the Algorithms collection with a System Event of **Enter**, an appropriate sequence and the algorithm **C1-CHKACHAGR**.

NOTE: The product does not provide any functionality for populating the characteristic on the taxpayer record. This functionality is custom and must be provided by your implementation.

Integration Mapping

Obligation types used by the product should have corresponding values defined in the self service product.

Your implementation may decide to use exactly the same values in both products or configure the mapping using domain value mapping in the SOA Composer application

FASTPATH: Refer to the self service product documentation for details.

Configuration Tasks for Payment Vendors

The following sections list the additional configuration tasks needed to support an external payment vendor.

External Payment Report Task Type

Create a service task type to use when a payment in the reconciliation report for an external vendor is not found.

- The service task type BO should be **C1-StandardSelfServiceTaskType**
- The related transaction BO should be set to **C1-UnrecognizedExtPymtRptTsk**.
- To Do Type is not applicable. The service task BO has an algorithm that creates a To Do based using the unrecognized payment To Do Type on the payment vendor lookup.
- To Do Role is not applicable
- Confirmation Header Message Category and Message Number and Error Header Message Category and Message Number are not applicable.

External Vendor Extendable Lookup

Create a payment vendor extendable lookup record for the external vendor that is used by the self service application.

- If additional information is required by the external vendor to process the payment (such as the taxpayer's address), indicate an appropriate **Prepare Payment Data Script** that populates the data. The script should use the data area **C1-ExternalPaymentDetails** as its schema. The data area defines a paymentDetails list, which is a collection of field name and value pairs, to capture the additional information.

  NOTE: Integration with Official Payments. The product provides a service script **C1-BldExPyDt** that builds the additional data required for integration with Official Payments.

- If additional information is included in the payment processed by the external vendor, indicate the **External Payment Data Area** that describes the structure of the data. This information is captured in the service task created to process the payment in the raw element externalPaymentData.

  NOTE: Integration with Official Payments. The product provides the data area **C1-OPCExtPaymentData** that supports the additional data sent with payments made via integration with Official Payments.

If the vendor supports a reconciliation report, check the **Reconciliation Required** checkbox and fill in the remaining detail.

- Indicate the **External Payment Report Task Type** created above.

- Define the **External Payment Report Data Area** that describes the structure of the data supplied with the reconciliation report.

  NOTE: Integration with Official Payments. The product provides the data area **C1-OPCExtPaymentReportData** that defines the data provided in the reconciliation report from Official Payments.

- Indicate the **Number Of Days To Wait For Timeout** appropriate for your implementation.
- Define the **Payment Reconciliation Script** that includes the vendor specific logic invoked by the reconciliation algorithm. The script should reference the business object **C1-StandardOneTimePaySSTask** as its schema.

  NOTE: Integration with Official Payments. The product provides a service script **C1-PymtRecon** that provides the additional payment reconciliation logic for integration with Official Payments.

Additional Topics

The following sections provide some additional information related to online payment functionality.

Implementing New Payment Destinations

Your implementation may wish to support additional payment options for your taxpayers. For example, perhaps a certain tax type is assigned an external identifier on its tax role and your taxpayers are able to use that identifier to "pay a given tax type". For the purposes of this section, the assumption is that the external identifier is unique across all tax roles in the system. The following information outlines the steps required in this product to support an additional payment destination.

NOTE: Additional steps are required in the self service product. Refer to the self service product documentation for more information.

Lookup

Define a new value in the **C1_PAYMENT_TARGET_FLG** lookup to represent the new payment destination.

Create Payment Algorithm

Each payment destination requires a create payment algorithm that understands how to direct the payment to the appropriate obligation(s). In our example of paying a filing period via external id, the create payment algorithm must use a provided External ID to determine an appropriate Tax Role. From that tax role, the algorithm must determine the obligation(s) for the tax role that have outstanding debt and direct the payment towards the obligations appropriately.

The algorithm must be coded and implemented using an Algorithm Type and related Algorithm. The base product Create Payment algorithm types may be used as examples.

Characteristic Type

If there is not already a base characteristic type for each distribution detail value that must be provided for the payment distribution to work, one must be created. In this example, an Ad-hoc characteristic type to capture the External ID must be defined.

Distribution Rule

An appropriate distribution rule for each distribution detail required by the new payment destination must be created. In our example a distribution rule for "pay a given tax type" is required configuring the above created characteristic type and create payment algorithm.

NOTE: If the payment destination requires multiple pieces of information, such as an ID plus a filing period, then multiple distribution rules are required, each referring the appropriate characteristic type. Only the last distribution rule should reference the Create Payment algorithm.

Payment Processor Service

The processor service is used for the following purposes:

- Validation. When the payment service task is first created, the processor is called to validate the details. The processor should use the payment destination details to verify that an appropriate record is found and that the appropriate account for that record can be determined. For our example, the processor should take the input External ID and find one and only one tax role with that ID and determine the tax role's account. The processor should provide appropriate errors if the data cannot be found.
- Validate Only. This is a variation of validation and is used for checking payment details when using an external vendor. The only difference between this and the validation logic is that the account ids are not retrieved for this logic.
- Build. When getting ready to process the payment, the service task BO first uses this processor to build the appropriate collection of Payment Distribution Details expected by the creation of a payment. The distribution details built by the processor are captured in the service task in the <paymentDistributionList> collection. A subsequent algorithm uses this information to create the payment with this distribution detail.

When creating a new custom Processor, use any of the base business services provided as an example of the type of functionality needed. All base business services provided begin with **C1-PaymentDestination%**. The processor may also be implemented as a service script, if preferred.

The custom service, whether it be a service script or a business service should include the data area **C1-PayDestProcessorCommon** along with a destination details group that includes the list of payment details provided by the taxpayer. These elements may be defined with specific identifiers. The service task type will contain mapping to populate the elements from the input information.

Service Task Type

Each additional payment destination requires its own service task type. Refer to *Configuration Tasks for Online Payments* for more information.

Account Verification Service

The processor is used to verify if the input account is valid for the entity identified by the current access information. If the account is invalid it returns an error. When creating a new custom Processor, use any of the base business services or service scripts provided as an example of the type of functionality needed. All base components provided begin with C1-OTPVAc%. The processor may be implemented as a service script or a business service. The custom service, whether it be a service script or a business service should include the data area C1-SelfServiceKeys along with an <accountId> element.

Retrieve Payment Due Service

When creating a new custom Processor, use any of the base business services or service scripts provided as an example of the type of functionality needed. All base components provided begin with C1-RetPymtsDue%. The processor may also be implemented as a service script, if preferred.

The custom service, whether it be a service script or a business service should include the data areas C1-SelfServiceKeys and C1-RetrievePaymentsDueCommon.

Service Task Type

Each additional payment destination requires its own service task type. See *Configuration Tasks for Online Payments* for more information.

Implementing a Fee Requirement Script

When integrating with an external payment vendor, the product provides the ability to indicate for each service task type (i.e., payment destination) if the fee should be passed onto the taxpayer or not based on taxpayer type. Your implementation may conditionally pass on the fee to certain kinds of taxpayers. For example, maybe when a taxpayer is paying a filing period, the fee is passed on if the taxpayer is not paying the filing period on time. The product provides a service script (**C1-FeeReqFPr**) that includes this logic.

If your implementation has rules for when a fee should be passed onto the taxpayer based on specific conditions, a service script with the appropriate rules must be implemented. The above base script should be used as a sample, including the input and output that is expected.

Account Information

The self service product user is viewing the tax account data and eventually pays an outstanding balance. Account information portal displays account summary, various alerts, and also filing and payment history.

This functionality follows an inquiry request handling pattern where the service task type captures various configurations and instruction but the request does not result in the service task creation. Otherwise the integration is using the inquiry request flow.

NOTE: Refer to the *Message Processing Overview* for more information about integration flow patterns.

The topics in this section describe more information about the provided functionality, followed by configuration tasks.

Account Summary

The tax account summary contains the most important facts your implementation may wish to bring to taxpayer's attention. The summary is supposed to provide at a glance overview of the account status.

The structure of the summary is a follows:

- **Title** - A short description of the tax account.
- **Details** - Essentials about tax account status, for example a start and end date, the date and the amount of the last payment etc.
- **Location** - An address associated with the account.
- **Current Balance** - The outstanding balance including penalty and interest forecasted as of the current date.

In the self service product the title and the details of the summary are composed using message text with the substitution parameters.

The product is expected to supply the actual data items (dates, numbers, types); this information is used by the self service product as substitution parameters for the summary messages.

The self service product sends an inquiry request containing the tax account identifiers (access type + access keys) and a line of business. The web service is processed by the XAI Inbound Services TSGetTaxAccountSummary, which invokes the service script **C1-GetAcctSm**.

The service script reads the Master Configuration, determines the service task type holding account information-related configurations and invokes an account summary retriever logic associated with request's access type.

Account Summary Retriever

The account summary retriever is expected to deliver the following information:

- Summary Title parameters list.
- Summary Details parameters list.
- Taxpayer Name (required, used internally by the self service product).
- Tax Type (optional, used internally by the self service product).
- Current balance amount and currency (optional, used internally by the self service product).
- Address data.

Retriever logic may also completely override summary title and details text and populate it on the response.

The account summary retriever provided with the base product is implemented for the access type ***Tax Role***. It uses summary instructions defined on the service task type and returns the following details:

- Summary title parameters *tax type* and a *taxpayer name*, summary details parameters: tax role's *startdate*, *outstanding balance*, last *payment's date* and *amount*.
- Account's mailing address.
- Tax role's outstanding balance forecasted as of the current date.

NOTE: Review the business service **C1-GetTaxRoleAccountSummary** as an example of a tax account summary retriever. Refer to *Service Task Types* for more details about summary instructions configuration.

Alerts

Alerts are meant to inform the taxpayer about various urgent matters related to the tax account and in some cases to take immediate action to resolve the issue. Alert may also be used to communicate tax legislation changes potentially affecting the taxpayer or remind about important tax-related dates.

The integration provides out of the box support for the following alerts:

- **Open collections.** This alert indicates that the tax account is associated with open collections.
- **Overdue balance exists**. This alert indicates the existence of an overdue balance for the tax account.
- **Stop Filer Alert.** This alert indicates that return is due for one of the filing periods.
- **Taxpayer Info Incomplete** This alert indicates that taxpayer record doesn't have a valid email address

The topics below describe more information about the provided functionality, followed by configuration tasks.

Retrieving Alerts

The self service product sends an inquiry request containing the tax account identifiers (access type+access keys) and a line of business. The web service is processed by the XAI Inbound Services TSGetTaxAccountAlerts, which invokes the service script C1-GetAlerts.

The service script reads the Master Configuration, determines the service task type holding alert-related configurations for the input line of business, derives applicable alert types, and invokes alert retrievers.

Alert retriever is expected to deliver the following information:

- Alert parameters list.
- Document location (optional).
- Payment Amount.

Alert parameters are used by the self service product as substitution parameters for the alert message. The document location (if provided) is displayed as a link.

Retriever logic may also completely override alert text and populate it on the response.

In the self service product many aspects of the alert are configurable, including the target navigation URL. For example, an alert may read "New child benefit claim forms are available. File now" and the link "File now" would redirect the taxpayer to the online form. The navigation URL may also be overridden by the retriever.

NOTE: See *Tax Account Access Information* for tax account-related inquiry flows.

Alert Type

Self service Alert Type is implemented by the product via extendable lookup. A single lookup value is representing an alert type and references alert retrievers.

The product supports two categories of alerts:

- **Access Based** alerts are alerts whose logic evaluates tax account-related issues. Alerts of this type define retrievers for each supported access type. It is implemented using the extendable lookup business object **C1-AccessTypeAlertLookup**
- **General** alerts are alerts whose logic evaluates system-wide issues. Alerts of this type define a single retriever It is implemented using the extendable lookup business object **C1-GeneralAlertLookup**

Applicable Alerts List

The tax authority has an option to designate certain alerts to a specific audience within the self service user base. The product supports the ability to configure a list of alert types applicable for a line of business, including:

- Tax account-related alerts applicable to a line of business, e.g., alerts concerning corporate taxes.
- Generic alerts applicable for a line of business, e.g., alerts concerning business registration requirements.
- Generic alerts applicable for all taxpayers.

The list is implemented using service task type business objects **C1-AccessAlertsTaskType** and **C1-GeneralAlertsTaskType**. The objects are included in the base product.

Implementing a New Alert Type

Your implementation may wish to introduce additional generic or tax account-specific alerts. The following information outlines the steps required in this product to support a new alert.

NOTE: A new alert should be configured in the self service product. Refer to the self service product documentation for more information.

Alert Retriever

Design and implement the business logic for alert. If the reason for issuing this alert is related to outstanding payment(s), consider retrieving the amount due. Use alert parameters to communicate dates, amounts and other important information.

When creating a new custom retriever, use any of the base business services provided as an example of the type of functionality needed.

The retriever may also be implemented as a service script, if preferred.

The custom service, whether it be a service script or a business service, should include the data area **C1-TaxpayerAccountAlertCommon**.

Extendable Lookup

Define a new value in the extendable lookup to represent the new alert type.

- For tax account-related alerts, use **C1-AccessTypeAlertLookup**.

- For general alerts, use **C1-GeneralAlertLookup**.

Service Task Type

Add the new alert type to the service task type(s) that represent the applicable alerts list.

Payment History

The tax account payment history displays the list of payments. The self service product provides an ability to filter the list by a date range.

For each payment on the list the product displays payment amount, date, payment method, status and the confirmation number (where applicable).

The self service product sends an inquiry request containing the tax account identifiers (access type + access keys) and a line of business. The web service is processed by the XAI Inbound Services **TSGetPaymentHistory**, which invokes the service script **C1-GetPymtHs**.

The service script reads the Master Configuration, determines the service task type holding account information-related configurations and invokes the payment history retriever logic associated with request's access type.

The payment history retriever business service **C1-GetTaxRolePaymentHistory** provided with the base product is implemented for the access type ***Tax Role.***

Filing History

The tax account filing history displays the list of submitted forms. The self service product provides an ability to filter the list by a date range.

For each filing period the following details are retrieved:

- Filing period start and end date
- Form type and received date - not available for missing filing periods
- Filing's due date
- Filing status
- Document locator number
- Confirmation ID
- Form's printable document location
- Amount due (hidden on the self service screen)

The self service product sends an inquiry request containing the tax account identifiers (access type + access keys) and a line of business. The web service is processed by the XAI Inbound Services TSGetPaymentHistory, which invokes the service script **C1-GetPymtHs**.

The service script reads the Master Configuration, determines the service task type holding account information-related configurations and invokes the filing history retriever logic associated with request's access type.

Filing History Retriever

The filing history retriever business service **C1-GetTaxRoleFilingHistory** provided with the product is implemented for the access type ***Tax Role***.

This retriever utilizes the following instructions defined on the service task type for account information:

- Filing types that should be excluded from the response

- Form's characteristic type for the printable form document location
- Indicates if the missing filing periods should be included in the list

The filing status is represented in the base product by the values of the lookup SS_FILING_STATUS_FLG

Configuration Tasks for Account Information

The following sections list the configuration tasks needed to implement the account information functionality.

NOTE: For information about configuration tasks for new alert types, see *Implementing a New Alert Type*.

Characteristic Types

Printable Form Document Location

If your implementation supports the ability to link a printable document (PDF or other format) to the form and these documents are stored in the location accessible for the public, create a characteristic type of class **File Location**. Specify **Form** as a characteristic entity.

Service Task Types

Account Information Task Type

Create service task types for the **account information** configurations with the business object Account Information Task Type. Configure one service task type for each line of business your implementation wish to support.

- Select the line of business from a drop-down list.
- The related transaction BO should be set to C1-StandardInquiryTask.
- Service task class should be set to Standard Inquiry.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type Self Service Task Issues (C1-SSTTD) is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

  NOTE: Refer to the Messages section of the *General Configuration Tasks* for more information.

- **Summary Instructions.** If your implementation uses the tax account summary retrievers provided by the base product, define the instructions to use when retrieving the tax account summary:
  - Specify a default name type to be used as a taxpayer name on the summary.
  - Indicate if the address should be included in the summary by default. This configuration could be different for ***Business*** and ***Individual*** line of businesses. For example, an individual is likely to have a single mailing address associated with all tax roles and accounts and there is no need to display the address redundantly in multiple places.
  - List special instructions for the tax types supported by your implementation:
    - Use checkbox to indicate if the primary taxpayer's data should be used for the summary.
    - If the above is unchecked, specify either account-person relationship type or tax role-person relationship type to use in order to find a taxpayer whose information should be used.

    - Specify the taxpayer's name type that should be displayed.
    - Indicate if the summary should include the address. For example, consider the situation where Individual line of business is encompassing both individual income and property taxes. For the individual income, the address bears little significance but for the real property tax it makes sense to display the address associated with the tax roles.
- **Filing History Instructions.** If your implementation uses the tax account filing history retrievers provided by the base product, define the instructions to use when retrieving the tax account fling history:
    - Specify a char type created above as a Char Type for Printable Form Location.
    - Indicate if missing filing periods should be included in the list.
    - List filing types to exclude from the filing history.
- **Payment History Instructions.** If your implementation uses the tax account payment history retrievers provided by the base product, define the instructions to use when retrieving the tax account payment history:
    - Indicate if cancelled payments should be included in the list.
- **Access Type Processors.** For each supported access type list the processors responsible for the tax account information retrieval.
    - Account Summary Retriever.
    - Filing History Retriever.
    - Payment History Retriever.

NOTE: The base product provides the business services **C1-GetTaxRoleAccountSummary**, **C1-GetTaxRolePaymentHistory**, and **C1-GetTaxRoleFilingHistory**. See the *Account Summary*, *Filing History*, and *Payment History* topics for more details.

Applicable Alerts Task Type

Create service task types for the **general** and **tax account-related alert lists** with the business objects **General Alerts** and **Access Based Alerts**, respectively. Use this configuration to group the alerts according to your business requirements.

- Select the line of business from the drop-down list.
- The related transaction BO should be set to C1-StandardInquiryTask.
- Service task class should be set to Standard Inquiry.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type Self Service Task Issues (C1-SSTTD) is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

NOTE: See the Messages section of the *General Configuration Tasks* topic for more information.

- **Alert Types**. List all alert types applicable for the line of business selected above.

Master Configuration

The self service master configuration record includes several settings required for the account information inquiry processing:

- Account Information. For each supported line of business (as defined in the LINE_OF_BUSINESS_FLG lookup) indicate the corresponding Service Task Type for Account Information.
- Alerts.
  - Specify a Service Task Type that defines default generic alert types list. If no line of business is included in the alert inquiry web service request, this list will be used.
  - For each supported line of business (as defined in the LINE_OF_BUSINESS_FLG lookup) indicate the corresponding Service Task Types for tax account-related and generic alerts.

Integration Mapping

Alert Types. All supported alert types must be configured in the alert type domain value mapping in the SOA Composer application.

Tender Types. Payment captured in the system and shown on the payment history may be coming from various sources, not limited to the self service product. In order to display all payments properly all Tender Types defined in the system must be configured in the tender type domain value mapping in the SOA Composer application.

Payment Status. Payment statuses used in the system must be configured in the payment status domain value mapping in the SOA Composer application.

Refer to the self service product documentation for details.

Taxpayer Information

The self service product user is viewing taxpayer information and allowed to make certain updates online. The taxpayer in this case is a taxpayer linked to the tax account in context, which means that "user" is not always equal to a "taxpayer"; for example consider the situation where the business owner is viewing the business account and exploring related business taxpayer record as opposed to the same person viewing his/her own personal income tax account and related individual's information.

Taxpayer portal includes:

- The *taxpayer summary*
- The *contact information*
- The *correspondence information*

This functionality uses the service task types to captures various configurations and instruction but using it may also result in the service task creation.

NOTE: See *Message Processing Overview* for more information about integration flow patterns.

The topics below describe more information about the provided functionality, followed by configuration tasks.

Taxpayer Summary

The taxpayer summary contains the most important facts your implementation may wish to bring to user's attention. The structure of the summary is a follows:

- **Title** - a short description of the taxpayer
- **Details** - essential details.
- **Primary Contact -** the name and an email address of a primary contact

In the self service product the title and the details of the summary are composed using message text with the substitution parameters.

The base product is expected to supply the actual data items - dates, numbers, types; this information is used by the self service product as substitution parameters for the summary messages.

The self service product sends an inquiry request containing the tax account identifiers (access type + access keys) and a line of business. The web service is processed by the XAI Inbound Services **TSGetTaxpayerSummary**, which invokes the service script **C1-GetTxpSum**.

The service script reads the Master Configuration, determines the service task type holding taxpayer information-related configurations and invokes the taxpayer summary retriever logic associated with request's access type.

Taxpayer Summary Retriever

The account summary retriever is expected to deliver the following information:

- Summary Title parameters list
- Summary Details parameters list
- Taxpayer Name (required, used internally by the self service product)
- Taxpayer Type (optional, used internally by the self service product)
- Primary Contact details:
  - Contact Type
  - Contact Name
  - Email address

Retriever logic may also completely override summary title and details text and populate it on the response.

The taxpayer summary retriever provided with the base product is implemented for the access type ***Tax Role***. It uses summary instructions defined on the service task type to return the following details:

- Summary title parameters *taxpayer name* and *ID number*, summary details parameters: *taxpayer type*
- Primary Contact details, where applicable.

Review the business service **C1-RetrieveTaxpayerInfoSummary** for an example of a taxpayer summary retriever. Refer to *Service Task Types* for more details about summary instructions configuration.

Contact Information

Contact information includes a list of taxpayer's phone numbers and an email address stored in the system. The self service user may choose to add and/or edit the information.

The self service product sends a request containing the tax account identifiers (access type + access keys) and a line of business. It may also contain updated contact info. The web service is processed by the XAI Inbound Services **TSGetTaxpayerContactInformation**, which invokes the service script **C1-GetTxpCon**.

The service script reads the Master Configuration and determines the service task type holding taxpayer information-related configurations.

The contact info instruction on the service task type indicates whether it should be the taxpayer itself or the person linked to the taxpayer via person-to-person relationships.

The script proceeds according to the input action:

- For action **READ** it invokes the contact info retriever logic associated with request's access type
- For action **UPDATE** it creates the service task referenced on the service task type. Service task algorithm(s) perform the actual update of the taxpayer information.

NOTE: Refer to the algorithm **C1-UPDTXPINF** for more details about taxpayer contact info update logic.

Contact Info Retriever

The taxpayer contact info retriever provided with the base product is implemented for the access type ***Tax Role***. It uses contact info source instructions defined on the service task type to return the following details:

- List of taxpayer's phone numbers, including extensions.
- Email address.

The instruction indicates whether the source of the contact info is the input taxpayer itself or the person linked to the taxpayer via person-to-person relationships.

Review the business service **C1-RetrieveTaxpayerContactInfo** for an example of a taxpayer contact info retriever. See *Service Task Types* for more details about contact information source instructions configuration.

Correspondence Information

The correspondence information contains list of addresses associated with the taxpayer. The self service user may choose to add and/or edit the specific address.

The portal displays address type and formatted address info for each address instance.

The base product is expected to supply the actual address fields and the formatting is performed in the self service product.

The self service product sends a request containing the tax account identifiers (access type + access keys) and a line of business. The web service is processed by the XAI Inbound Services **TSGetTaxpayerCorrespondenceInformation**, which invokes the service script **C1-GetTxpCor**.

The service script reads the Master Configuration, determines the service task type holding taxpayer correspondence-related configurations and invokes the address retriever logic associated with request's access type

The correspondence info retriever provided with the base product is implemented for the access type ***Tax Role***.

Review the business service **C1-GetTaxpayerCorrespondInfo** for an example of a taxpayer address information retriever. Refer to *Service Task Types* for more details about related configurations.

Update an Address

The self service product allows taxpayer to update an existing address record.

The integration applies the following steps:

- The self service user modifies existing address information or adds a new address.
- The self service product sends a request containing the tax account identifiers (access type + access keys), line of business, and the address data. The web service is processed by the inbound web service **TSAddressMaintenance**, which invokes the service script **C1-MaintAddr**.
- The service script reads the Master Configuration and determines the service task type holding taxpayer correspondence-related configurations for the input line of business.
- It then creates the service task referenced on the service task type. Service task algorithm(s) perform the actual update of the address.

NOTE: Refer to the algorithm **C1-MNTTXPADR** for more details about taxpayer correspondence information update logic.

Configuration Tasks for Taxpayer Information

The following sections list the configuration tasks needed to implement the taxpayer information functionality.

Service Task Types

Taxpayer Information Task Type

Create service task types for the **taxpayer information** configurations with the business object Taxpayer Information Task Type. Configure one service task type for each line of business your implementation wishes to support, as follows:.

- Select the line of business from the drop-down list.
- The related transaction BO should be set to **C1-UpdateTaxpayerInfoTask**.
- The service task class should be set to **Service Request**.
- **To Do Type** should be set to a standard error To Do type to use when transitioning to error. The base product provides **To Do Type Self Service Task Issues** (C1-SSTTD) for this purpose.
- **To Do Role** should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided, the default role for the To Do type is used.
- Configure the **Confirmation Header Message Category and Message Number** and the **Error Header Message Category and Message Number** to set up communication with the self service user.

  NOTE: See the Messages section of the *General Configuration Tasks* for more information.

- **Summary Instructions.** If your implementation uses the taxpayer summary retrievers provided by the base product, define the instructions to use when retrieving the taxpayer summary:
  - Specify a default name type to be used as a taxpayer name on the summary
  - List special instructions for the taxpayer types supported by your implementation. This configuration could be different for ***Business*** and ***Individual*** line of businesses. For example, individual taxpayer may not need/have an additional person to be listed as primary contact, while businesses are likely to have a designated person for this purpose:
    - Use the checkbox to indicate if the primary taxpayer's data should be used as the primary contact.
    - If the above is unchecked, specify either person-to-person relationship type to use in order to find a taxpayer whose information should be used.
    - Specify taxpayer's name type that should be displayed for the primary contact.
- **Contact Info Source Instructions.** If your implementation uses the taxpayer contact info retrievers provided by the base product and the algorithms linked to the base business object, define the instructions below. Note that the taxpayer whose contact information is displayed and updated is not necessarily the same taxpayer whose email was used for the primary contact. Consider the following situation: the taxpayer "in context" is a business. The source of the primary contact for the business could be a customer service department (person) linked to the main business (person). However the source of the contact info should be a business (person) itself, with phone numbers of business's departments.
  - List special instructions for the taxpayer types supported by your implementation:
    - Use the checkbox to indicate if the primary taxpayer's data should be displayed and updated online.
    - If the above is unchecked, specify either person-to-person relationship type to use in order to find a taxpayer whose information should be used

- **Access Type Processors.** For each supported access type list the processors responsible for the tax account information retrieval.
  - Taxpayer Summary Retriever.
  - Contact Info Retriever.

    NOTE: The product provides out of the box the business services **C1-RetrieveTaxpayerInfoSummary** and **C1-RetrieveTaxpayerContactInfo**.

Taxpayer Correspondence Information Task Type

Create service task types for the **correspondence information** configurations with the business object Taxpayer Addresses Task Type. Configure one service task type for each line of business your implementation wish to support.

- Select the line of business from the drop-down list.
- The related transaction BO should be set to C1-GetTaxpayerCorrespondInfo.
- Service task class should be set to Service Request.
- To Do Type should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type Self Service Task Issues (C1-SSTTD) is provided for this purpose.
- To Do Role should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

  NOTE: See the Messages section of the *General Configuration Tasks* for more information.

- **Access Type Processors.** For each supported access type list the processors responsible for the tax account information retrieval.

  Correspondence Info Retriever

  NOTE: The base product provides the business services **C1-GetTaxpayerCorrespondInfo**.

Master Configuration

The self service master configuration record includes settings required for the account information inquiry processing:

- **Taxpayer Information**. For each supported line of business (as defined in the LINE_OF_BUSINESS_FLG lookup) indicate the corresponding Service Task Type for Taxpayer Information.
- **Correspondence Information**. For each supported line of business (as defined in the LINE_OF_BUSINESS_FLG lookup) indicate the corresponding Service Task Type for Correspondence Information.

Integration Mapping

Phone Types. All Phone Types defined in the system must be configured in the phone type domain value mapping in the SOA Composer application.

Alternatively, your implementation may choose to use exactly same values in both products.

Online Form Processing

In this release, the integration supports on-line form filing. The following diagram illustrates an expected process flow:

The integration has multiple steps.

Initial processing works as follows:

- **Casual user.** The self service application captures information about the taxpayer and sends a web service request to this product to validate the taxpayer (proof of identity - POI).
- **Enrolled user.** The identification is not performed.

> **NOTE:** See *User Identity Verification* for more information.

The interpretation of the identification outcome includes a provision for the first-time filers. The option is configured in the self service product. If first-time filers are allowed, the identification request may return neither taxpayer ID(s) nor an identification error.

Next the online form is rendered and the taxpayer begins to fill in the information. User may press action buttons to request the data to be copied from the previous return and validate the incomplete form multiple times. Every action is triggering a web service call and the base product is processing the incoming web service request. See *Form Actions* for more details.

Lastly, the user is pressing Ready To File button and the form data is validated one last time. If this action produced no errors, the user is offered an option to review and print the form and then submit it. The integration generates the DLN and also a confirmation ID.

As a result of a successful online form submission the form is created and linked to the form submission service task. The DLN is captured on the service task via characteristic.

The topics below describe more information about the provided functionality, followed by configuration tasks.

Form Data Model

Form definitions are in a sense shared between self service application and the base product. Both systems rely on the metadata when rendering forms on screen and applying various business rules on the form data.

The solution provides the ability to import form type definitions into the self service product.

The self service product operates with generic form data model. The requests originated from the self service product contain the form data in this format:

```
<formData>
<id/>
<name/>
<section type="list">
<id/>
<name/>
<sequence/>
<line type="list">
<field type="group">
<id/>
<name/>
<dataType/>
<value/>
</field>
</line>
<table type="list">
<id/>
<name/>
<tableRow type="list">
<sequence/>
```

```
<field type="list">
<id/>
<name/>
<dataType/>
<value/>
</field>
</tableRow>
</table>
</section>
</formData>
```

The form processing integration flow assumes that for the form of a certain type the names of the elements on the generic form data model (sections, lines, tables etc) exactly match the business names of the elements on the form type definitions. This assumption allows an automated transformation of the generic form data XML into form business object XML based on the form type definition.

The base product provided with the business services **C1-TransformFormToGenericWeb** and **C1-TransformGenericWebToForm** for the form data conversion.

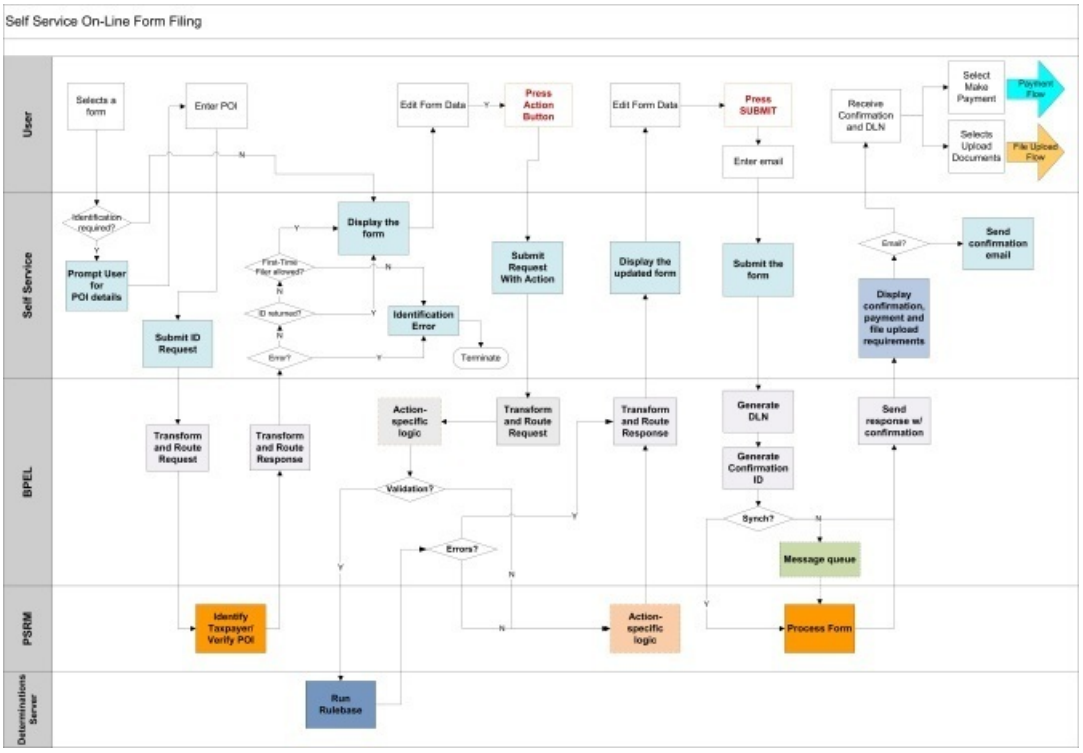
Fastpath: Refer to the *Import Form Definition* for more information

Form Process Request

The web services handling online business registration and tax form filing are processed by the XAI Inbound Services **TSProcessRegistrationForm** and **TSProcessTaxForm**, respectively. Both services invoke the service script **C1-RSISvcReq**. The appropriate service task type is derived from the Master Configuration based on the information received from the self service system.

The handling of a specific form action is delegated to the processor components (service scripts or business services) specified on the Master Configuration.

The following diagram illustrates the online form filing flow:



Form Actions

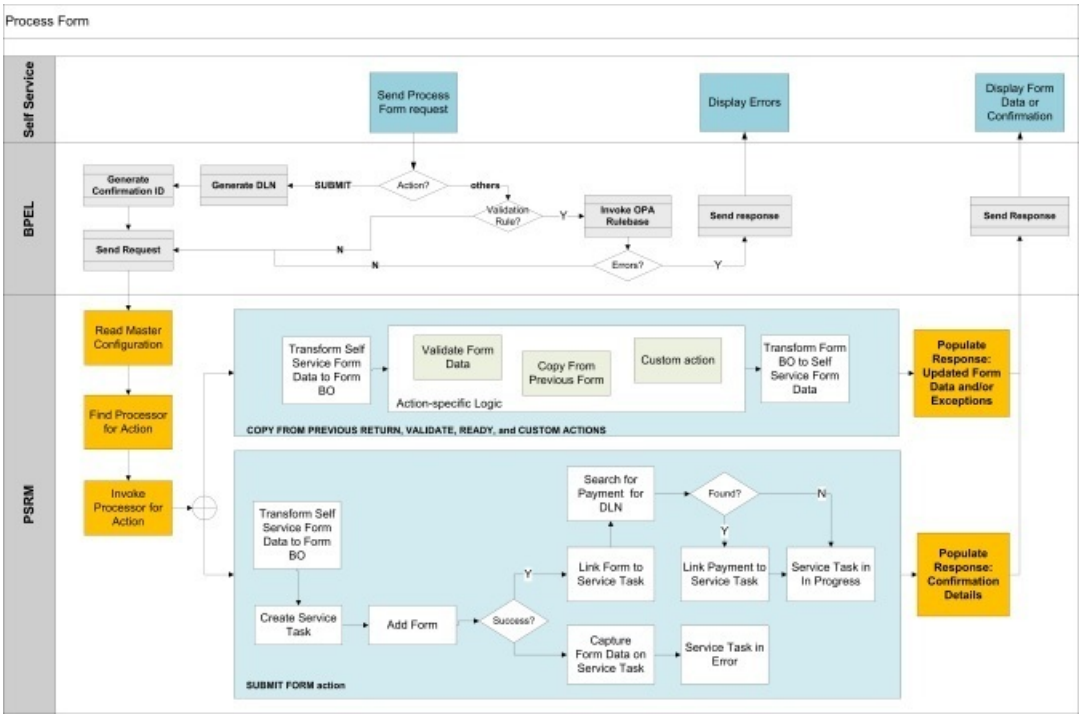


Figure 8: Handling Form Actions in PSRM

The following form actions are supported by the base product.

Copy From Previous Return is expected to return an updated form data or a message indicating that no previous return was found. The product supports an alternative optional scenario for this action. If no previous return is found, the form may be populated with basic taxpayer details, e.g., primary ID, name, and mailing address. This is done by implementing the action **Get Taxpayer Info**.

> **NOTE:** The action **Get Taxpayer Info** is *not* called directly from the self service application.

Check Form Data. This action triggers the form data validation and the response is expected to contain the corrected form data and the list of exceptions. The solution provided in the base product performs the validation using the **C1-ApplyWSSValidation** business service.

Ready to File. This action is expected to perform the final round of the form data validations. The outcome is expected to be similar: updated form data and a list of exceptions, if any. If this action returns no errors/exceptions, the self service product allows the user to submit the form.

Create Form. This action is responsible for actual form creation. The service task created as a result of a form submission plays a slightly different role than other service tasks. The form is created "outside" of the task; the form action processor **C1-CreateForm** creates the form and links it to the service task as a related object.

If the form submission is followed by supporting documents, upload, and/or payments, these entities are also linked to the service task. Thus, the service task serves as the tracking device for the various activities related the form submission. The lifecycle of the service task business object includes a monitor algorithm that completes the service task when the form is successfully posted.

NOTE: All form action processing starts with transforming the self service generic form data XML into base form business object XML and ends with transforming the form business object XML into a self service generic form data XML. The business logic is performed on the form business object.

Notes on Form Validation

The business service **C1-ApplyWSSValidation** invokes the form rules linked to the WSS Validation rule event. When designing the rules, consider the following circumstances:

- Calculate whatever is possible to calculate and minimize manual input.
- Auto-correct is the preferable rule outcome. Create an exception only if the self service user could possibly fix the issue.
- The form may be only partially filled when the user invokes the validation.
- The validation is likely to be invoked multiple times.
- Don't include internal IDs and other sensitive information in exception messages.
- By default, the self service product displays the expanded message text for each rule exception. Make sure these messages are suitable for the self service user; explain the issue in a user-friendly manner and avoid technical details.

Configuration Tasks for Online Form Processing

The following sections list the configuration tasks needed to implement the on-line form processing functionality.

Form Sub-Type

The form sub types defined in the base product - ***Business Registration Form*** and ***Tax Form*** - must be configured in form category domain value mapping in the SOA Composer application. Refer to the self service product documentation for details.

Form Rule Group

The self service user is certainly less competent than the agency user and would likely make various mistakes and miscalculate the numbers. Even though the on-line form is equipped with multiple help and guidance tools and the form data is validated using Oracle Policy Automation-based validation engine, the chances are that the self service user would repeat the *Check My Form* action multiple times. When designing the form rule group(s) associated with WSS Validate (C1WI) rule event try to maximize the auto-correction and to minimize the number of possible exceptions.

Form Source

You may wish to create a dedicated form source for the forms submitted through the self service portal

Service Task Types

Taxpayer Identification Task Type

Define a task type to use for taxpayer identification with the business object Taxpayer Service Request Self Service Task Type.

- The **Related Transaction** BO should be set to **C1-TaxpyrIdentFormFilingSSTask**.

  NOTE: The state algorithm **C1-IDTXFORMF** implements the first-time filer scenario.

- **Service Task Class** should be set to **Taxpayer Identification**.
- **To Do Type** should be set to a standard error To Do type to use when transitioning to error. The base product To Do Type Self Service Task Issues (**C1-SSTTD**) is provided for this purpose. Note that the algorithm plugged in on the error state for the base business object checks that there is not already a To Do for the record before creating one of this type. This allows algorithms that detect an error to also create a To Do with a specific type, if desired.
- **To Do Role** should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided, the default role for the To Do type is used.
- Configure the Confirmation Header Message Category and Message Number and the Error Header Message Category and Message Number to use for communication to the self service user.

  NOTE: Refer to the **Messages** section of the General Configuration Tasks for more information.

- The service request fields mapping is used when creating the target service task to correctly populate the **requestField** list from the list of fields passed in on the web service request XML. For the base transaction business object, the following fields are expected:

Sequence	Transaction BO XPath
1	requestData/legalName
2	requestData/idType
3	requestData/personIdNumber

- Configure the Service Request Data Instructions. Specify if the identification request task should be persistent and whether the web service response should be echoing back the input data.

  NOTE: Refer to the Messages section of the General Configuration Tasks for more information.

NOTE: Service Task Type Mapping. The service task type defined here must be configured in the service task domain value mapping in the SOA Composer application. Refer to the self service product documentation for details.

Form Submission Task Types

Define a task type to use for each Form Sub Type (***business registration*** and ***tax***) with the business object **Form Submission Self Service Task Type**.

- The related transaction BO should be set to **C1-RegFormSubmissionSSTask** and **C1-TaxFormSubmissionSSTask**, respectively.
- The service task class should be set to *Standard Self Service*.
- **To Do Type** should be set to a standard error To Do type to use when transitioning to error. The base product provides **To Do Type Self Service Task Issues** (C1-SSTTD) for this purpose.
- **To Do Role** should be configured to an appropriate default To Do role for the above To Do type. This is optional. If no value is provided, the default role for the To Do type is used.
- Configure the **Confirmation Header Message Category and Message Number**, as well as the **Error Header Message Category and Message Number**, to enable communication to the self service user.

  NOTE: See the *Messages* section of the *General Configuration Tasks* topic for more information.

Master Configuration

The self service master configuration record includes several settings required for the form definition import processing.

- Set Char Type for DLN to **C1-DLNSS**.
- Specify the Form Source created above.
- Configure the service task types to use when processing for each form sub-type. Create entries for Business Registration Form and Tax Form sub-types and specify service task types created above.
- Configure the processing components for all form actions supported by the base product. The business services mentioned below are provided with the product. The implementation may use them as-is or implement alternative action processors.
  - Action **Copy From Previous Return** - specify a business service **C1-CopyFromPreviousForm**.
  - Action **Ready to File** - specify a business service **C1-ValidateFormData**.
  - Action **Create Form** - specify a business service **C1-CreateForm**.
  - Action **Check Form Data** - specify a business service **C1-ValidateFormData**.
  - Action **Get Taxpayer Information** – specify a business service **C1-GetTaxpayerInfoForm** if your implementation is to support the special behavior for the **Copy From Previous Return** action, where basic taxpayer information is populated on the form if no previous return is found.

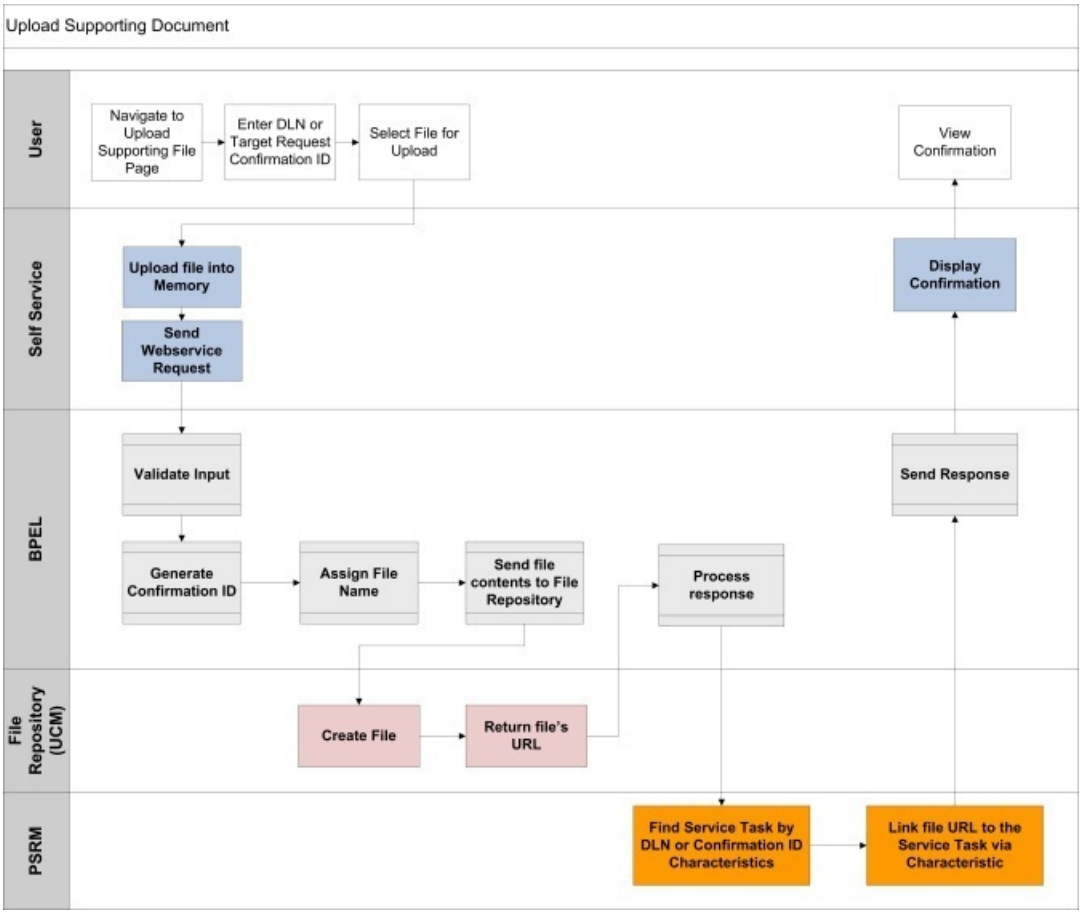
Implementing a Custom Form Action

Your implementation may wish to support additional actions for the online filing process. The self service product allows enabling a form action on specific form. For example, consider the following requirement/implementation scenario:

- **Requirement:** Improve the self service user's experience by splitting **Check My Form** into two actions: *Calculate Totals*, whose purpose is to update the numbers on the form, and *Check my Form* whose purpose is purely data verification.
- **Possible implementation:**
  - Create a new **Form Rule Event** named *Calculate* and implement form rules for calculations.
  - Implement the form action processor to call a rule event created above **C1-ApplyWSSValidation**. For the base product, from XML conversion to and from the self service generic XML, use the business services **C1-TransformFormToGenericWeb** and **C1-TransformGenericWebToForm**.
  - Add a new form action using lookup **C1_SELF_SVC_FORM_ACTION_FLG**.
  - Configure the new action on the **Self Service Master Configuration**.
  - Set up a new action in the self service product and enable it on the form definition(s).

Upload Supporting Documents

The following diagram illustrates the Upload Supporting Documents process flow:



The integration supports an ability to upload supporting documentation for a form or a service request with the following steps:

- The file is uploaded on the self service portal and processed by the SOA Composite.
- File contents are sent to the document repository and the result file location is populated on the request.
- A confirmation ID for the file upload event is generated and populated on the request. The request is forwarded to the base product.

The request is processed by the XAI Inbound Services **TSUploadSupportingDocument**, which invokes the service script **C1-UplSupFle**.

The service script is searching for the service task either by a target confirmation ID or a DLN. The logic is adding a characteristic to the service task referencing the input supporting file URL and adds a new detail to the service task confirmation info containing the file upload confirmation ID.

Configuration Tasks for Supporting Documents Upload

The following sections list the configuration tasks needed to implement the upload supporting files for form functionality.

Master Configuration

The self service master configuration record includes settings required for the form definition import processing.

Specify characteristic type C1-SUPDC as a Char Type for File Location.

Import Form Definition

The integration supports the import of form type definitions into the self service product. The ability to import the definition allows seamless integration between the product and the self service application.

The import process has the following steps:

- The implementer enters a form sub-type and other search criteria. This triggers the web service call.
- The request is processed by the XAI Inbound Service **TSRetrieveActiveFormTypes**, which invokes the service script **C1-RetAcFrTy**. The service script reads the Master Configuration and invokes the defined processor. The list of form types available for import is determined by the product and returned back to the self service portal.
- The user is prompted to select one or more form types. This triggers another web service call for the service **TSRetrieveFormTypeDefinitions**, and the form definitions are retrieved and captured as a self service product's form definition.

The imported information for a single form type includes:

- **Form Sections:** Business name, display sequence, occurrence, label.
- **Form Single Lines:** Business name, display sequence, line number, label, data type, referenced lookup (if applicable), data precision, and scale.
- **Form Group Lines:** Business name, display sequence, line number, label.
- **Referenced lookups:** A list of values and descriptions for each lookup referenced by a form line.

Notes:

- Form Group Line is interpreted as a table in self service product. On the import XML it is represented by the tag <table>.
- Form Single Line within a group line is interpreted as a table column.
- All language-base information is returned for all languages supported by the base product.

Configuration Tasks for Import Form Definition

The following sections list the configuration tasks needed to implement the form definition import functionality.

Master Configuration

The self service master configuration record includes settings required for the form definition import processing.

Specify the business service **C1-RetrieveActiveFormTypes** as Active Form Types Retriever.

Maintaining Self Service Tasks

Use the Service Task transaction to view and maintain service tasks. Navigate using **Menu** > **Self Service** > **Service Task.**

Self Service Task Query

Use the query portal to search for a service task. Once a service task is selected, you are brought to the maintenance portal to view and maintain the selected record.

Self Service Task Portal

This page appears when viewing the detail of a specific self service task.

Self Service Task - Main

This portal appears when a Self Service Task has been selected from the Self Service Task Query portal.

The topics in this section describe the base-package zones that appear on this portal.

Self Service Task

The Self Service Task zone contains display-only information about the selected Self Service Task, including the following:

- Audit information for the task, including the web user ID and name, the email address and IP address.
- The list of related objects associated with the task
- Any error information
- Confirmation ID and message and any confirmation details
- Other information that is specific for the type of task. Refer to the in-line help text for more information about the fields.

Self Service Task - Log

Navigate to the Log tab to view the logs for a self service task.

Oracle Policy Automation Integration

Oracle Public Sector Revenue Management provides tools to facilitate the integration with Oracle Policy Automation platform (OPA).

Integration Overview

Oracle Policy Automation's is designed to handle the implementation of complex policies and business logic. The integration allows invoking OPA rulebase via webservice and retrieving and capturing the determination result, including step-by-step decision report on how the OPA reached the conclusion.

The product supports multiple integration patterns. When selecting an integration method that is appropriate for your business requirements, consider the following scenarios:

- A complex policy, a benefits calculator, an eligibility rule or other determination is implemented as OPA rulebase. This rulebase is deployed on the determinations sever that is accessible either publicly or via organization’s intranet. Your requirement is to perform similar validation or determination. In this scenario, use the *Direct Webservice Integration* method to invoke an independently-designed rulebase from within the product.
- Your implementation designers determined that certain functional requirement is suitable to be implemented with OPA and should be executed during business object lifecycle or as part of another business process. Or, you’ve been designing a Form and realized that most of the Form validation rules can (or better be) implemented using OPA. For these scenarios, use the *Shared Data Model Integration* method to create the rulebase with pre-generated data model and seamlessly incorporate it into the product.

The following sections describe the technical information needed by your implementers to be able to invoke OPA rules from within the system.

Configuring the Direct Webservice Integration

The topics in this section describe configuration required in the product for direct webservice integration with OPA and steps needed to use one of the sample OPA Rulebases provided by the product.

Verify the Rulebase Web Service Adapter Options

The direct webservice integration with OPA uses *web service adapters* to define the connection information to the OPA server and the specific mapping required between the product and the individual OPA rulebases. The product provides a Rulebase Web Service Adapter BO (**F1-OpaWebSvc**). Each OPA Rulebase requires an individual web service adapter that uses this business object.

Before creating any web service adapter records, verify that the Rulebase Web Service Adapter BO has been properly configured for the installation. Each installation must configure two BO options with specific server locations related to the integration. Review the BO options to ensure they are configured. If not, the installation team can provide the appropriate values:

- **Oracle Web Determinations Server Location**. This is the URL of the Oracle Web Determinations server. It should be in the format **http://[server-name]:[portNumber]/determinations-server/soap**. For example **http://opa-server-name:1000/determinations-server/soap**. This is the server location that is part of any WSDL URL used to create an appropriate web service adapter for a specific rulebase.
- **Oracle Policy Automation Rulebase Location**. This is the server directory that includes a copy of the deployment files of the OPA rulebases supplied with the product. This is needed by the business service that generates the mapping data areas when creating a web service adapter for a rulebase.

Once the configuration of the Rulebase Web Service Adapter BO is verified, your implementers may now create specific web service adapters for each specific rulebase used by your implementation.

Configuration Required for a Sample OPA Rulebase

For any sample OPA rulebase provided by the product, most components are supplied by the product, but final steps are required by each implementation. To illustrate the details, we'll use as an example the timeliness validation algorithm for creating an appeal.

- The product supplies the rulebase. In this scenario it is called **Appeal_Validation**. As part of the installation of the product, the deployment files are installed on the OPA server that the product will integrate with and also copied to the rulebase location server directory described above.
- The product supplies an appropriate algorithm type that invokes the call to OPA. The algorithm type is responsible for gathering the data required as input to the OPA rulebase and includes appropriate logic based on the outcome returned by the rulebase. For example, the call to OPA may return a decision report. The algorithm may be designed to store the decision report and link the decision report ID to the appropriate entity for viewing later. In this scenario the product supplies a BO Enter plug-in for the Appeal business object's **Validated** state. It is called *C1-AP-CHKATL* . The product supplies the algorithm type. However, the algorithm requires the Web Service Adapter name as input so the product does not supply the algorithm nor is it plugged into the appeal business object.

The following points explain the additional configuration steps required by an implementer to implement a sample rulebase.

1. Determine the WSDL URL for the rulebase. The WSDL URL is composed as follows **[Oracle Web Determinations Server Location]/[rulebase name]/specific?wsdl**. Using the URL example above and this rulebase the WSDL URL would be **http://opa-server-name:1000/determinations-server/soap/Appeal_Validation/specific?wsdl**.

   TIP:
   To verify that you have composed the WSDL URL correctly, paste the composed URL into an internet browser and verify that you can access the WSDL.

2. Define a web service adapter for the rulebase using the rulebase WSDL. Refer to *Understanding Web Service Adapters* for details about fully creating and generating the web service adapter.
3. Create an algorithm for the appropriate algorithm type provided by the product for this particular OPA integration. The algorithm requires the web service adapter name. Depending on the specific algorithm type, there may be additional parameters required.
4. Plug the algorithm into the appropriate plug-in spot as defined by the specific integration point.

FASTPATH:
For this scenario, refer to *Configuring the Appeal Timeliness Rule* for specifics about defining the algorithm correctly and plugging it into the appropriate plug-in spot.

Defining a New Rule

The first step is to design the business rule. In addition to designing the logic of the OPA rulebase, your designers must consider where and when the business rule should be invoked by the product as well as what logic should occur in the product based on the output from the call to OPA.

The topics in this section describe more detail to consider when implementing a new business rule using an OPA rulebase.

Develop the Algorithm to Invoke the Rule

An important step in considering an integration point with OPA is to consider when it should be invoked within the product. In other words, what plug-in spot? For example:

- Is the business rule validation that must be invoked any time a certain object changes? Then perhaps this should be implemented as a BO validation algorithm for an appropriate business object.
- Is the business rule validation that determines if an object may transition to a different status? Then perhaps this should be implemented as an enter plug-in algorithm on an appropriate state for a business object.

As part of determining the appropriate plug-in spot, the designer should become familiar with the expected responsibilities of the plug-in spot and the data it receives when invoked.

Next, the designer should determine if the product already supplies an algorithm type for the desired plug-in spot that invokes OPA. For example, perhaps the product supplies an out of the box integration with OPA and the algorithm logic (the data it retrieves to send to OPA and the logic that occurs after returning from OPA) is appropriate for your business rule. However, the detailed logic performed by the product's sample rulebase does not match the business rule needed by the implementation. If so, your implementation may only require a new OPA rulebase to plug into this algorithm type.

The following points highlight more detail needed for designing a new algorithm to invoke an OPA rulebase:

- Work with the business rule designer to determine what information needs to be provided to OPA. The algorithm is responsible for gathering all the information required by OPA, if it is not already supplied to the algorithm.
- To invoke OPA, the product provides a web service dispatcher business service (**F1-InvokeWebService**). The business service requires the web service adapter name, the name of the operation to invoke (typically **Assess** for OPA integration) and the request and response data areas related to the operation. The algorithm must determine the appropriate web service adapter and must populate the request data area with the information required for the OPA call.

  The product algorithms have typically been designed to define the web service adapter name as an input parameter. The algorithm then includes logic to retrieve the request and response data areas defined on the web service adapter. This allows for algorithm type re-use. It means that the same algorithm type may be used for different business rules implemented with different OPA rulebases, assuming that the other logic performed by the algorithm applies to the different rules.
- Determine what logic should occur upon receiving the rulebase response. See the Rulebase Outcome section below for more information.

Rulebase Outcome

The type of data returned by a rulebase is configured in the request by populating the Outcome Style element for each output value (referred to as a "goal" in OPA terminology).

- An outcome style of **value-only** tells OPA to simply return the value of the goal (output) . This is the default if nothing is specified in the request.
- An outcome style of **decision-report** tells OPA to return a detailed report of why a particular result is given in addition to the value of the goal.

> **NOTE:**
> The above values are defined in the Outcome Style extendable lookup (**F1-OutcomeStyleLookup**).

Based on the business requirements, the algorithm must determine what should occur based on the results.

If the business requirement dictates that the decision report should be stored, the product provides a business service Create Decision Report (**C1-CreateDecisionReport**). This business service stores the decision report details in a special "attachment" table and returns the ID. Based on the business rules, the ID may be captured and stored with the object that requested the call to OPA. The following points provide more detail on storing a decision report.

- The following information should be provided to the business service to create the decision report:
- Populate the BO with **F1-DecRpt**
- Populate the MO and prime key values to appropriate values based on the object that invoked the OPA rule. For example, if the OPA rulebase was used to validate an appeal, the MO is set to **C1-APPEAL** and the PK value is set to the appeal id. This allows cross referencing on the decision report to the object that created it.
- Populate the Decision Report Data with the appropriate decision report node returned by the call to OPA.
- The attachment id is returned. To store a link to the decision with the object that created it, the product recommendation is to create a Log Entry, if the maintenance object supports logs. The characteristic type for the log should be set to **C1-DCRPT** and the characteristic value should be set to the attachment ID.

> **NOTE:**
> The characteristic type may require additional configuration to include the log in question as one of the valid characteristic entities.

Refer to *Viewing Decision Report* for information about viewing the decision report.

Deploying the Rulebase

Use Oracle Policy Modeling to develop the rulebase. Once the rulebase is tested and it is compiled and built, the deployment file is created.

- This rulebase should be deployed on the Oracle Web Determinations server. Note that in most implementations a separate group such as a release services group is responsible for this type of task.
- As described in *Configuring the Integration*, besides deploying the rulebase on the server, the web service adapter logic requires the rulebase to be copied to the server directory defined in the BO option Oracle Policy Automation Rulebase Location.

Final Steps

The remaining steps for the integration involve creating the web service adapter and fully configuring and plugging in the algorithm.

> **FASTPATH:**

Refer to *Configuring the Integration* for more information.

Configuring the Shared Data Model Integration

The topics in this section describe configuration required in the product for shared data model integration with OPA and provide high-level guidelines for OPA rulebases participating in this integration method.

The idea of this integration method is that an object in the product and the rulebase may share the data structure. Firstly, the entity is designed and defined in the main system. Then the entity's data structure is described using a special xml format and stored in a file that can be imported into OPA rulebase as a data model. The similarity of the models allows seamless exchange of the information between the product and the OPA rulebase. The webservice interaction between the product and the OPA determinations server is completely encapsulated.

Generated Rulebase Data Model

The data model has to be generated for each individual OPA rulebase invoked using this integration method. The generated file is stored as an owned attachment linked to the source object, for example Form Type or Data Area. The product provides an OPA Rulebase Data Model BO (**C1-OPARulebaseDataModel**) to capture the data model xml. The product also supplies the OPA Rulebase Data Model (attachment) search.

TIP:
Multiple rulebases can be built on the same data model. For tracking purposes capture the rulebase name on the Generated Data Model attachment.

NOTE:
The product does not support an automatic synchronization between the source entity (such as Form Type or Data Area) and the generated rulebase data model. Manually propagate the minor modifications of the source entity to the rulebase properties. Regenerate the data model if you significantly modified the Form Type structure or the data area's schema.

Setup OPA Integration Master Configuration

The shared data model integration uses master configuration to define the connection information to the OPA server, setup parameters for the data model generator and store default configurations for the OPA-based form rules. The product provides an OPA Integration Configuration BO (**C1-SelfServiceMasterConfig**).

Setup OPA Integration Configuration prior to an attempt to generate OPA rulebase data model for either a form type or a data area. For configurations related to the specific OPA installation, request the appropriate values from the installation team.

The the end-point URL for the rulebase webservice invocation is constructed dynamically at run-time. The URL is composed as: **[port:host]/[determitation server deployment location]/[webservice wsdl reference]/[name of the rulebase invoked]**,for example **http://myhost:0000/determinations-server0000/assess/soap/generic/MyRuleBase**.

The master configuration defines parts of the end-point URL pertaining to the OPA sever participating in the integration:

- **Determinations Server Location**. This is the deployment location of the Oracle Determinations server. It should be in the format **http://[server-name]:[portNumber]/[determinations server]**. For example, **http://myopaserver:0000/determinations-server**. By default, the **determinations-server** directory is created during OPA installation. However, OPA does not imposes a mandatory directory structure, leaving it at the installation team's discretion.
- **Web Determinations Location**. This is the deployment location of the Oracle Web Determinations. It should be in the format **http://[server-name]:[portNumber]/[web determinations location]**. For example, **http://myopaserver:0000/web-determinations**. This definition can be used if you implement requirement to trigger OPA web interview from the hyperlink placed anywhere on the portal zone.

- **Rulebase WSDL Reference**. This is the partial path of the ***Assess*** generic wsdl used for the integration. Combined with the value of the **Oracle Determinations Server** and the rulebase name it produces the full end-point URL for the rulebase invocation. This attribute may refer to either a version-neutral or a version-specific wsdl. Specify **/assess/soap/generic/** unless your business requirements dictate executing the historic version of OPA rulebases. An example of a version-specific reference: **/assess/soap/generic/10.4/**. Note that this definition is applicable to all run-time interactions with OPA.
- **Rulebase List WSDL Reference.** This is the partial path pointing to the determination server's wsdl. Combined with the value of the **Oracle Determinations Server** attribute, it produces the full URL of the wsdl. This wsdl described the ***odsServer*** service that the system invokes to retrieve list of rulebases deployed on the Oracle Determination Server
- **Installed OPA Version**. This is the exact version of OPA instans participating in the integration. The precise version number is necessary to ensure the compatibility of the generated data model with the current installation. It should be in a format of **N.N.N.N**, for example **10.4.4.21**

At design time the following definitions are used by the rulebase data model generator services **C1-DataAreaGenerateDataModel** and **C1-GenerateOPARulebaseModel:**

- **System Name** This is an alphanumeric code that identifies the current system. It is used internally by the data model generator and indicates the product that is triggering the generation process. Specify: **PSRM**.
- **Attachment Business Object**. This is a business object that the system uses to store the generated data model. The product provides the business object **C1-OPARulebaseDataModel** for this purpose.

The following definitions are used at run-time for the webservice request:

- **SOAP Action**. This is the definition of the SOAP action for the OPA webservice. It is version-specific and should include the 2–parts OPA version number. For ***Assess*** webservice specify: **http://oracle.com/determinations/server/10.4/rulebase/types/Assess**.

NOTE:
It is important to keep the master configuration in synch with the actual OPA installation. Verify the configuration every time a newer version of OPA is installed.

Configuration Required for Form Validation using OPA Rulebase

Consider implementing the OPA-based Form Rule if you intention is to validate the entire form at once and implement multiple business rules, verifications and calculations. In this scenario most infrastructure components are supplied by the product and only few configuration steps and business logic implementation in OPA are required:

- Generate an OPA rulebase data model for the Form Type. This option is available only for active Form Types.
- Save the data model file locally with extension **xsrc**.
- Create a new OPA rulebase and add the data model file as properties file. Develop, test and deploy the rulebase.

  FASTPATH:
  Refer to *Defining a New Rule with Pre-generated Model* for specifics about creating the form validation rulebase.

- Add a Form Rule to the source Form Type and associate it with the rulebase created above.. The product supplies a Form Rule BO (**C1-OpaValidation**) complete with an apply rule algorithm type that performs the call to OPA. The algorithm is responsible for gathering the form data required as input to the OPA rulebase, followed by webservice invocation and includes appropriate logic based on the outcome returned by the rulebase. For example, the Form Rule configuration may indicate that call to OPA should return a decision report. The algorithm is designed to store the decision report and link the decision report ID to the Form Log for viewing later. The product supplies both the algorithm type *C1-OPAVLAPRL* and the algorithm that is plugged into the form rule business object.

  FASTPATH:

Refer to *Using OPA Validation for the Form Rule* for specifics about configuring the OPA-based Form Rule.

Configuration Required for Data Area Validation using OPA Rulebase

The product provides the infrastructure allowing to process a data area using OPA rulebase. Most components are supplied by the product, but final steps are required by each implementation. To illustrate the details, we'll assume that there is a requirement to implement an eligibility rule plug-in using OPA.

Remember that the rulebase has no direct access to the product database and may not be able to retrieve additional information. Hence the preliminary processing logic supposed to gather all the information required to determine the eligibility. This logic could be implemented using Java or scripting. Next, the data should be passed to the OPA rulebase that in turn will determine the eligibility.

Here is what's provided by the product:

- The product supports the ability to generate rulebase data model that is structurally similar to the data area's schema.
- The product supplies a context-sensitive dashboard zone that contains an action button that is triggering the generator. The zone also displays the information about previously generated data models. The information is displayed as a hyperlink that points to the OPA Rulebase Data Model search. Another dashboard zone provides a complimentary ability to view the plug-in spot schema.
- The product supplies a business service **C1-DataAreaInvokeOPA** to facilitate the call to OPA. It is responsible for transforming the data into the format compatible with OPA webservice request and includes logic based on the outcome returned by the rulebase. Either updated xml or an error message are returned. Business service input allows to specify if call to OPA should return a decision report. You can specify that decision report is either stored immediately as an attachment or returned to the caller as a raw xml.

The following points explain the configuration steps required by an implementer to implement a data area validation via rulebase.

- Define the input for the rulebase and create a new data area that will serve as an API for the OPA call.
- Generate the rulebase data model and save it locally with extension **xsrc**.
- Create a new OPA rulebase and add the data model file as properties file. Develop, test and deploy the rulebase.
- Implement the call to the business service **C1-DataAreaInvokeOPA**, sending in the data area and the rulebase name.

FASTPATH:
Refer to *Defining a New Rule with Pre-generated Model* for specifics about creating a rulebase with pre-generated data model.

Defining a Rule with Pre-generated Model

The topics in this section describe more detail to consider when implementing a new business logic using an OPA rulebase with pre-generated data model.

Understanding the Generated Data Model

The generated data model reflects the structure of the source entity. Each entity name corresponds to the xml node name and may be prefixed with the succession of parent node names and node type "qualifiers", such as *section*, *line*, *table*, *list*, *group* or *tablerow*. This is done in order to ensure the uniqueness of the entity names within the generated model.

Each entity that represents the actual data-bearing elements, has two value-holder attributes, one for an original input value and one for the value determined as a result of the rulebase execution. The input value is named **xxx_submitted_value**, the output is named **xxx_determined_value.**

Develop the OPA Rule

In OPA development environment create a new project, select **Properties** folder on the project explorer three and use the option **Add Existing File** to add the generated data model file as a properties file. Perform an initial sanity check: compile the rulebase and verify that the generated data model contains no errors.

Set up the initial values for the attributes that will be referenced by the validation logic. To validate or pre-calculate the values you may need to perform various mathematical and logical operations with the values. Note that OPA does not automatically sets either blank values for text or zeroes for numeric attributes. Instead, it defaults all of them to a the special value **unknown**. This value is not equivalent to a null and cannot be evaluated or compared with other regular values, hence you may need to perform an explicit initialization of the attributes whose values are not provided. This example illustrates the initialization of a numeric attribute in the OPA rule:

Total Gross Sales' Determined Value	
0	The total gross sales' submitted value is unknown.
The total gross sales' submitted value	otherwise

Implement form data validations and calculations. The ultimate goal is to determine whether the data is valid, to correct the invalid values and/or provide the calculation results. The rulebase may also raise form exceptions. For that purpose, you should populate the entity's attribute named **xxx_error_message** with the actual error text.

Certain limitations apply:

- **Do not alter public names of the entities and attributes.** It will break the integration. You can modify the generated entity's text to make the entity more usable and intuitive. For example you may turn the generated "lineItems section's firstPrepayment" into "the first prepayment". This simplifies the rule writing process and makes you rule much more readable..
- **Do not remove entities and/or value-holder attributes from the generated model**. The integration logic populates the webservice request with all the values available in the system. The corresponding entity and/or attribute must be defined on the receiving side.
- **Data model changes should be made in both systems**. If the business requirements dictate changes to the data model, similar changes should be made to the model's source object's structure.
- **The output error message size should not exceed 250 characters**. This is an internal integration limitation.

Rulebase Outcome

The rulebase outcome comprise multiple determined values, validation error(s) and error indicators. Make sure your rulebase's output meets the expectations of the corresponding integration component:

- A form rule algorithm *C1-OPAVLAPRL* expects the **error_severity** and **rule_outcome** indicators to be populated with numeric values. These values are mapped to the standard form rule parameters **Exception Class** and **Rule Action** and further interpreted by the product's form rule engine. The error messages returned by OPA are captured as form exceptions.
- A business service **C1-DataAreaInvokeOPA** expects that OPA returns a single error message and treats it as a regular application error. .

The product integration supports retrieving a single decision report associated with the root data model entity. This entity has a boolean attribute named **xxx_contains_error** that should be set to **true** or **false** by the rulebase.

If requested, the integration component stores the decision report and links it to the "owner" entity via log..

Refer to *Viewing Decision Report* for information about viewing the decision report.

Deploying the Rulebase

Use Oracle Policy Modeling to develop the rulebase. Once the rulebase is tested and it is compiled and built, the deployment file is created.

- This rulebase should be deployed on the Oracle Web Determinations server. Note that in most implementations a separate group such as a release services group is responsible for this type of task.

Final Steps

The remaining steps for the integration involve configuring the components that invoke the rulebase.

FASTPATH:
Refer to *Configuring the Shared Data Model Integration* for more information.

Viewing the Decision Report

The product provides examples of storing a resulting decision report after a call to an OPA rulebase. For example, the **Appeal - Check Timeliness** algorithm stores the resulting decision report and provides a link to the decision report via the appeal log.

FASTPATH:
Refer to *C1-AP-CHKATL* for more information.

As described in *direct webservice integration* and *shared data model integration* chapters, a stored decision report can be linked to the calling object using a log entry and its characteristics. The section indicates an appropriate foreign key characteristic type to use.

A user views the decision report by navigating to the log and clicking the hyperlink for the stored decision report (attachment) id. Assuming that the appropriate characteristics type was used, clicking the hyperlink causes the decision report to display in a separate window.

NOTE:
The decision report (attachment) can be referenced via foreign key anywhere on the business object's schema. In this case it appears on UI as a regular hyperlink.

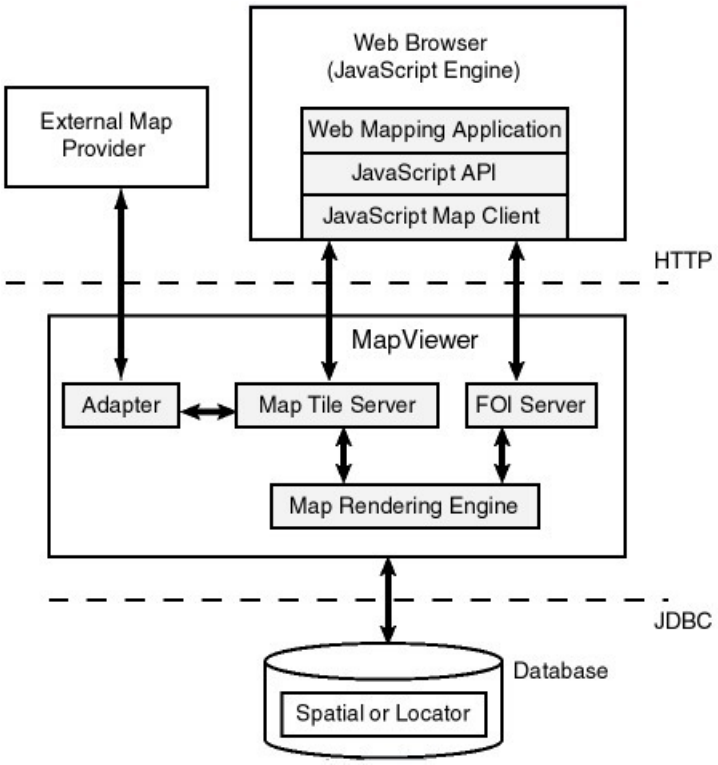
Oracle MapViewer Integration

Oracle Public Sector Revenue Management provides tools to facilitate the integration with Oracle Fusion Middleware MapViewer (Oracle MapViewer) and supports the ability to display geographic maps on the portal..

The topics in this section describe the technical information needed by your implementers to configure the integration.

About the Oracle MapViewer

Oracle MapViewer supports the ability to incorporate highly interactive maps and spatial analysis into business applications.



The system uses the Oracle MapViewer JavaScript API to retrieve the map and render it on the page.

It invokes JavaScript map client that is fetching the map image tiles from the map tile server, then displays the map in the Web browser. The application may also invoke the JavaScript map client to fetch dynamic spatial features from the feature of interest (FOI) server and display them on top of the map tiles.

Tiles can be fetched either directly from the Oracle MapViewer map rendering engine or from an external Web map services provider.

Oracle MapViewer configurations including topology, map layers and themes are configured using Oracle MapViewer Management Console.

FASTPATH: For more details refer to the Oracle Fusion Middleware MapViewer documentation.

Integrating Maps

The product integrates with Oracle MapViewer as follows:

- The integrated Oracle MapViewer is deployed on the network. It is connected to a map data source. The actual map data is not included in the base product and has to be obtained (and possibly licensed) separately. Any map data source compatible with Oracle MapViewer may be used.
- The reference to the Oracle MapViewer is configured in the system through a single, dedicated master configuration.
- The map is rendered on the UI Map within Explicit Map Portal Zone. UI Map's HTML includes JavaScript code that uses the Oracle MapViewer API to invoke various functions and retrieve and display the map.

For information on featured integration patterns see *Basic Map Entities*.

Basic Map Entities

Multiple entities in the system are associated with geographic location, directly or by proxy.

Map-enabled entities are those in which the data includes the latitude/longitude directly or in which the latitude/longitude can be derived using other information captured on the Business Object.

For these entities the following is supported:

- Maintenance portal includes a geographic map that shows location(s) associated with the entity, e.g., a person's address.

  NOTE: The map's zoom level is adjusted automatically to include all locations in the initial rendering.

- Additional information about an object residing in this location, such as property picture, asset's appraised value etc. is displayed.
- Search results include View Map option.

Map Zone on Maintenance Portal

The availability of the map is controlled by the Business Object option **Geo Map Derivation Script**. This option references a service script that retrieves list of geo locations associated with the entity.

The zone on the maintenance portal is visible only when the script returns one or more locations.

NOTE: The product geo map derivation service scripts follow a naming convention of script code `C1-GeoMap%`. These scripts share a common schema structure:

```
<schema>
    <includeDA name="C1-GeoMapInfo"/>
</schema>
```

Map on the Search/Query Results

The search results for the map-enabled entity includes View Map option. The derivation of the location information is performed by Business Object's Geo map Derivation Script. The map is shown on the popup window.

Customizing the Integration

The following components of the integration can be customized:

- **Geo Map Derivation Script**. It returns the whole set of information used to retrieve and render the map. It includes the list of locations to display and also the general map definitions, such as initial zoom levels, pointer images, map layer and even the Oracle MapViewer installation. Custom geo Map derivation Script logic can completely override the entire map.
- **Zone Visibility Script**. The base product script evaluates whether the geo location information is available in order to decide if the map should be displayed. The implementation may configure alternative conditions for map visibility.
- **Pointer Image**. You can customize/replace the graphic delivered with the base product and/or associate special graphic with a location. For example, Address Type can be associated with a special pointer image.

Configuring the Integration

To enable the integration you need to set up the MapViewer Configuration master configuration as follows. This setup is used at runtime when the system renders the map.

1. Navigate to **Admin** > **Master Configuration** and select the **MapViewer Configuration** business object from the list.
2. Define a reference to the Oracle MapViewer installation connected to the current environment:
   - **Base URL** defines the location of the Oracle MapViewer installation.
   - **Java Script Path** defines the location of MapViewer JavaScript library. The path should be specified relative to the base URL (see above).
   - **Spatial Reference ID** uniquely identifies the spatial coordinate system. Refer to *https://en.wikipedia.org/wiki/Spatial_reference_system* and *https://en.wikipedia.org/wiki/SRID* for more information.
3. Define the map source and initial rendering parameters:
   - **Default Window Style** refers to one of the styles available from Oracle MapViewer API.
   - **Map Data Source** refers to one of the map data sources installed and configured in Oracle MapViewer. It is the source for the embedded maps.
   - **Map Tile Layer** defines the default tile layer displayed on the map. Single Map Data Source may include multiple tile layers whose content may wary. The tile layer is the ultimate link between the UI component and the MapViewer.

     NOTE: The master configuration defines a **default** map tile layer used for *Basic Map Entities*. The implementation can integrate other tile layers in order to address specific business requirements.

   - **Default Pointer Image** references an image used as a location pointer on the map.
   - **Default Initial Zoom**, **Default Maximum Zoom**, and **Default Minimum Zoom** define the initial parameters of the rendering.
4. Additional configurations include:
   - **Default Info Callout Title** defines the metadata field whose description is used as the title of the info callout displayed when user double-clicks on a location pointer image.
   - **Default Historic Address Label** defines the metadata field whose description is used as a label for the historical addresses.
   - **Labels** for the map zoom levels. These labels are displayed on the map's zoom control widget. Example: Street, City, Country.

Enabling a Map on a Maintenance Portal

Availability of the latitude and longitude is imperative for displaying the location on the map.

Map-enabled entities are those in which the data includes the latitude/longitude directly or in which the data can be derived using other information captured on the Business Object.

To enable a map on a maintenance portal:

1. Derive geographic map information by creating a service script that retrieves one or more locations associated with the object.

   The common schema for geo map derivation service scripts is:

   ```
   <schema>
       <includeDA name="C1-GeoMapInfo"/>
   </schema>
   ```

   For each location retrieve:

- **Latitude** and **Longitude**.
- **Tooltip** text is the text that is shown in the callout when the user hovers over the pointer image.
- **Additional information contents** and **title** is the information displayed in the popup when user clicks on the pointer image and the title for this popup. The information can be returned as plain text or HTML.
- **Pointer Image Location** is the alternative image for the pointer image. Populate it if your implementation wishes to override the default graphic, or when a certain location(s) is associated with a special image.

There is also an option to override the displayed map completely. The output of the script may include an alternative map window style, map theme, map layer, default initial zoom and even point to an alternative Oracle MapViewer installation.

2. Define a business object option by adding a new option, **Geo Map Derivation Script**, to the business object. Specify the service script created above.

3. Add a portal zone by adding an **Explicit Map Zone** to the maintenance portal.

   - **Display Object**. Specify `ss='C1-GeoMapDer'`. This common service script derives object-specific **Geo Map Derivation** script and invokes it to retrieve the map data.
   - **UI Map**. Specify map='C1-GeoMap'. This map is designed to display a set of geo locations derived by a **Geo Map Derivation** script.
   - **Zone Visibility Service Script**. The base product includes visibility script that evaluates an object by maintenance object+primary keys combination, invokes Geo Map Derivation script and returns true if there is at leat one location to display. An example of this parameter configuration for **Asset**:

     ```
     ss='C1-GMShwZn'
     input=[mo='C1-ASSET' pkval1=ASSET_ID]
     output=shouldShowZone
     ```

   - **XML Parameters 1-15**. Use these parameters to pass maintenance object and primary keys for the entity in context to the service script. An example of XML Parameters 1 and 2 for Asset:
     XML Parameter 1:

     ```
     name=ASSET_ID
     targetPath=input/pkValue1
     poprule=R
     ```

     XML Parameter 2:

     ```
     name=MAINT_OBJ_CD
     targetPath=input/mo
     spec='C1-ASSET'
     ```

   Refer to Zone `C1-ASSETMAP` as an example.

4. Configure the main query/search zone. The **Map** column with the **View** link does not appear on the search result automatically, so the zone configuration must be amended as follows:

   - Add logic to check for the existence of the geo location information (e.g., for the existence of at least one address linked to an asset whose latitude and longitude are populated. Return the existence indicator as an SQL column.
   - Make sure the SQL results include the entity identifiers **Maintenance Object** and **Primary Keys**.
   - Configure an explorer column to invoke the BPA script `C1-GeoMapOP`, passing entity information (**Maintenance Object** and **Primary Keys**) as an input. The script determines the business objects, invokes the geo map derivation script, and opens a UI map with the data returned by the script.

     An example of the column configuration for the **Asset Search**:

     ```
     source=SQLCOL
     sqlcol=LABEL_LONG
     ```

```
label=ADDRESS_MAP_LBL
bpa='C1-GeoMapOP'
tempstorage=[mo='C1-ASSET' pkValue1=ASSET_ID]
```

Refer to zone `C1-ASSETQ1` as an example.

CTI-IVR Integration

Oracle Public Sector Revenue Management provides tools to facilitate the integration with your Computer Telephony Integration/Interactive Voice Response (CTI/IVR) system. The interface provides the following functionality:

- The ability to launch Control Central for a particular account ID or phone number from an external application
- The ability to perform an outbound phone call from within Oracle Public Sector Revenue Management
- The ability to accept the next call, as dictated by the CTI software, from the toolbar

This document provides technical information needed by your implementers to fully integrate with your CTI/IVR system.

Launching The System From an External Application

There following sections describe possible options to launch the system from an external system.

Launching Control Central Using an ActiveX Navigator

Oracle Public Sector Revenue Management provides an ActiveX component **CDxCTI.CDxNavigator** that external applications, such an IVR application, can use to launch Control Central for a given account number or phone number.

NOTE:
Enable ActiveX. In order to use the navigator, you must *configure your browser to enable ActiveX*.

The CDxNavigator object exposes two methods:

- **ContralCentralByAccountId** invokes Control Central for a given account ID.
- **ControlCentralByPhone** invokes Control Central for a given phone number.

Method: ControlCentralByAccount

Input:

- **Server URL:** The Oracle Public Sector Revenue Management server URL, for example http://spl-server
- **AccountId:** The account ID to search for.

VB Example: Navigate to Control Central Using an Account ID

```
Dim nav As New CDxTAPI.CDxNavigator
nav.ControlCentralByAccountId ("http://spl-server:1000", AccountID)
```

Web Page Example: Navigate to Control Central Using an Account ID

```
Dim nav As New ActiveXObject("CDxTAPI.CDxNavigator");
nav.ControlCentralByAccountId ("http://spl-server:1000", AccountID)
```

Method: ControlCentralByPhone

Input:

- **Server URL:** The Oracle Public Sector Revenue Management server URL, for example http://spl-server
- **PhoneNumber**: The phone number of the person to search for

- **PhoneFormat:** The format in which the phone number is provided

VB Example: Navigate to Control Central Using a Phone Number

```
Dim nav As New CDxTAPI.CDxNavigator
nav.ControlCentralByPhone ("http://spl-server:1000", "(415) 357-5423", "(999) 999-9999")
```

Web Page Example: Navigate to Control Central Using a Phone Number

```
Dim nav As New ActiveXObject("CDxTAPI.CDxNavigator");
nav.ControlCentralByPhone ("http://spl-server:1000", "(415) 357-5423", "(999) 999-9999");
```

Main Processing

The ActiveX component performs the following:

- Locate the first Internet Explorer instance running Public Sector Revenue Management.
- If an Internet Explorer session is found, use ActiveX automation to navigate to Control Central. Depending on the search type (account or phone), enter the appropriate values in the Control Central page and launch the search.
- If an Internet Explorer session cannot be found, launch Internet Explorer and go directly to Control Central.

Navigation Sample Provided with the System

An HTML page has been provided to demonstrate the integration. This sample may be found in the following location on your Oracle Public Sector Revenue Management server: /ci/cti/CTISample.HTM.

- Start an Internet Explorer session.
- Navigate to URL above.
- Select an account ID or phone number and click **Navigate**.

NOTE:
Sample Data. The accounts and phone numbers included in the sample HTML file correspond to accounts and phone numbers that exist in the demo database.

- A new session is started if one is not already active and Control Central is launched with the account corresponding to the selected account or phone number.

This sample program is provided to illustrate to implementers how to integrate their CTI-IVR system with Oracle Public Sector Revenue Management.

Launching The Application Using a URL

You may also launch the application using a URL. With this option you can set the system to launch a script upon startup. You can also indicate to the system to automatically load an appropriate page (if this information is not part of the script).

FASTPATH:
Refer to *Launching A Script When Starting The System* for further information.

Initiating an External Call

This section describes the automated dialer functionality provided with the system as well as information about integrating with your own automated dialer.

Overview of Automated Dialer

In order to initiate a call to a taxpayer from within the system, a context menu item **Go To Automated Dialer** is available on the Person context menu. To call a taxpayer displayed in the current context, choose this option from the person context menu and a window appears, showing a list of phone numbers defined for that person.

Select the desired phone number and click **Dial**.

> **NOTE:**
> **Context Entry Secured**. The *navigation key* for this window **automatedDialer** refers to an application service to facilitate application security. If your installation does not support an integration with external dialer software, configure the security settings to ensure that users do not have access to the application service for this context entry.

Technical Implementation of Automated Dialer

The popup window is implemented as a JSP page, which calls the JSP page ext_cti_dialer.jsp to integrate with an automated dialer. The ext_cti_dialer.jsp page provided with the system integrates to the Microsoft Phone Dialer, available on any Windows 2000 workstation.

The Microsoft Phone Dialer is invoked through the CDxPhoneDialer ActiveX object.

```
************************************************************************
* Invoke an external phone Dialer
* In the sample provided we launch the Microsoft phone Dialer
************************************************************************
*/
function callDialer(phoneNumber){
CDxPhoneDialer.makeCall(phoneNumber);
}
```

Object: CDxPhoneDialer

This object is used to call the Microsoft Phone Dialer for an outbound call. It is only used when your implementation uses the Microsoft standard dialer.

Method: makeCall

Input: Phone Number

Micorsoft Phone Dialer Configuration

If your implementation chooses to use the functionality provided with the system and integrate with Microsoft Phone Dialer, you must copy the JSP page ext_cti_dialer.jsp from the /cm_templates directory found under the web application root directory on your Oracle Enterprise Taxation and Policy Management server to the /cm directory.

> **NOTE:**
> **Enable ActiveX**. In order to use the integration with the Microsoft Phone Dialer, you must *configure your browser to enable ActiveX*.

Customize Integration to Your Automated Dialer Software

In order to integrate with a different automated dialer software application, your implementers must modify the ext_cti_dialer.jsp to call the appropriate dialer.

- Copy the JSP page ext_cti_dialer.jsp from the /cm_templates directory found under the web application root directory on your Oracle Public Sector Revenue Management server to the /cm directory.
- Make the appropriate changes to the copy of ext_cti_dialer.jsp in the /cm directory to integrate with your automated dialer.

Customize Automated Dialer User Interface

- Your implementation may choose to display a different user interface for the **Go To Automated Dialer** function than the one provided with the system. For example, perhaps there is more information that you would like to display in addition to the person's name and phone numbers. In order to do this, perform the following steps:
- Create your customized component to provide the desired functionality.
- Create a navigation key for your new component and indicate the URL being overridden. The remainder of the section walks you through these steps.

Go to **Admin, Navigation Key +**.

For **Navigation Key,** specify a name for the new navigation key prefixed with CM.

For **URL Location**, select **External (Override)** to override a base navigation key.

When you select **External (Override)**, the **Overridden Navigation Key** becomes available. Select the **automatedDialer** navigation key because that is the key you are overriding.

The **URL Override** is the path on the Web server to your custom component.

When overriding a navigation key, you must flush the system login cache on the Web server. The navigation keys are stored in the system login cache, so the overrides do not become effective until the cache is flushed. To flush the cache, issue the following command in your browser's address bar: **http://server:port/flushSystemLoginInfo.jsp**, where server is the name or address of your web server and port is the port number of the application, for example, **http://CD-Implementation:7500/flushSystemLoginInfo.jsp**.

FASTPATH:
Refer to the *Defining Navigation Keys* for more information.

Receiving the Next Caller in the Queue

If your CTI-IVR system allows users to request the next caller waiting in a queue, the system provides a mechanism to integrate with this functionality.

A BPA script **C1-GetNxtClr** is provided and can be used to request the next call waiting in an inbound queue managed by a CTI application. Your implementation may choose to configure a menu entry for this BPA script or may recommend that appropriate users configure this BPA script as a "favorite" script and enable the Favorite Scripts dashboard zone.

When the BPA is invoked, it launches a browser script function called **launchCTI** located in a file called **ext_cti.jsp**. The **launchCTI** function calls a function called **ctiGetNextCaller** to retrieve the next caller's account ID and uses the **CDxNavigator** object to launch Control Central for that account.

Customize Integration to Your Next Caller Function

The ext_cti.jsp file shipped with the base product provides sample functionality that should be replaced with the appropriate integration to your CTI application. In the sample provided, the **ctiGetNextCaller** randomly takes an account ID from a predefined list of accounts.

In order to integrate the next caller functionality with your CTI-IVR system, perform the following steps:

- Copy the JSP page ext_cti.jsp from the /cm_templates directory found under the web application root directory on your Oracle Enterprise Taxation and Policy Management server to the /cm directory.
- In the /cm directory, replace the contents of the **ctiGetNextCaller** function to retrieve the next caller ID from your CTI application.

ActiveX Component - CDxCTI

The system provides an ActiveX component **CDxCTI** that contains all the functionality required for inbound and outbound calling. It contains two objects:

- CDxNavigator
- CdxPhoneDialer

Configuring Your Browser to Enable ActiveX

In order to use the automated phone dialer functionality or the next caller functionality, your users must configure their browser to enable ActiveX. Perform the following steps:

- In your Internet Explorer browser window, navigate to **Tools**, **Internet Options** and go to the **Security** tab. From there, select **Local Intranet**.
- Click **Custom Level**.
- Under the ActiveX controls and plug-ins section, set the following:
- Download signed ActiveX controls: **Prompt**
- Download unsigned ActiveX controls: **Disable**
- Initialize and script ActiveX controls not marked as safe: **Disable**
- Run ActiveX controls and plug-ins: **Enable**

Installing the CDxCTI ActiveX Component

The CDxCTI ActiveX components install automatically the first time the Automated Phone Dialer is launched or when the CTISample.htm is launched. The CDxCTI component is signed using Microsoft Authenticode technology, therefore when it is downloaded the first time, a dialog will appear describing the source of the component and asking the user to accept the installation of the component on the local machine.

Creating an Instance of the CDxCTI Object in a Web Page

To use the CDxCTI objects from a web page, declare them explicitly using the OBJECT tag:

```
<OBJECT ID="CDxPhoneDialer"
CLASSID="CLSID:151A6E91-8C55-4666-BFFB-9EC345583CBD"
CODEBASE="CDxCTI.CAB#version=1,5,0,8">
</OBJECT>
```

```
<OBJECT ID="CDxNavigator"
CLASSID="CLSID:E7EF882D-662A-4451-A78C-CD62393F06C6"
CODEBASE="CDxCTI.CAB#version=1,5,0,8">
</OBJECT>
```

Alternatively, use the new ActiveXObject function

```
var nav = new ActiveXObject("CDxCTI.CDxNavigator");
```

```
var nav = new ActiveXObject("CDxCTI.PhoneDialer");
```

Configuration Migration Assistant Addendum

The Configuration Migration Assistant (CMA) provides customers with a flexible, extensible facility for migrating their configuration data from one environment to another e.g., from a production environment to a test 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.

This addendum describes how the Configuration Migration Assistant can be used with Oracle Public Sector Revenue Management.

Read and review the *Configuration Migration Assistant* chapter in the Oracle Utilities Application Framework Administration Guide before attempting to use this functionality.

At a high level, migrating data involves the following steps:

- Configuration:
  - Identify or create *Migration Plans* that each define a maintenance object to migrate and includes sub instructions to identify related objects. The product supplies migration plans for most administrative maintenance objects that may be used. Or implementations may develop their own.
  - Identify or create an appropriate *Migration Request*, which defines the migration plans to include in a given export. Specific selection criteria may be used when configuring the migration plans to limit the data that is included in the request.
- Export the data set. Use the *Migration Data Set Export* object to facilitate the export a specified migration request.
- The resulting file written to the export directory needs to be copied to the appropriate import directory.
- Import the data in the target region.
  - Use a *Migration Data Set Import* object to facilitate importing the data.
  - Review the changes detected by the import and compare process.
  - Apply approved changes.

The topics in this section describe specific information about migration plans and migration requests provided by the product.

Overview

To export data, there must be a migration request that references one or more migration plans. The migration plan is a set of instructions that defines the structure of an object to be exported. It may also contain instructions for foreign keys related to the object.

The definition of the migration plan for a given object and the instructions to include depend a little bit on the type of migration request that it will be included in. It also depends on whether or not the foreign key is a physical column in the object or if it is captured in the BO Data Area (CLOB) or as a flattened characteristic. The instructions for foreign keys serve two purposes:

- **Copy Related Data**. The instructions serves as an indication to the CMA tool that the related object represented by that foreign key should also be copied. For example, a migration plan for Tax Type may have an instruction for its Revenue Calendar. If the Tax Type migration plan is included in a migration request but the Revenue Calendar migration pan is not, the revenue calendars related to the migrated tax types will also be migrated. This is true whether the foreign key is linked as a real column or defined in the BO Data Area for one of the business objects for the migration plan's maintenance object.
- **Group Related Data**. For a migration request that includes a list of migration plans for different objects, the instructions help the CMA tool to group together objects in a logical 'transaction' for importing. For example, imagine the migration plan for Person Type contains an instruction for its default Identifier Type. If a migration request includes the migration plans for both Person Type and Identifier Type, the CMA tool will export all Person Types and Identifier Types. In addition because of the instruction on Person Type indicating that there is a relationship between person type and identifier type, the CMA tool will ensure that any Identifier Type defined on a Person Type will be grouped for import with its related person type. The result is that at import time the Identifier Type is added before the Person Type preventing any foreign key validation issues.

  NOTE: The CMA tool does not require instructions for "real" columns to be able to group related data. This is because the tool can use the table / FK constraints to determine the dependencies. So for the examples above, if it

is known that the Tax Type and Revenue Calendar migration plans will always be included in the same Migration Request and that the selection criteria for each plan will be “select all records”, it is not necessary to define a sub-instruction in the Tax Type migration plan referencing Revenue Calendar. In this case, the CMA tool will select all tax types and all revenue calendars. Then it will use the constraints to understand relationships and will group any revenue calendar that is referenced by a tax type in the same transaction as the tax type.

Configuration migration assistant may be used for two broad types of data migration:

- **Wholesale migrations**. This is where an implementation is trying to “copy all” administrative data from one environment to another. For example, if trying to set up a test region that mirrors production in order to recreate a bug. Another example is to “promote” configuration changes from a test region to production after testing the new configuration. In these types of migrations, the migration plans for objects that include foreign key data in the BO Data Area, it is beneficial to have sub-instructions for all foreign keys. This will allow CMA to correctly group related data.
- **Piecemeal migrations**. This type of migration is more targeted and would only copy a subset of maintenance objects or a subset of data within a given set of maintenance objects. Some examples:
  - A set of new form types for the coming year are defined and their data should be copied to a test region.
  - The new dates for all the revenue calendars have been added for the coming year and should be copied to production.
  - A new calculation control is introduced with the changes for the coming year’s property tax calculation rules and should be copied to a test region.

  For these types of migrations, it is beneficial to only include sub-instructions for the foreign keys that need to be included. For example, in the case of a new form type, if it is for an existing obligation type, there is no need to copy the obligation type and all the data that is related to that. Ideally, the migration should only copy the data that is expected to be new or changed as a result of the new form type.

Migration Plans

As described in the previous section, the drivers for which instructions to include in a migration plan differ a bit based on whether the migration plan will be included in a wholesale or a piecemeal migration request. The decision for the base product migration plans was to not provide multiple migration plans for various objects (one for wholesale migrations and one for piecemeal migrations). Rather, the base product provided migration plans supports a reasonable piecemeal migration. In general, sub-instructions are not provided for the foreign keys where there is a reasonable assumption that the data already exists in the target region. For example, the migration plan for any record that has a foreign key to Tax Type will not include a sub-instruction for tax type given that tax type is considered a type of “parent” configuration object that would be copied on its own to a region and not as part of the migration of a lower level entity.

NOTE: Potential issues in wholesale migrations. Because not all foreign key references that are part of base business objects in the BO Data Area are defined in the migration plans, it means that CMA will not know about the relationship between the record and its foreign key and will not know to group the data together. This could cause some “foreign key not found” errors on the import side. Users importing the data will then need to manage resolving the order of insertion of the new records in the target region.

To see the migration plans provided with the base product, navigate to **Admin** > **Migration Plan** and view the data that is provided there.

The following points highlight some information about the base administrative objects and their migration plans.

- A small number of administrative maintenance objects include a Log table. Those MOs have been configured to not migrate the log entries (using the **Non-Migrated Table** MO option).
- The Form Change Reason maintenance objects has been configured to not migrate its related form types (using the **Non-Migrated Table** MO option).

- The following objects do not have their own migration plans but rather are included as a sub-instruction in a related object's migration plan:
  - Adjustment Type Extension (part of the adjustment type migration plan)
  - Form Section (part of the form type migration plan)
  - Form Line (part of the form type migration plan)
  - Letter Template (part of the customer contact type migration plan)
  - Revenue Period (part of the revenue calendar migration plan)
- Tender source includes an optional reference to a suspense Obligation ID. CMA cannot copy master and transaction data. As a result, the base migration plan includes an import algorithm to not copy the Obligation ID from the source when adding or updating a tender source in the target region. Note that when the tender source already exists in the target region and has a reference to a valid Obligation ID from the target region, any updates to the tender source via CMA will not change the Obligation ID.
- Master configuration, service task type and extendable lookup are Framework owned objects, however special migration plans are provided in the base product to define foreign key references in the BO Data Area for some of the base business objects.
- Migration plans were not provided for any functionality that is considered "legacy" functionality and therefore not recommended to use going forward for new installations. For example, administrative data related to classic billing, legacy address, case type or DB processes are not provided.
- A migration plan is not provided for Activity Type. If an implementation uses this object and wishes to include it in a migration, a custom migration plan is needed.
- A migration plan is not provided for Collection Agency. This object comprises of a code, description and Person ID (to represent the agency). Because CMA cannot copy master or transaction data, and Person ID is a required field, this object cannot be copied. An implementation must manually create collection agency records in the target region.

Refer to the detailed descriptions of the base migration plans for more information.

NOTE: Base package migration plans cannot be altered. To extend an existing base package migration plan, the base package plan must be duplicated and then altered as needed. The duplicate migration plan can then be added to a custom migration request.

Migration Requests

The product provides out of the box migration requests. To see the migration requests provided with the base product, navigate to **Admin** > **Migration Request** and view the data that is provided there. The following sections provide general information about the base provided migration requests.

Wholesale Migration

In order to do a full "copy all administrative data" migration, several migration requests are needed. The separate migration requests are used to minimize the dependencies that would be found when trying to copy all data in one request. The following are the recommended migration requests to export / import:

1. **F1–Languages**. Use this migration request to copy languages. Note that this is not necessary if the environments use only the ENG (English) language because this language is included as part of the product installation. It may also be simpler to go to the target region and define the languages manually assuming there are not very many languages supported. Note however that all languages defined in the source region must be defined in the target region if administrative data that will be copied includes language rows for that language.
2. **F1–SchemaAdmin**. This migration request copies the objects that are part of the building blocks of a schema.

3. **C1-FWOwnedAndCoreBaseAdmin**. This migration plan copies the remaining framework owned migration objects not already copied in previous migration requests along with base owned migration plans that are considered “core” and would have a lot of other objects that reference them. Note the following with respect to this migration request:
   - There are several configuration tool objects where only records with a CM owner flag are included in the migration. However for other configuration tool objects, all records are included to cater for the fact that the objects may have customizable columns or CM owned collection entries. The CMA tool will know to only update the CMable portions of base owned objects.
   - The migration request includes Rate Schedule, but it does not include RQ Rule. As a result, it specifically doesn’t include any rate schedules that reference an RQ rule.
4. **C1-BaseAdmin**. This migration request includes the remaining administrative tables. Note the following with respect to this migration request:
   - The Form Types copied as part of the request are only those in the status of **PENDING**, **GENERATED** or **ACTIVE**.
   - The base owned Master Configuration migration plan is included here. However, it specifically does not copy the SEPA Master Configuration record because that record references master data such as a Person and Address. If your implementation uses the SEPA Master Configuration, it must be defined manually in the target region.
   - The entries for Rate Version and Rate Components specifically do not include records related to a rate schedule that references an RQ rule.

Piecemeal Migration

The base product provides a migration request to help orchestrate a targeted copy of Form Data. The **C1–FormData** migration request includes all administrative objects related to managing form data. An implementation may use the migration request as is to copy all form data from one region to another. Otherwise, it can use this migration request as a template for creating custom migration requests that may include specific selection criteria.

Also note that the **C1–FormType** migration plan has sophisticated instructions so that it may be used in a special migration request to copy one or more form types and their related data. The product has not provided a migration request for this migration plan because the selection criteria would differ for each migration. To create a specific migration request for one or more form types, follow these steps:

1. Navigate using

   Admin Menu > **Migration Request** in Add mode.
2. Define an appropriate Migration Request code and Description.
3. Define the **C1–FormType** migration plan.

   Use the Selection Type to define a **Specific Key** when attempting to migrate one or more form types and their data by listing the form type codes. Or use a Selection Type of **SQL Statement** if there are multiple form types to select and the selection should be by something other than the code (such as all the form types for a given tax type or all form types effective on or after a given date).
4. Save the record and proceed to the export and import steps.

The Conversion Process

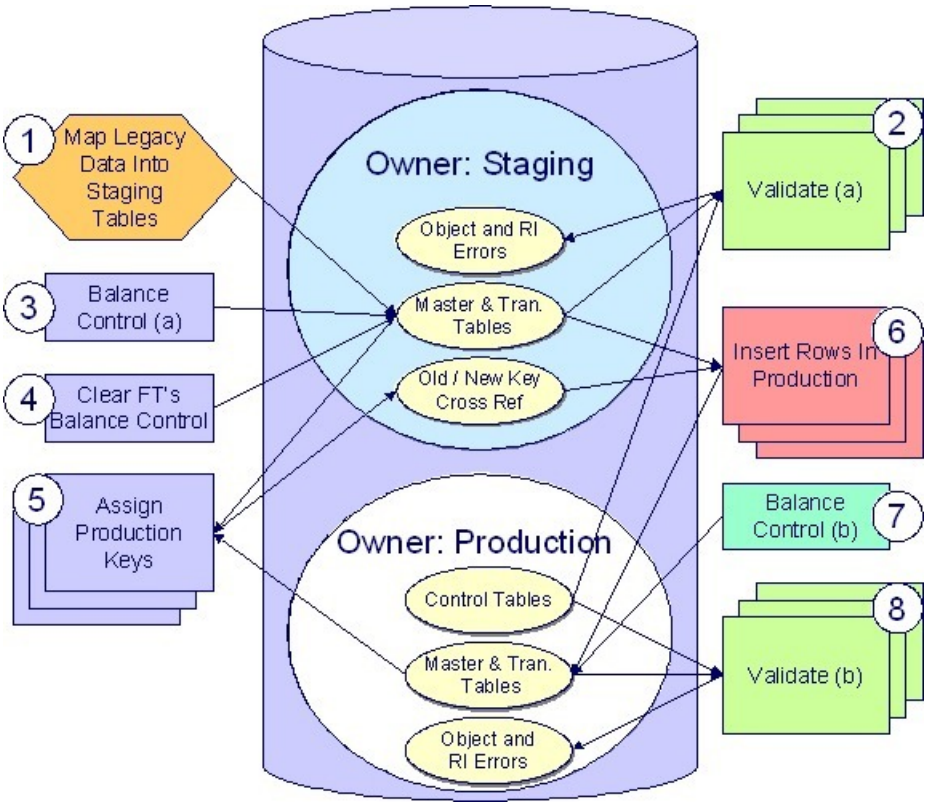
This document describes the Oracle Public Sector Revenue Management conversion process.

Introduction

When you're ready to convert data from your legacy system into Oracle Public Sector Revenue Management, you will have analyzed your requirements according to your business and organizational needs and set up the control tables accordingly.

FASTPATH: Refer to the **Administration Guide** for a complete discussion of the various control tables and the order in which they must be set up.

After the control tables are set up, you are ready to load data into the system from your legacy system. This conversion effort involves several steps as illustrated in the following diagram:



The following points briefly outline each of the above tasks:

- **Map Legacy Data Into Staging.** During this step, your legacy master data (e.g., account, person and tax role) and transaction data (e.g., adjustment, tax forms) is migrated 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. Refer to *Appendix B - Multiple Owners In A Single Database* for information about table ownership.

  CAUTION: Different Databases For Staging and Production. The above diagram illustrates how the system is configured to support the conversion effort in the standard installation, i.e., the staging tables are in the same database as the production tables (each with a different owner). However, it is possible for the staging tables to be in a separate database. This option requires additional effort on your part (because you would have to copy the control tables from production into your staging database). Please refer to *Appendix B - Multiple Owners In A Single Database* for information about this alternative.

  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 (a).** During the validation (a) step, the system validates the data you loaded into the staging tables. Two types of validation programs exist:
  - **Object Validation Programs.** Each of the system's master data objects (e.g., person, account, location, etc.) is validated using the same logic that is used to validate data added by users in your production system.
  - **Referential Integrity Validation Programs.** After you have successfully validated the master data objects, the referential integrity validation programs are executed to validate transaction data and to highlight "orphaned" rows. These programs check the validity of the foreign keys on all rows on all tables.

    NOTE: Control tables from production. It's important to notice that the validation programs validate your staging data using the control tables that have been set up in production. Refer to *Appendix B - Multiple Owners In A Single Database* for a description of how this works.

- **Balance Control (a).** During this step, you run the balance control program and then verify that the balances that it generates are consistent with the balances in your legacy system.
- **Clear FT's Balance Control.** In the previous step, the system creates a balance control and links it to the FT's. If the balance control's balances are consistent with the amount of receivables being transferred into the system, you should run the Clear FT's Balance Control program. This program simply resets the Balance Control column on the FT so that the FT's can be included in a balance control (see the last step below) after they have been transferred to production.
- **Assign Production Keys.** During this step, the system allocates random, clustered keys to the rows in the staging database.
- **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 are reassigned using the data populated in the previous step.
- **Balance Control (b).** During this step, you run the balance control program against production. You do this to verify the balances in production are consistent with the values of receivables converted from your legacy application.
- **Validate (b).** During this step, you rerun the object validation programs, but this time against production. We recommend rerunning these programs to confirm that the insertion programs have executed successfully. We recommend running these programs 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 programs in full validation mode (to validate every object).

Conversion Process Steps

The following sections provide more details about the steps in the conversion process.

Map Legacy Data Into Staging Tables

This section provides some high level discussion about mapping legacy data to the system's staging tables. Refer to *The Staging Tables* for details about the staging tables in the system.

NOTE: Recommendation. You can use any method you prefer to load Oracle Public Sector Revenue Management 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.

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 account ID is allocated, the key assignment program checks the account key table to see if it exists.
- Key tables only have two columns: 1) The key of the object and 2) 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 name of every table's key table is defined under the Generated Keys column in the Table Names sections in *The Staging Tables*
- 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_TAX_ROLE 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 number. A later process, *Allocate Production Keys*, will allocate random, system-assigned keys prior to production being populated.

Validate Information In The Staging Tables

During the first validation step, the system validates the data you loaded into the staging tables. Two types of validation programs exist:

- **Object Validation Programs.** The object validation programs validate each of the system's master data objects (e.g., person, account, etc.) and a limited number of transaction data objects. Please note that these programs call the same programs that are used to validate data added by users in your production system.
- **Referential Integrity Validation Programs.** After the master data objects have been validated, the referential integrity validation programs are executed to validate transaction data and to highlight "orphaned" rows. These programs simply check the validity of the foreign keys on all rows on all tables.

The topics in this section describe how to execute the validation programs.

Object Validation Programs

Each of the objects described under *Master Data* must be validated using the respective object validation program indicated in its Table Names section.

In a limited number of cases object validation is available for *Transaction Data* objects, where customers may convert transaction data that is still pending. For the same objects you may also be converting historic records. You may not want to perform validation on completed records. To support this, some background processes provided for transaction data allow you to limit the validation to records in a given status.

We strongly recommend validating each object in the following steps:

- Execute each object's validation program in random-sample mode to highlight pervasive errors. When you execute a validation in random-sample mode, you are actually telling it to validate every X records (where X is a parameter that you supply to the job). Refer to *Submitting Object Validation Programs* for more information about the parameters supplied to these background processes.
- You can view errors highlighted by validation programs using the *Validation Error Summary* transaction.
- Correct the errors using SQL. 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 program in all-instances mode to highlight elusive, one-off errors. Refer to *Submitting Object Validation Programs* for more information about the parameters supplied to these background processes.

CAUTION: Take note! Whenever an object validation program is run, it is necessary to delete all previously recorded errors associated with its tables from the validation error table before it inserts new errors.

After the various object validation programs run cleanly, run the referential integrity validation programs as described in the next section.

Submitting Object Validation Programs

The object validation programs that are described in the *staging tables* table names matrices are classic background processes as they can also be run against production data. You submit these processes in the same way you submit any background process in production.

Referential Integrity Validation Programs

It's important to understand that only master data objects (e.g., persons, accounts, assets, locations, etc.) are validated by the object validation programs discussed above. This means that only master data objects will have their foreign keys checked for validity by the object validation programs. You must run the referential integrity programs to validate all other data.

The referential integrity validation programs highlight:

- Orphaned rows because orphan rows, by definition, don't reference an object.
- Invalid foreign keys on transaction data.

NOTE: Validating Transaction Data. You may wonder why transaction data is not subject to the object validation routines. This is because: a) the production system only needs validation logic for master data because transaction data is not entered by users, and b) most conversions necessitate loading skeletal transaction data because the legacy system typically doesn't contain enough information to create accurate transactions in the system.

Each of the tables described under *Transaction Data* must be validated using the respective referential integrity validation program indicated in its Table Names section. We strongly recommend validating each table in the following steps:

- Execute each table's referential integrity validation program. Refer to *Submitting Referential Integrity Validation Programs* for more information about the parameters supplied to these background processes.
- You can view errors highlighted by this process using the *FK Validation Summary* transaction.
- Correct the errors using SQL (you cannot use the application to correct these types of errors).
- Rerun the referential integrity programs until no errors are produced.

CAUTION: Whenever you run a referential integrity validation program, it deletes all errors associated with its table from the referential integrity error table.

In order to highlight orphaned rows in the master data, run the referential integrity validation programs against all tables described under *Master Data* using the procedure described above.

Submitting Referential Integrity Validation Programs

The referential integrity validation programs described under *Master Data* and *Transaction Data* (in the Table Names matrices) are submitted using a batch driver program, **CIPVRNVB**, and this program is executed in the staging database. Please note that the referential integrity validation programs may also be run in the production environment on occasion, to determine the integrity of data in the production database.

You should supply the following parameters to this program:

- **Batch code.** The batch code associated with the appropriate table's referential integrity validation program. Refer to each table listed under *Master Data* and *Transaction Data* (in the Table Names matrices) for each referential integrity batch code / program.
- **Batch thread number.** Thread number is not used and should be left blank.
- **Batch thread count.** Thread count is not used and should be left blank.
- **Batch rerun number.** Rerun number is not used and should be left blank.
- **Batch business date.** Business date is the date supplied to the referential integrity validation programs and the date under which statistics will be logged.
- **Total number of commits.** Total number of commits is not used and should be left blank.
- **Maximum minutes between cursor re-initiation**. Maximum minutes between cursor re-initiation is not used and should be left blank.
- **User ID.** User ID is only used to log statistics for the execution of the batch job.
- **Password.** Password is not 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 at start** (Y/N), **trace program exit** (Y/N), **trace SQL** (Y/N) and **output trace** (Y/N). These switches are only used during QA and benchmarking. If trace program start is set to Y, a message is displayed whenever a program is started. If trace program at exist is set to Y, a message is displayed whenever a program is exited. If trace SQL is set to Y, a message is displayed whenever an SQL statement is executed.

Recommendations To Speed Up Validation Programs

The following points describe ways to accelerate the execution of the validation programs:

- Gather Schema statistics using the DBMS_STATS PL/SQL package after data has been inserted into the staging tables. Collecting statistics at the schema level is more efficient than object by object. Be sure to specify the ‘degree’ parameter to enforce parallel statistics collection.
- *Object validation programs* should be run 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.
- *Referential integrity validation programs* run fairly quickly without much tuning. However, additional benefits are gained by running several programs at the same time. Monitor system resources (CPU, RAM, IO) to fine tune how many jobs can be run simultaneously.
- Remember that the *object validation programs* can be run in "validate every n^{th} row". We recommend running these programs using a relatively large value for this parameter until the pervasive problems have been rectified.

Balance Control (a)

During this step, you run the balance control programs and then verify that the balances that it generates are consistent with the balances in your legacy system.

NOTE: Submitting this process. You submit this process in the staging database. Refer to *The Big Picture of Balance Control* for more information about the balance control processes. Refer to *Balance Control* for information about the page used to view the balances generated by this process.

Clear FT Balance Control

In the previous step, the system created a balance control and links it to the FT's. If the balance control's balances are consistent with the amount of receivables being transferred into the system, you should run the Clear FT's Balance Control program. This program simply resets the Balance Control column on the FT so that the FT's can be included in a balance control (see the last step below) after they have been transferred to production. Note: the batch control ID of **CNV-BCG** is used to request this process.

NOTE: Submitting this process. You submit this process in the staging database. For a detailed description of this batch control and its parameters, refer to the Batch Control page in the application or view this batch control in the application viewer.

Allocate Production Keys

The topics in this section describe the background processes used to assign production keys to the staging data.

The Big Picture of Key Assignment

It's important to understand that the system does not overwrite the prime-keys or foreign 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 old key / new key tables are named the same as their primary table, but rather than being prefixed by "CI", they are prefixed by "CK". For example, the old key / new key table for CI_ACCT is called CK_ACCT.

The insertion programs that transfer 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. Note that the capability of assigning the new key to a foreign key applies to

- "True" foreign keys, i.e. where the key is a column in another table. For example, CI_TAX_ROLE has a column for ACCT_ID.
- FK reference characteristics. These are characteristics that define, through an FK reference, the table and the key that this characteristic represents.

The insertion programs are not able to assign "new keys" to foreign keys defined in an XML structure field (CLOB).

The key assignment programs listed under *Master Data* and *Transaction Data* (in the table names sections) are responsible for populating the old key / new key tables (i.e., you don't have to populate these tables). Because the population of the rows in these tables is IO intensive, we have supplied detailed instructions that will accelerate the execution time of these programs.

NOTE: Why are keys reassigned? 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).

NOTE: Iterative conversions. Rather than perform a "big bang" conversion (one where all taxpayers are populated at once), some implementations have the opportunity to go live on subsets of their taxpayer 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 taxpayers, you can be assured of getting clean keys. Note that iterative conversions of tax types for existing taxpayers is not currently supported.

NOTE: Optional Foreign Keys. One responsibility of the key allocation programs is to generate a single "zero" entry in its key table to represent a blank foreign key. This step is required by the subsequent Insert programs so that they may correctly insert new rows where optional foreign keys are blank. For example, the CI_FT table has a foreign key to BILL_ID. Conversion for classic billing is no longer supported. However, the key generation program for Bills must still be run in order to generate the entry in the CK_BILL table for the "zero" row. This is needed by the FT Insertion program. The details of which Key Generation programs are required for successful run of a given insert program are detailed in each staging table section.

NOTE: Program Dependencies. The programs used to assign production keys are listed in the Table Names matrices. Most of these programs have no dependencies (i.e., they can be executed in any order you please). The exceptions to this statement are noted in *Program Dependencies*.

Submitting Key Assignment Programs

The key assignment programs described under *Master Data* and *Transaction Data* (in the Table Names matrices) are submitted using a batch driver program, **CIPVRNKB**, and this program is executed in the staging database. You should supply the following parameters to this program:

- **Batch code.** The batch code associated with the appropriate table's key assignment program. Refer to each table listed under *Master Data* and *Transaction Data* (in the Table Names matrices) for each key assignment batch code / program.
- **Batch thread number.** Thread number is not used and should be left blank.
- **Batch thread count.** Thread count is not used and should be left blank.
- **Batch rerun number.** Rerun number is not used and should be left blank.
- **Batch business date.** Business date is the date supplied to the key assignment programs and the date under which statistics will be logged.
- **Total number of commits.** Total number of commits is not used and should be left blank.
- **Maximum minutes between cursor re-initiation**. Maximum minutes between cursor re-initiation is not used and should be left blank.
- **User ID.** User ID is only used to log statistics for the execution of the batch job.
- **Password.** Password is not 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 at start** (Y/N), **trace program exit** (Y/N), **trace SQL** (Y/N) and **output trace** (Y/N). These switches are only used during QA and benchmarking. If trace program start is set to Y, a message is displayed whenever a program is started. If trace program at exist is set to Y, a message is displayed whenever a program is exited. If trace SQL is set to Y, a message is displayed whenever an SQL statement is executed.

- **Mode.** The proper use of this parameter will greatly speed up the key assignment step as described under *Recommendations To Speed Up Key Generation*. This parameter has three values:
  - If you supply a mode with a value of **I** (initial key generation), the system allocates new keys to the rows in the staging tables (i.e., it populate the respective old key / new key table).
  - If you supply a mode with a value of **D** (resolve duplicate keys), the system reassigns keys that are duplicates.
  - If you supply a mode with a value of **B** (both generate keys and resolve duplicates), the system performs both of the above steps. This is the default value if this parameter is not supplied.
  - Please see *Recommendations To Speed Up Key Generation* for how to use this parameter to speed up the execution of these processes.

    NOTE: Parallel Key Generation. Note well, no key generation program should be run (either in mode**I** or **B**) while another program is being run unless that program is in the same tier (see *Program Dependencies* for a description of the tiers).

- **Start Row Number.** This parameter is only used if you are performing conversions where data already exists in the tables in the production database (subsequent conversions). In an Oracle database the key assignment routines create the initial values of keys by manipulation of the Oracle 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 purpose of this parameter is to increase the value of row number by the given value, and minimize the chance of duplicate key assignment.

Recommendations To Speed Up Key Generation Programs

The following points describe ways to accelerate the execution of the key generation programs.

NOTE: Naming convention. The convention "CK_<table_name>" is used to denote the old key / new key tables described under *The Big Picture of Key Assignment*.

- Gather table statistics after each key generation program runs and before running key generation programs for the next level. Table key generation is performed in tiers or steps because of the inheritance dependency between some tables and their keys. Although key generation for the 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.
- Key generation programs are single threaded and use set-based SQL. Consider running key generation jobs from the same level (see *Program Dependencies*) in parallel. Monitor system resources (CPU, RAM, IO) to fine tune how many jobs can be run simultaneously
- Optimal use of the **Mode** parameter under *Submitting Key Assignment Programs*.
  - Before any key assignments, drop both the “old key” CX_ID index and the “new key” CI_ID index on the CK_<table_name> tables. Make sure you save the index DDLs before dropping the indexes. You can use the script provided in *Appendix D* to save the index DDLs. The script creates another script called ***create_ck_index.sql***, which can be used to recreate the indexes in a subsequent step.
  - Run all *key assignment tiers*, submitting each job with MODE = "I".
  - Recreate the CX_ID and CI_ID indexes on the CK_<table_name>, using the ***create_ck_index.sql*** script that was created previously. This script uses parallelism and no logging options to speed up the index creation. After the indexes are created, this script will change the parallelism to 1 and will enable the logging. Statistics should be computed for these indexes.
  - Run all key assignment tiers that were previously run in MODE = 'I', submitting each job with MODE = 'D'. This will reassign all duplicate keys.

- Do not run key generation jobs from different tiers simultaneously. It is OK to run key generation programs from the same tier in parallel. See *Program Dependencies* for a description of the tiers.

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.

The Big Picture Of Insertion Programs

All insertion programs are independent and may run concurrently. Also note, all insertion programs can be run in many parallel threads as described in the next section (in order to speed execution).

Submitting Insertion Programs

The insertion programs described under *Master Data* and *Transaction Data* (in the Table Names matrices) are submitted using a batch driver program, **CIPVRNIB**, and this program is executed in the staging database. You should supply the following parameters to this program:

- **Batch code.** The batch code associated with the appropriate table's insertion program. Refer to each table listed under *Master Data* and *Transaction Data* (in the Table Names matrices) for each insertion batch code / program.
- **Batch thread number.** Thread number contains the relative thread number of the process. For example, if you want to insert accounts into production in 20 parallel threads, each of the 20 execution instances receives its relative thread number (1 through 20). Refer to *Parallel Background Processes* for more information.
- **Batch thread count.** Thread count contains the total number of parallel threads that have been scheduled. For example, if the account insertion process has been set up to run in 20 parallel threads, each of the 20 execution instances receives a thread count of 20. Refer to *Parallel Background Processes* for more information.
- **Batch rerun number.** Rerun number is not used and should be left blank.
- **Batch business date.** Business date is the date supplied to the insertion programs and the date under which statistics will be logged.
- **Total number of commits.** This is the number of commits IN TOTAL that you want to perform. For example, if you have 1,000,000 accounts and you supply a value of **100**; then a commit will be executed for approximately every 10,000 accounts.
- **Maximum minutes between cursor re-initiation**. This should only be populated if you want to override the default value of **15**.
- **User ID.** User ID is only used to log statistics for the execution of the batch job.
- **Password.** Password is not 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 at start** (Y/N), **trace program exit** (Y/N), **trace SQL** (Y/N) and **output trace** (Y/N). These switches are only used during QA and benchmarking. If trace program start is set to Y, a message is displayed whenever a program is started. If trace program at exist is set to Y, a message is displayed whenever a program is exited. If trace SQL is set to Y, a message is displayed whenever an SQL statement is executed.

Recommendations To Speed Up Insertion Programs

The following points describe ways to accelerate the execution of the insertion programs:

- Before running the first insertion program:
  - Rebuild the index on the prime key on the old key / new key table (i.e., those tables prefixed with "CK").
  - Alter all indexes except primary key and unique indexes on the production tables being inserted into to be unusable.
  - Gather statisticson the old key/new key table(s) using the DBMS_STATS PL/SQL package.
- After the insertion programs have populated production data,
  - Rebuild the indexes on the production tables.
  - Gather statistics using the DBMS_STATS PL/SQL package after insertion programs have completed and the indexes have been rebuilt.
  - Validate the production schema to ensure that all schema changes made during conversion have been reversed properly.

Run Balance Control Against Production

During this step, you rerun the balance control program, but this time against production. You do this to verify the balances in production are consistent with the values of receivables converted from your legacy application.

NOTE: Submitting this process. You submit this process in the production database. Refer to *The Big Picture of Balance Control* for more information about the balance control processes. Refer to *Balance Control* for information about the page used to view the balances generated by this process.

Validate Production

During this step, you rerun the *object validation programs*, but this time in production. We recommend rerunning these programs to confirm that the insertion programs have executed successfully. We recommend running these programs 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 programs in full validation mode (to validate every object). Please refer to the various "Table Names" sections above for the respective names of the programs to run.

The Validation User Interface

The topics in this section describe the various pages that assist in the conversion effort.

Validation Error Summary

Navigate to **Admin** > **Validation Error Summary** to view validation errors associated with the objects defined in *Master Data*.

Description of Page

You can use **Table Name** to restrict errors to a specific object. If this field is left blank, all errors on all objects will be displayed.

The grid contains a separate row for each type of error. The following information is displayed:

- **Table Name** is the name of the main table associated with the object.
- **Message Category** and **Message Number** define the type of error. These fields are the unique identifier of the message that describes the error (the verbiage of this message is displayed in the **Message Text** column).
- **Count** contains the number of records with this error. Press the Go To button to see the individual records with the error.

Validation Error Detail

This page is used to view validation errors of a given type associated with one of the objects defined in *Master Data*. This transaction is not intended to be invoked from the **Admin** menu. Rather, drill into the validation details from *Validation Error Summary*.

Description of Page

Use **Table Name**, **Message Category**, and **Message Number** to define the object and the type of error you wish to display. The grid contains a separate row for each object with the given type of error. The following information is displayed:

- **Table Name** is the name of the main table associated with the object.
- **Record Identifier** is the unique identifier of the object with the error (e.g., the person ID, the account ID, the location ID, etc.). Press the Go To button to transfer to the maintenance page associated with the object.
- **Message Category** and **Message Number** define the type of error. These fields are the unique identifier of the message that describes the error (the verbiage of this message is displayed in the **Message Text** column).

FK Validation Summary

Navigate to **Admin** > **FK Validation Summary** to view foreign key validation errors associated with the objects defined in *Master Data*.

Description of Page

You can use **Table Name** to restrict errors to a specific object. If this field is left blank, all errors on all objects will be displayed.

The grid contains a separate row for each table and foreign key error combination.

The following information is displayed:

- **Table Name** is the name of the main table associated with the object.
- **Count** contains the number of records on this table that have this error.
- **Foreign Key Field Names 1 to 6** contain the names of the foreign keys contained on this table that have been found to be in error.
- **Foreign Key Values 1 to 6** contain the values within the foreign key fields that are found to be in error.

NOTE: Most foreign keys on a table are obvious based on the field name. For example, if the output shows Table Name **CI_ADJ**, Count **100**, Foreign Key Field Name 1 **ADJ_TYPE_CD**, and Foreign Key Value 1 **SALES_INTEREST**, you know that there are 100 records in the Adjustment table referencing an invalid Adjustment Type Code of **SALES_INTEREST**. However, some foreign keys are multi-part keys and in viewing the Foreign Key names, the table they refer to may not be obvious. If it is not clear what table a foreign key is referring to, navigate to the Table page for the table reported in the error and view the Constraints tab. All the foreign keys being checked are listed there with their respective table names.

FK Validation Detail

This page is used to view foreign key validation errors of a given type associated with one of the objects defined in *Master Data*. This transaction is not intended to be invoked from the **Admin** menu. Rather, drill into the validation details from *FK Validation Summary*.

Description of Page

Use **Table Name** to specify the table you wish to view. The names and values of the foreign key fields on the table are displayed. The grid that follows contains the primary key values of this table's records that are in error. The following information is displayed:

- **Table Name** is the name of the main table.
- **FK Fields 1 to 6** are the names of the foreign keys contained in this table. Displayed alongside the key names are the values within these fields. These identify records on other tables to which this tables record is related. For example, the CI_ACCT_CHAR record identified by its displayed primary keys should be related to an Account record with the Account ID shown - it appears in this list only if there is something amiss with this relationship.

The Staging Tables

This section describes the objects into which your legacy data is mapped. For each object, we provide the following:

- A data model.
- An indication of which tables have system-assigned keys.
- The physical table names.
- The name of the batch control to submit to validate the object.
- The name of the program (and related batch control) that validates each table for referential integrity.
- The name of the program (and related batch control) that performs key assignment for each table.
- The name of the program (and related batch control) that inserts the table's rows into production from staging.
- Suggestions to assist in the conversion process.

CAUTION: Recommendation. We recommend you read this document on a browser (or using Word under windows) so you can take advantage of the *Color Coding*.

NOTE: Column details do not appear in this document. When you're ready to examine an object's tables, use the hyperlinks in the respective Table Names section to transfer to the *data dictionary*. The data dictionary will show you the required columns, the foreign keys (and their related tables), the source code of the program that validates the contents of the table, and a host of other information that will assist the conversion process.

CAUTION: Look Up and Control Tables. In the data models that appear below, you will find a variety of entities that are classified as either a control table or a lookup table. Please refer to *Color Coding* for more information about how to recognize such an entity.

A Note About Programs in the Table Names Matrices

For each object described in the master data and transaction data sections, there is a "table names" section that includes a matrix listing the name of each table that is part of the maintenance object. Included in the matrix is information about the programs provided to perform object validation, referential integrity validation, key assignment and insertion. The following are some points about these programs:

- For maintenance objects that require *object validation*, an object validation program exists for the entire set of tables for the maintenance object. The **Object Validation Batch Control** column indicates the batch control used to submit the object validation. Refer to *Submitting Object Validation Programs* for more information. Drilling down on the hypertext allows you to see more information about the batch control, including the program associated with it.

- A separate *referential integrity batch validation* program exists for each table that requires one. As described in *Submitting Referential Integrity Validation Programs*, these programs are submitted using a driver supplied by the system where the batch code for the appropriate table is provided. (The driver then executes the program whose name matches the batch code). The **Referential Integrity Validation Batch Control** column indicates the table's batch control / program name.
- One *key assignment* program exists for the parent table for the maintenance object. As described in *Submitting Key Assignment Programs*, these programs are submitted using a driver supplied by the system where the batch code for the appropriate table is provided. (The driver then executes the program whose name matches the batch code). The **Key Assignment Batch Control** column indicates the table's batch control / program name.
- An *insertion program* exists for every table for the maintenance object. As described in *Submitting Insertion Programs*, these programs are submitted using a driver supplied by the system where the batch code for the appropriate table is provided. (The driver then executes the program whose name matches the batch code). The **Insertion Batch Control** column indicates the table's batch control / program name.

Master Data

This section describes the various "master data" objects (e.g., person, account etc.) that must be created before you can convert transaction data.

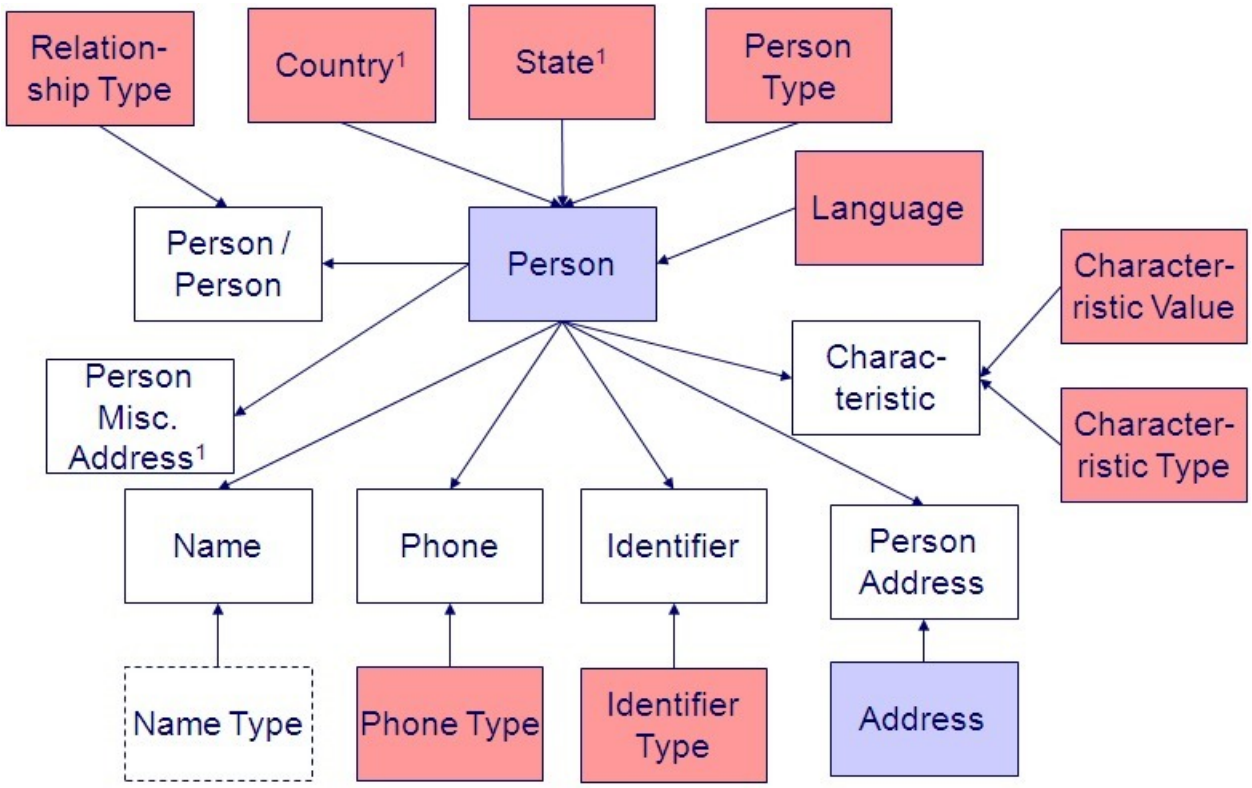
NOTE: Key Assignment Dictates The Order Of Conversion. The following topics are listed in the order in which the objects should be converted in order to maintain referential integrity.

Person

This section describes the person object.

Person Data Model

The following data model illustrates the person object.



Person Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Person	*CI_PER*	Yes *CI_PER_K*	VAL-PER		CIPVPERK	CIPVPERI
Name	*CI_PER_NAME*	No. The key is PER_ID plus a sequence number.		CIPVPNMV		CIPVPNMI
Person / Person	*CI_PER_PER*	No. The key is PER_ID1, PER_ ID2, relationship type and start date.		CIPVPPEV		CIPVPPEI
Phone	*CI_PER_PHONE*	No. The key is PER_ID plus phone type.		CIPVPPHV		CIPVPPHI
Identifier	*CI_PER_ID*	No. The key is PER_ID plus identifier type.		CIPVPIDV		CIPVPIDI
Characteristic	*CI_PER_CHAR*	No. The key is PER_ID plus an edate and a char type.		CIPVPRCV		CIPVPRCI

Address	*CI_PER_ADDR*	No. The key is PER_ID plus a sequence number.	CIPVPADV	CIPVPADI
Miscellaneous Address[1]	*CI_PER_ADDR_SEAS*	No. The key is PER_ID plus a sequence number.	CIPVPSAV	CIPVPSAI

NOTE: Note 1. Country, State and the Person Miscellaneous Addresses are only supported for legacy addresses. Refer to *Address Support* for more information.

Person Suggestions

A person must have at least one row on the name table and at least one of the names must be marked as being the primary name.

A person must have at least one row on the identity table and at least one of the identities must be marked as being the primary ID.

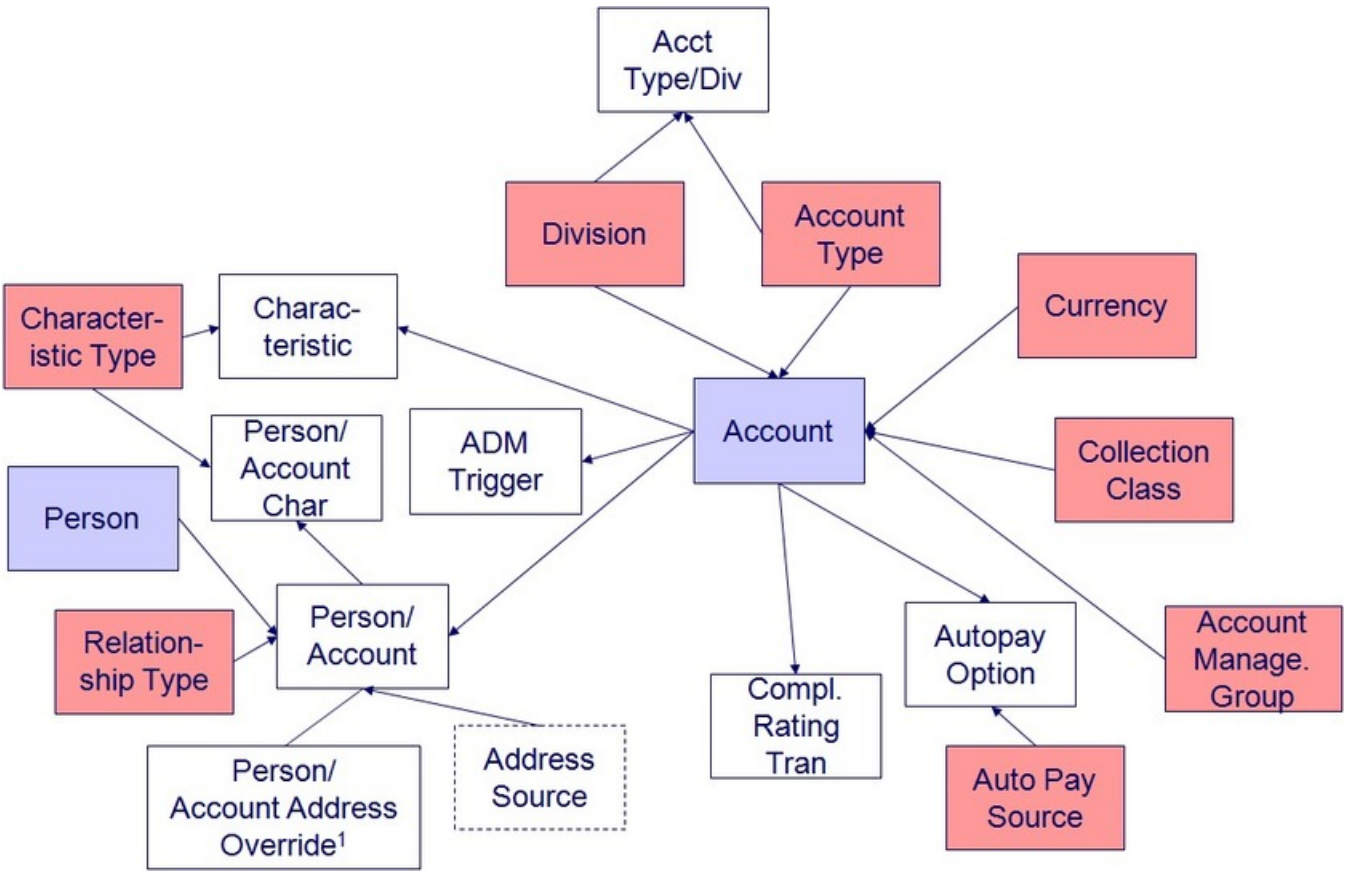
This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Account

This section describes support for converting the account object.

Account Data Model

The following data model illustrates the account object.



Account Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Account	*CI_ACCT*	Yes *CI_ACCT_K*	VAL-ACCT		CIPVACCK	CIPVACCI See Optional FK Note below.
Auto pay Option	*CI_ACCT_APAY*	Yes *CI_ACCT_APAY_K*		CIPVAAPV	CIPVAAPK *Has dependencies*	CIPVAAPI
Characteristic	*CI_ACCT_CHAR*	No. The key is ACCT_ID plus an edate and a char type.		CIPVACHV		CIPVACHI
Person/Account	*CI_ACCT_PER*	No. The key is account ID plus person ID.		CIPVACPV		CIPVACPI
Person / Account Char	*CI_ACCT_PER_CHAR*	No. The key is account ID plus person ID plus an		CIPVAPCV		CIPVAPCI

		edate and a char type.			
Person/Account Address Override[1]	*CI_PER_ADDR_OVRD*	No. The key is Account ID plus Person ID	CIPVPAOV		CIPVPAOI
Compliance Rating Transaction	*CI_CR_RAT_HIST*	Yes *CI_CR_RAT_HIST_K*	CIPVCRTV	CIPVCRRK *Has dependencies*	CIPVCRTI
ADM Trigger	*CI_ADM_RVW_SCH*	No. The key is account ID plus date	CIPVARSV		CIPVARSI

NOTE: Note 1. Mailing Location and the Person / Account Override Addresses are only supported for legacy addresses. Refer to *Address Support* for more information.

Account Suggestions

An account must have at least one row on the account / person table and at least one account / person must be marked as being the main taxpayer. Please see column notes for the account / person table for inter-field validation in respect of the various switches (e.g., if main taxpayer switch is on, then the person must also be financially responsible).

We recommend storing an ADM trigger (*CI_ADM_RVW_SCH*) for every account where the trigger date is the conversion date. This will cause the account to be reviewed by the *overdue monitor* when it next runs. We have supplied a dedicated batch process for this purpose that simply inserts a row in this table with the review date set equal to the current date. This will ensure that all converted accounts are reviewed after they are inserted into production. This program is named CIPVADMB and goes by the batch control ID of **CNV-ADM**.

If your legacy system has the equivalent of a compliance rating, you should create compliance rating transactions. The values you create need to be consistent with the base and threshold compliance rating on the installation record. Refer to the account user documentation for more information.

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

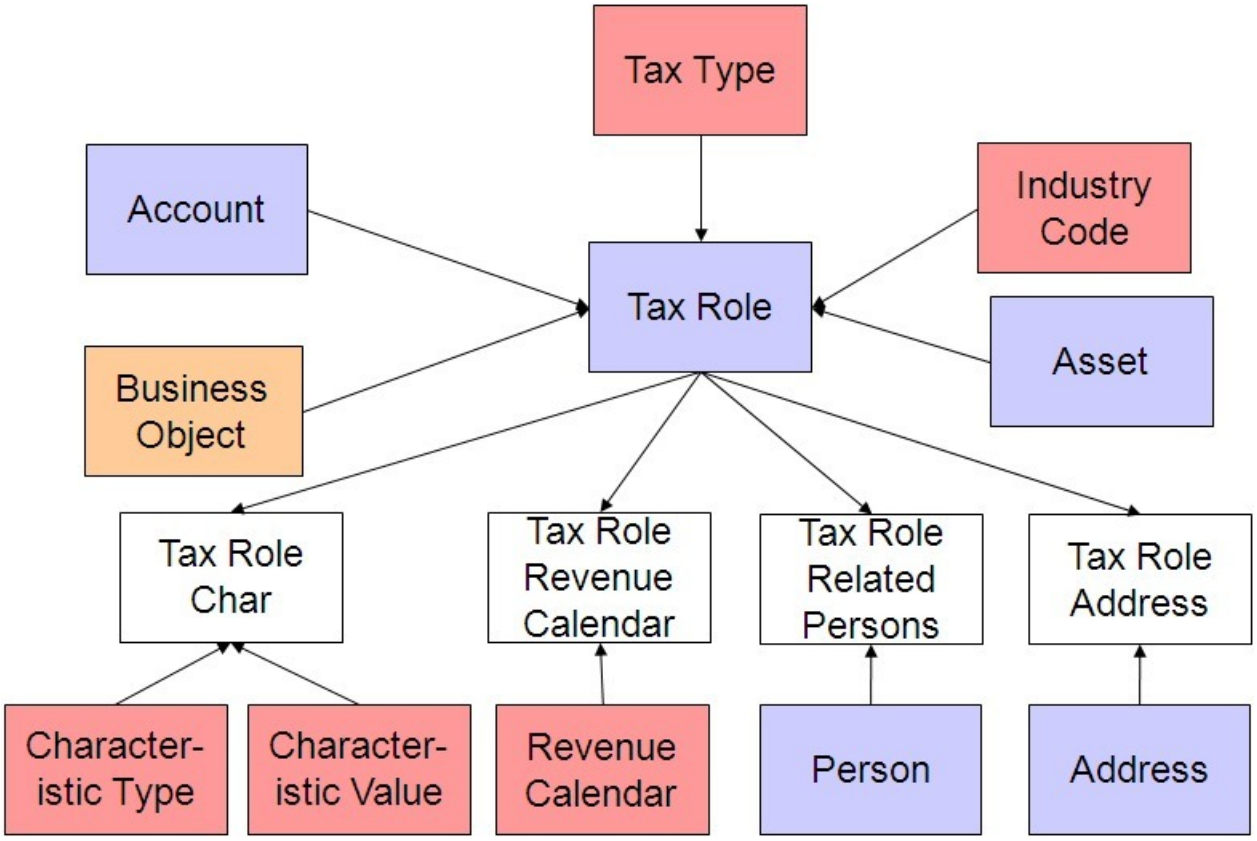
Optional FK Note

Account has an optional foreign key MAILING_PREM_ID to the Location (CI_PREM) table. Conversion for locations is no longer supported. However, the key generation program for Location (CIPVPRMK) must still be run. Refer to *The Big Picture of Key Assignment* for more information.

Tax Role

Tax Role Data Model

The following data model illustrates the tax role object.



Tax Role Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Tax Role	*CI_TAX_ROLE*	Yes. *CI_TAX_ROLE_K*	VAL-TAXR	CIPVTXRV	CIPVTXRK *Has dependencies*	CIPVTXRI
Tax Role Revenue Calendar	*CI_TAX_ROLE_CAL*	No. The key is Tax Role ID and Effective Date.		CIPVTRCV		CIPVTRCI
Tax Role Address	*CI_TAX_ROLE_ADDR*	No. The key is Tax Role ID and Sequence Number.		CIPVTRAV		CIPVTRAI
Tax Role Related Persons	*CI_TAX_ROLE_PER*	No. The key is Tax Role ID, Relationship Type, Start Date and Person ID.		CIPVTXPV		CIPVTXPI
Tax Role Characteristic	*CI_TAX_ROLE_CHAR*	No. The key is Tax Role ID, Characteristic		CIPVTXCV		CIPVTXCI

	Type, and Effective Date.

Tax Role Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

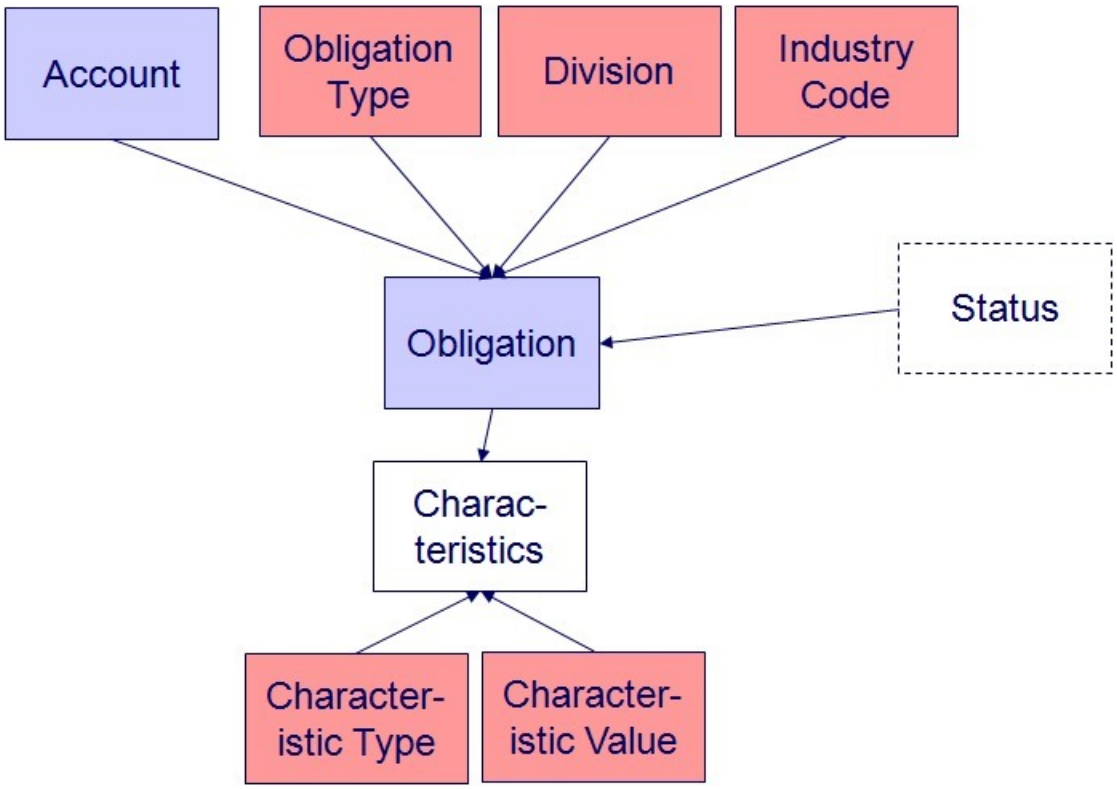
Optional FK Note

Tax Role has an optional foreign key ASSET_ID to the Asset (CI_ASSET) table. Implementations that are not planning to convert Assets must still run the key generation process for Assets. Refer to *The Big Picture of Key Assignment* for more information.

Obligation

Obligation Data Model

The following data model illustrates the obligation object.



Obligation Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*

Obligation	*CI_SA*	Yes *CI_SA_K*	VAL-OBLG		CIPVSVAK *Has dependencies*	CIPVSVAI See Optional FK Note below.
Characteristic	*CI_SA_CHAR*	No. The key is obligation ID plus an edate and a char type.		CIPVSACV		CIPVSACI

Obligation Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Optional FK Note

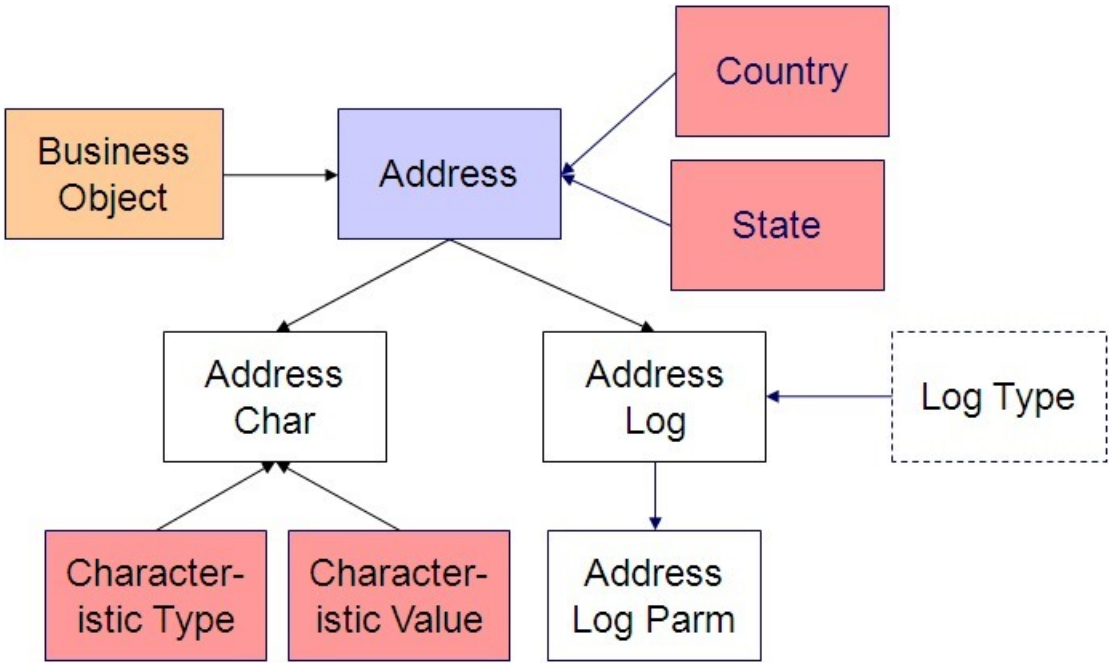
Account has an optional foreign key CHAR_PREM_ID to the Location (CI_PREM) table. Conversion for Locations is no longer supported. However, the key generation program for Location (CIPVPRMK) must still be run. Refer to *The Big Picture of Key Assignment* for more information.

Account has an optional foreign key TAX_ROLE_ID to the Tax Role (CI_TAX_ROLE) table. If your implementation is planning to convert obligations, but not tax roles, the key generation program for Tax Role must still be run. Refer to *The Big Picture of Key Assignment* for more information.

Address

Address Data Model

The following data model illustrates the Address object.



Address Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Address	*C1_ADDRESS*	Yes. *C1_ADDRESS_K*	VAL-AIN	CIPVAINV	CIPVAINK	CIPVAINI
Address Characteristic	*C1_ADDRESS_CHAR*	No. The key is Address ID, Characteristic Type, and Sequence.		CIPVAICV		CIPVAICI
Address Log	*C1_ADDRESS_LOG*	No. The key is Address ID and Sequence.		CIPVAILV		CIPVAILI
Address Log Parameter	*C1_ADDRESS_LOG_PARM*	No. The key is Address ID, Sequence, and Message Parameter Sequence.		CIPVAIMV		CIPVAIMI

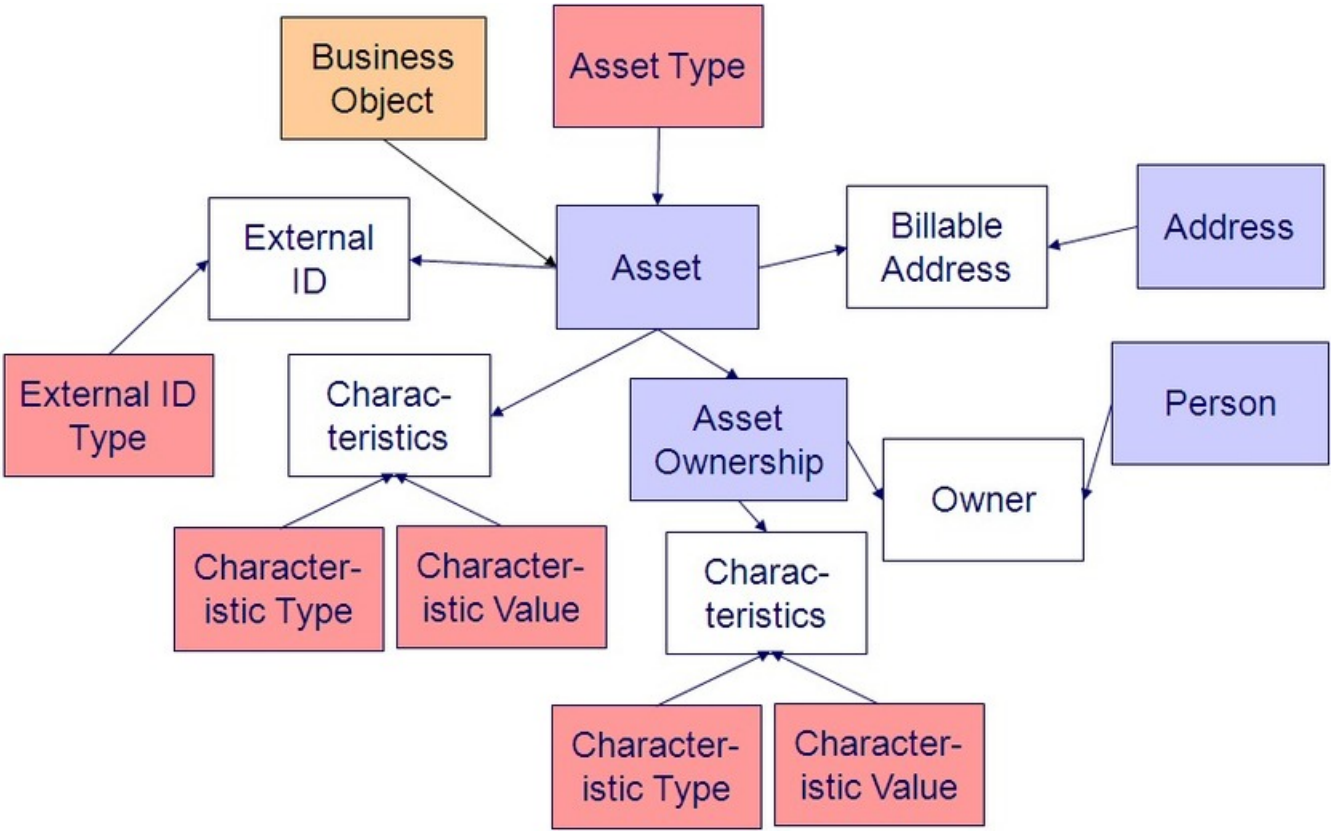
Address Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Asset

Asset Data Model

The following data model illustrates the asset object.



Asset Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Asset	*CI_ASSET*	Yes. *CI_ASSET_K*	VAL-ASST	CIPVASTV	CIPVASTK	CIPVASTI
Asset Billing Address	*CI_ASSET_BILLING_ADDR*	No. The key is Asset ID, Sequence Number.		CIPVASBV		CIPVASBI
Asset External ID	*CI_ASSET_EXT_ID*	No. The key is Asset ID, Sequence Number.		CIPVASEV		CIPVASEI
Asset Related Persons	*CI_ASSET_PER*	No. The key is Asset ID, Sequence Number.		CIPVASRV		CIPVASRI
Asset Characteristic	*CI_ASSET_CHAR*	No. The key is Asset ID, Characteristic Type, and		CIPVASCV		CIPVASCI

		Sequence Number.				
Asset Log	*CI_ASSET_LOG*	No. The key is Asset ID, Sequence Number.		CIPVASLV		CIPVASLI
Asset Log Parameter	*CI_ASSET_ LOG_PARM*	No. The key is Asset ID, Sequence, and Message Parameter Sequence.		CIPVASPV		CIPVASPI
Asset Ownership	*C1_ASSET_ OWN*	Yes. *CI_ASSET_ OWN_K*	VAL-AOWN	CIPVAOWV	CIPVAOWK *Has dependencies*	CIPVAOWI
Asset Owners	*C1_ASSET_ OWN_OWNER*	No. The key is Asset Ownership ID and Sequence Number.		CIPVAOOV		CIPVAOOI
Asset Ownership Characteristic	*C1_ASSET_ OWN_CHAR*	No. The key is Asset Ownership ID, Characteristic Type, and Sequence Number.		CIPVAOCV		CIPVAOCI
Asset Ownership Log	*C1_ASSET_ OWN_LOG*	No. The key is Asset Ownership ID, Sequence Number.		CIPVAOLV		CIPVAOLI
Asset Ownership Log Parameter	*C1_ASSET_ OWN_LOG_ PARM*	No. The key is Asset Ownership ID, Sequence, and Message Parameter Sequence.		CIPVAOPV		CIPVAOPI

Asset Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

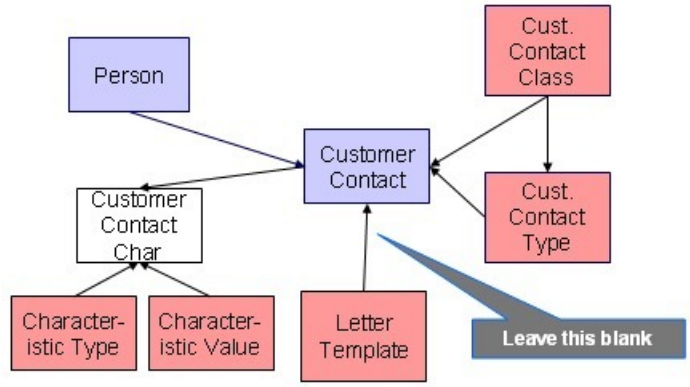
Transaction Data

This section describes the tables in which your transaction data (e.g., tax forms, payments, customer contacts, etc.) resides.

Customer Contact

Customer Contact Data Model

The following data model illustrates the Customer Contact object.



Customer Contact Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Customer Contact	*CI_CC*	Yes *CI_CC_K*	CIPVCSCV	CIPVCCTK *Has dependencies*	CIPVCSCI
Characteristics	*CI_CC_CHAR*	No. The key is customer contact ID plus char type code	CIPVCCTV		CIPVCCTI

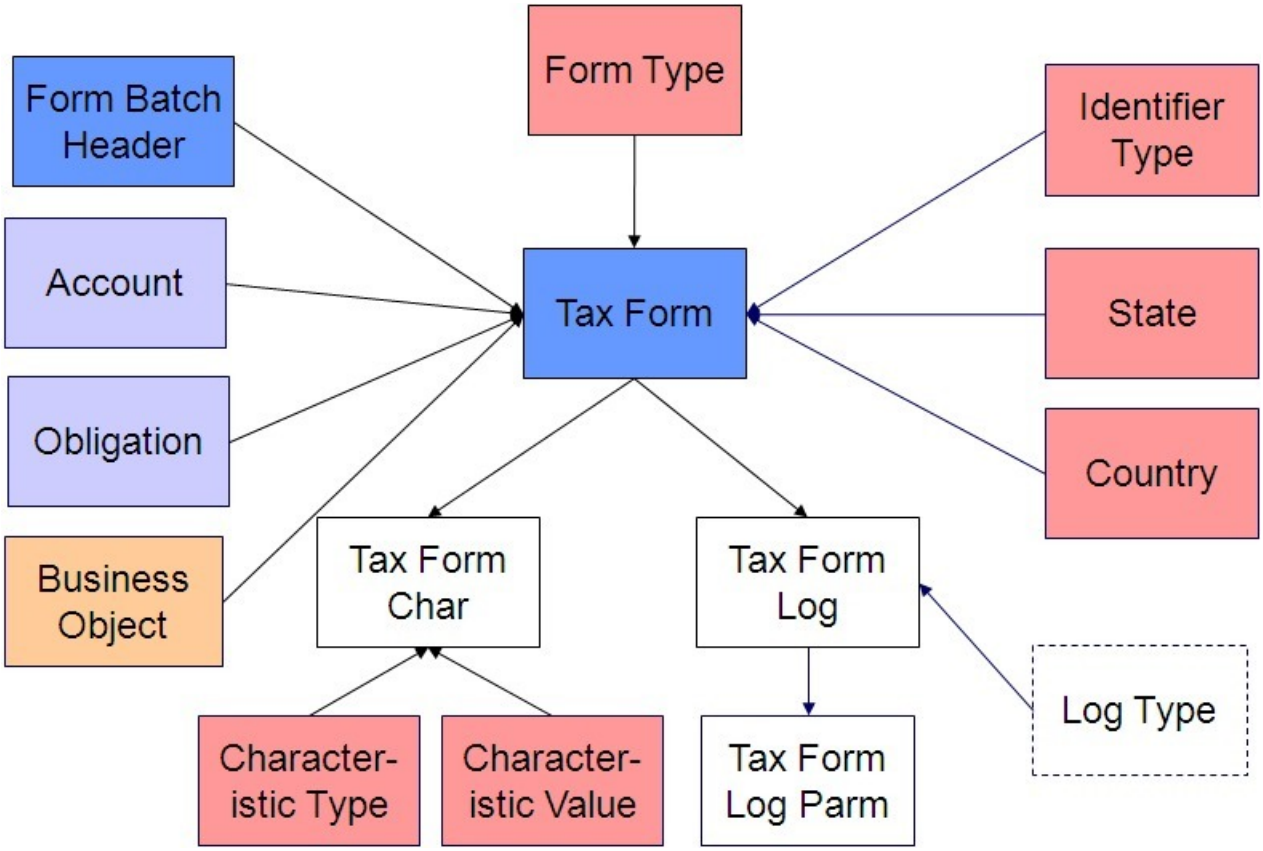
Customer Contact Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Tax Form

Tax Form Data Model

The following data model illustrates the Tax Form object.



Tax Form Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Tax Form	*CI_TAX_FORM*	Yes. *CI_TAX_FORM_K*	VAL-TXFR		CIPVTXFK	CIPVTXFI
Tax Form Characteristic	*CI_TAX_FORM_CHAR*	No. The key is Tax Form ID, Characteristic Type, and Sequence.		CIPVTFCV		CIPVTFCI
Tax Form Log	*CI_TAX_FORM_LOG*	No. The key is Tax Form ID and Sequence.		CIPVTFLV		CIPVTFLI
Tax Form Log Parameter	*CI_TAX_FORM_LOG_PARM*	No. The key is Tax Form ID, Sequence, and Message Parameter Sequence.		CIPVTLPV		CIPVTLPI

Tax Form Suggestions

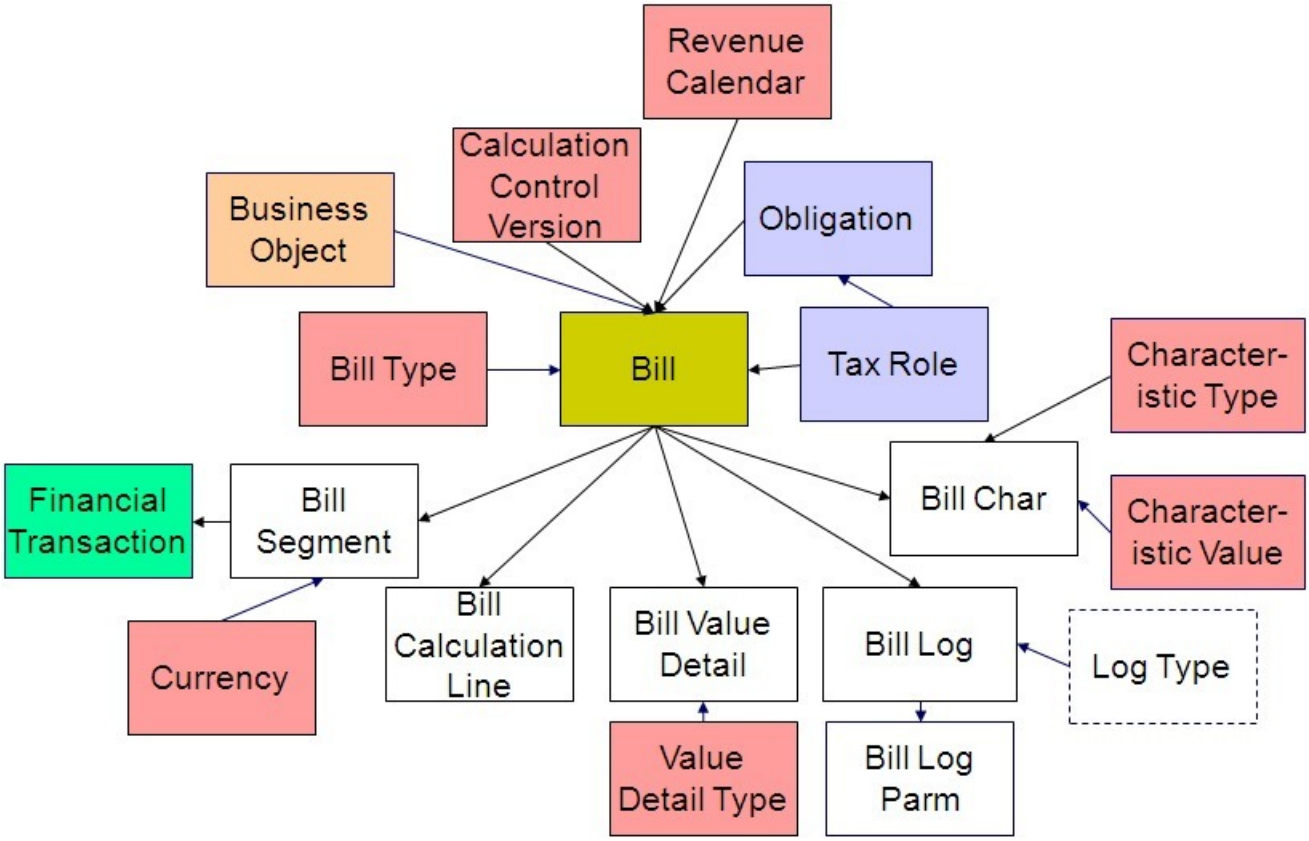
This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Bill

Bill Data Model

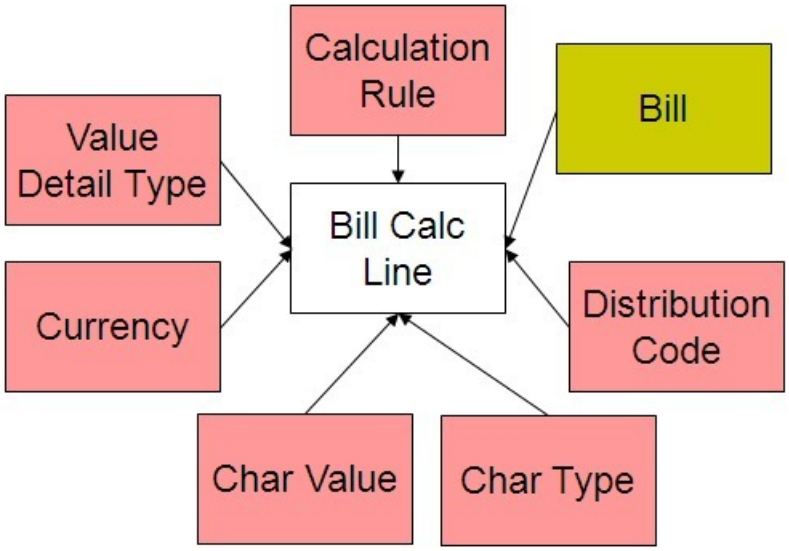
Bill - Main

The following data model illustrates the bill object.



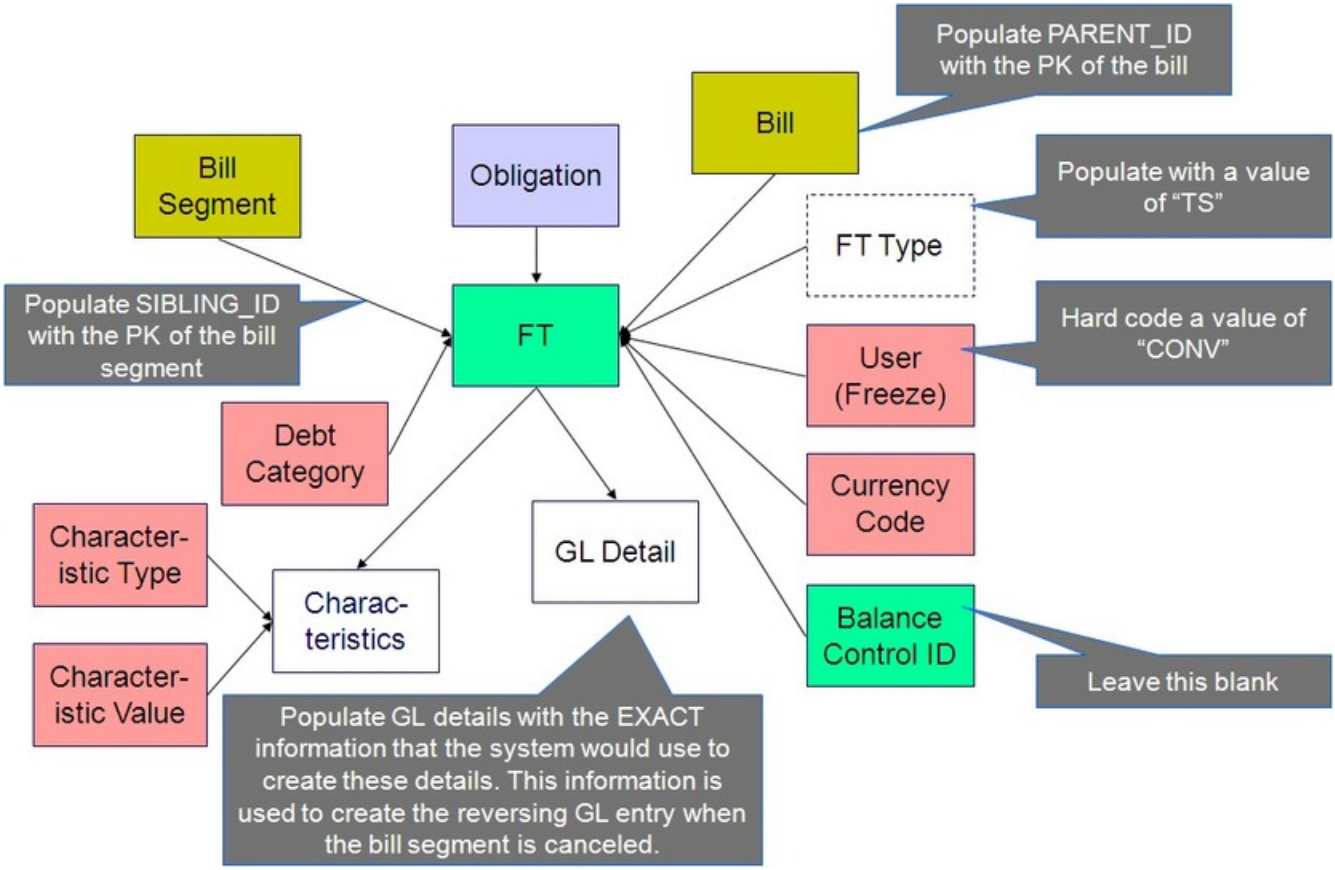
Bill - Calculation Line

The following data model illustrates the bill calculation line and important references.



Bill - FT

The following data model illustrates the FT that must be associated with a bill segment.



Bill Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*

Bill	*C1_TAX_BILL*	Yes *C1_TAX_BILL_K*	CTPVTBIV	CTPVTBIK *Has dependencies*	CTPVTBII
Bill Calculation Line	*C1_TAX_BILL_CALC_LN*	No. The key is bill ID plus sequence number.	CTPVTBCV		CTPVTBCI
Bill Segment	*C1_TAX_BILL_SEG*	Yes *C1_TAX_BILL_SEG_K*	CTPVTBSV	CTPVTBSK *Has dependencies*	CTPVTBSI
Bill Value Detail	*C1_TAX_BILL_VAL_DTL*	No. The key is bill id and a sequence number.	CTPVTBDV		CTPVTBDI
Bill Characteristics	*C1_TAX_BILL_CHAR*	No. The key is bill segment id, the char type, and a sequence number.	CTPVTBHV		CTPVTBHI
Bill Log	*C1_TAX_BILL_LOG*	No. The key is bill id and a sequence number.	CTPVTBLV		CTPVTBLI
Bill Log Parameter	*C1_TAX_BILL_LOG_PARM*	No. The key is bill id, sequence number and a parm sequence number.	CTPVTBPV		CTPVTBPI
FT (financial transaction)	*CI_FT*	Yes *CI_FT_K*	CIPVFTFV	CIPVFTXK *Has dependencies*	CIPVFTFI
FT Characteristic	*CI_FT_CHAR*	No. The key is FT id, char type code and a sequence number	CIPVFTCV		CIPVFTCI
FT GL (FT general ledger)	*CI_FT_GL*	No. The key is FT id and a GL sequence number	CIPVFTGV		CIPVFTGI

Bill Suggestions

Please populate the columns on the FT that's associated with the bill segment as follows:

- CUR_AMT should be set equal to the bill segment amount
- PAY_AMT should be set equal to the bill segment amount
- CRE_DTTM should be set equal to the bill segment end date / time
- FREEZE_SW should be "Y"
- FREEZE_DTTM should be set equal to the bill segment end date / time
- ARS_DT should be set equal to the bill segment end date
- CORRECTION_SW should be "N"
- REDUNDANT_SW should be "N"
- NEW_DEBIT_SW should be "N"
- NOT_IN_ARS_SW should be set to "N"
- SHOW_ON_BILL_SW should be set to "N"

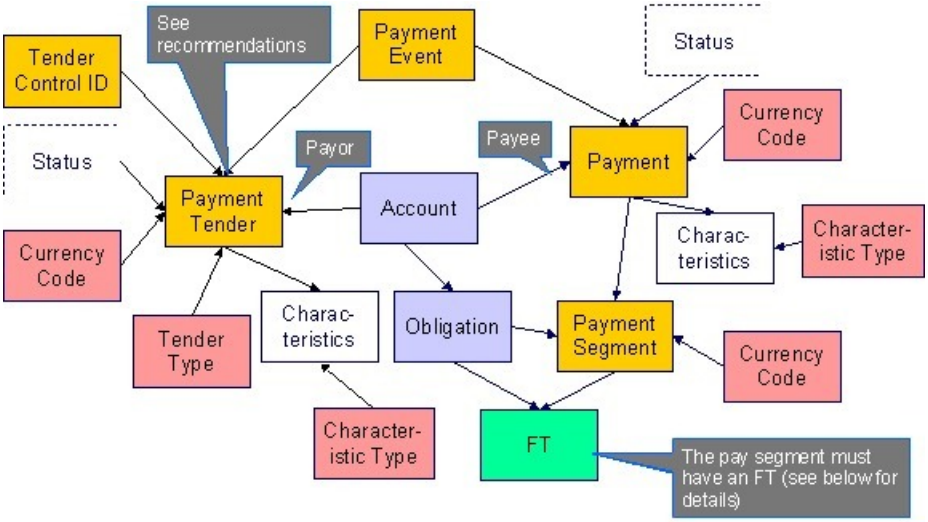
- ACCOUNTING_DT should be set to the current date
- SCHED_DISTRIB_DT should be left blank
- CURRENCY_CD should be the currency on the installation record
- BAL_CTL_GRP_ID should be left blank
- XFERRED_OUT_SW should be set to "Y"
- PARENT_ID should be set to the bill ID
- SIBLING_ID should be set to the bill segment ID
- Do NOT create any GL details for the FT. If GL details are converted, ensure they are populated with the EXACT information the system would use to create them. This information is used to create the reversing GL entry when the bill segment is canceled.

Payment

Payment Data Model

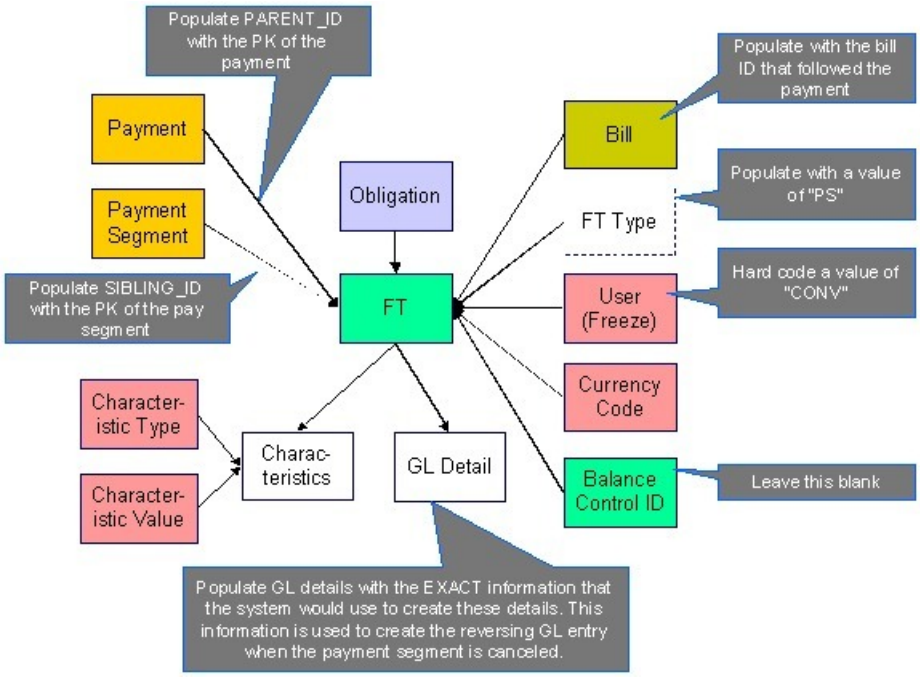
Payment - Main

The following data model illustrates the payment object.



Payment - FT

The following data model illustrates the FT that must be associated with a payment segment.



Payment Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Payment	*CI_PAY*	Yes *CI_PAY_K*	CIPVPAYV	CIPVPAYK *Has dependencies*	CIPVPAYI
Payment Characteristic	*CI_PAY_CHAR*	No. The key is PAY_ ID, plus a sequence number and a char type	CIPVPYCV		CIPVPYCI
Payment Event	*CI_PAY_EVENT*	Yes *CI_PAY_ EVENT_K*		CIPVPYEK *Has dependencies*	CIPVPYEI
Payment Tender	*CI_PAY_TNDR*	Yes *CI_PAY_TNDR_ K*	CIPVTNDV	CIPVTNDK *Has dependencies*	CIPVTNDI
Payment Tender Characteristic	*CI_PAY_TNDR_ CHAR*	No. The key is PAY_ TENDER_ID, plus a sequence number and a char type	CIPVTNCV		CIPVTNCI
Payment Segment	*CI_PAY_SEG*	Yes *CI_PAY_SEG_K*	CIPVPSGV	CIPVPSGK *Has dependencies*	CIPVPSGI
FT (financial transaction)	*CI_FT*	Yes *CI_FT_K*	CIPVFTFV	CIPVFTXK *Has dependencies*	CIPVFTFI See Optional FK Note below.
FT Characteristic	*CI_FT_CHAR*	No. The key is FT id, char type code and a sequence number	CIPVFTCV		CIPVFTCI

FT GL (FT general ledger)	*CI_FT_GL*	No. The key is FT id and a GL sequence number	CIPVFTGV	CIPVFTGI

Payment Suggestions

The SEQ_NUM field on the payment should be left blank. This is part of the primary key for the Payment Event Distribution Details, which are not part of the conversion process.

We recommend that you use the system to create a single deposit control and link to it a single tender control using the PRODUCTION tables. The tender control should reference a tender source of "conversion". Use the prime key of the tender control as the foreign key on the tenders that you insert into the STAGING tables. This means you will have an invalid foreign key relationship on CI_PAY_TNDR (it will reference a tender control that doesn't exist).

After converting the payments:

- Re-access the tender control in production and enter the appropriate amounts (per tender type) to balance the tender control.
- Re-access the deposit control in production and enter the appropriate amounts to balance the deposit control.

Please populate the columns on the FT that's associated with the payment segment as follows:

- CUR_AMT should be set equal to the payment segment amount
- PAY_AMT should be set equal to the payment segment amount
- CRE_DTTM should be set equal to the payment segment date / time
- FREEZE_SW should be "Y"
- FREEZE_DTTM should be set equal to the payment segment date / time
- ARS_DT should be set equal to the payment segment date
- CORRECTION_SW should be "N"
- REDUNDANT_SW should be "N"
- NEW_DEBIT_SW should be "N"
- NOT_IN_ARS_SW should be set to "N"
- SHOW_ON_BILL_SW should be set to "N" on all payments other than payments that have been received since the last bill. For recent payments that you want to show on the next bill, this switch must be "Y"
- ACCOUNTING_DT should be set to the current date
- SCHED_DISTRIB_DT should be left blank
- CURRENCY_CD should be the currency on the installation record
- BAL_CTL_GRP_ID should be left blank
- XFERRED_OUT_SW should be set to "Y"
- PARENT_ID should be set to the payment ID
- SIBLING_ID should be set to the payment segment ID
- Do NOT create any GL details for the FT. If GL details are converted, ensure they are populated with the EXACT information the system would use to create them. This information is used to create the reversing GL entry when the payment segment is canceled.

Optional FK Note

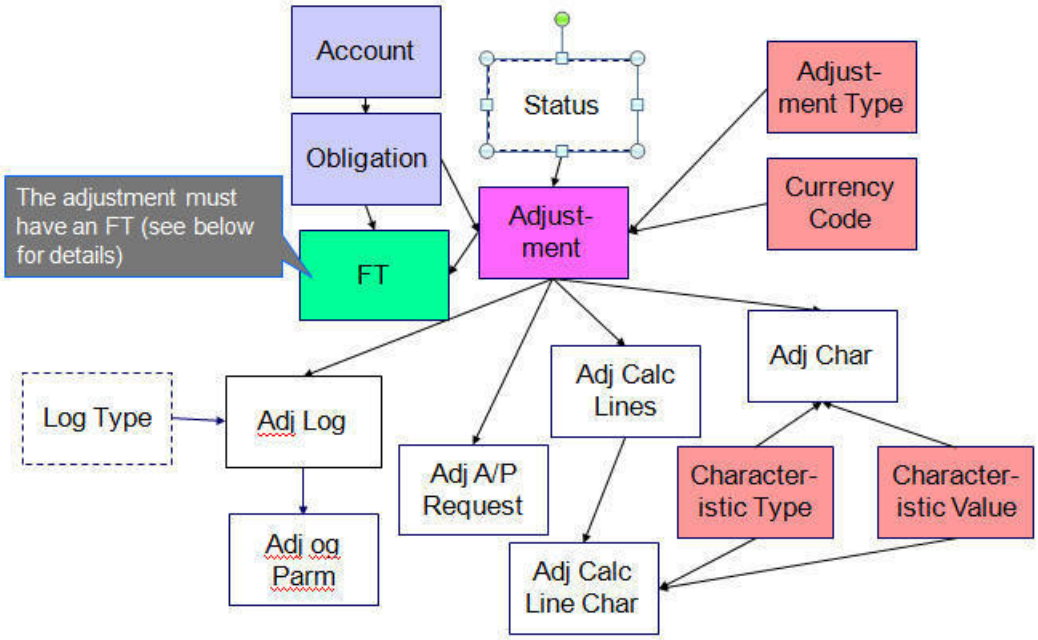
FTs for payments have an optional foreign key BILL_ID to the Bill (Classic) table (CI_BILL). Conversion for classic billing locations is no longer supported. However, the key generation program for Bill (CIPVBILK) must still be run. Refer to *The Big Picture of Key Assignment* for more information.

Adjustment

Adjustment Data Model

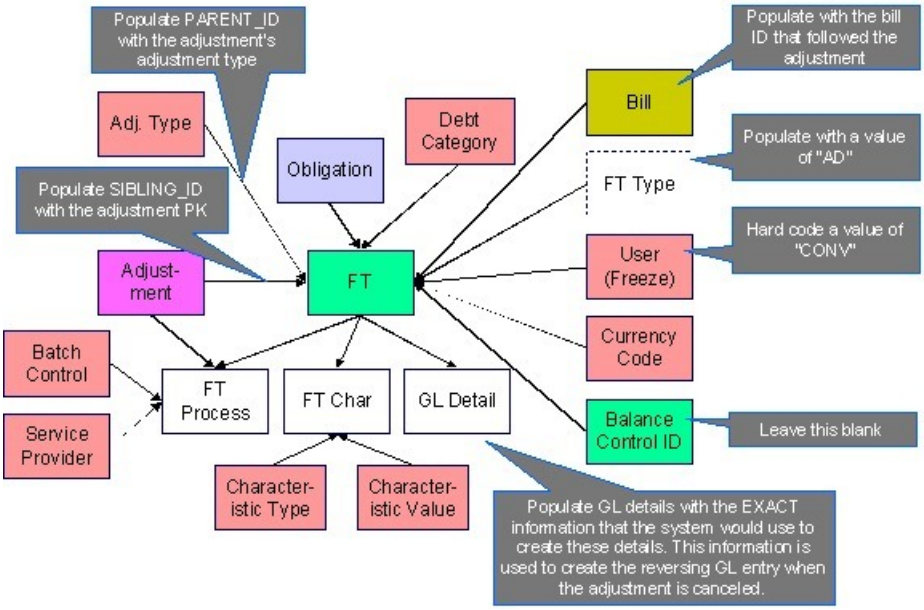
Adjustment - Main

The following data model illustrates the adjustment object.



Adjustment - FT

The following data model illustrates the FT that must be associated with an adjustment segment.



Adjustment Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Adjustment	*CI_ADJ*	Yes *CI_ADJ_K*	CIPVADJV	CIPVADJK *Has dependencies*	CIPVADJI
Adjustment A/P Request	*CI_ADJ_APREQ*	Yes *CI_ADJ_APREQ_K*	CIPVAPRV	CIPVAPRK *Has dependencies*	CIPVAPRI
Adjustment Calc Lines	*CI_ADJ_CALC_LN*	No. The key is adjustment id and a sequence number	CIPVACLV		CIPVACLI
Adjustment Calc Line Characteristics	*CI_ADJ_CL_CHAR*	No. The key is adjustment id, a sequence number and characteristic type.	CIPVCLCV		CIPVCLCI
Adjustment Log	*CI_ADJ_LOG*	No. The key is adjustment id and sequence.	CIPVADLV		CIPVADLI
Adjustment Log Message Parameters	*CI_ADJ_LOG_PARM*	No. The key is adjustment id, sequence and parameter sequence.	CIPVADPV		CIPVADPI
FT (financial transaction)	*CI_FT*	Yes *CI_FT_K*	CIPVFTFV	CIPVFTXK *Has dependencies*	CIPVFTFI See Optional FK Note below.
FT Characteristic	*CI_FT_CHAR*	No. The key is FT id, char type code and a sequence number	CIPVFTCV		CIPVFTCI

FT GL (FT general ledger)	*CI_FT_GL*	No. The key is FT id and a GL sequence number	CIPVFTGV	CIPVFTGI
FT Process	*CI_FT_PROC*	No. The key is FT id and a sequence number	CIPVFTPV	CIPVFTPI
Adjustment Characteristic	*CI_ADJ_CHAR*	No. The key is adjustment id, char type code and a sequence number	CIPVADCV	CIPVADCI

Adjustment Suggestions

Please populate the columns on the FT that's associated with the adjustment as follows:

- CUR_AMT should be set equal to the adjustment amount
- PAY_AMT should be set equal to the adjustment amount
- CRE_DTTM should be set equal to the adjustment date / time
- FREEZE_SW should be "Y"
- FREEZE_DTTM should be set equal to the adjustment date / time
- ARS_DT should be set equal to the adjustment date
- CORRECTION_SW should be "N"
- REDUNDANT_SW should be "N"
- NEW_DEBIT_SW should be "N"
- NOT_IN_ARS_SW should be set to "N"
- SHOW_ON_BILL_SW should be set to "N" on all adjustments other than adjustments that have been generated since the last bill. For recent adjustments that you want to show on the next bill, this switch must be "Y"
- ACCOUNTING_DT should be set to the current date
- SCHED_DISTRIB_DT should be left blank
- CURRENCY_CD should be the currency on the installation record
- BAL_CTL_GRP_ID should be left blank
- XFERRED_OUT_SW should be set to "Y"
- PARENT_ID should be set to the adjustment's adjustment type
- SIBLING_ID should be set to the adjustment ID
- Do NOT create any GL details for the FT. If GL details are converted, ensure they are populated with the EXACT information the system would use to create them. This information is used to create the reversing GL entry when the adjustment is canceled.

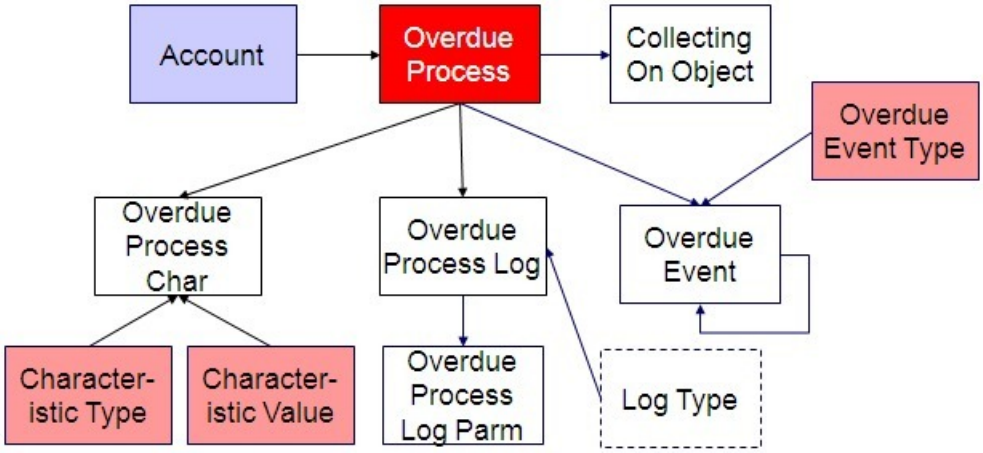
Optional FK Note

FTs for adjustments have an optional foreign key BILL_ID to the Bill (Classic) table (CI_BILL). Conversion for classic billing locations is no longer supported. However, the key generation program for Bill (CIPVBILK) must still be run. Refer to *The Big Picture of Key Assignment* for more information.

Overdue Process

Overdue Process Data Model

The following data model illustrates the Overdue Process object.



Overdue Process Table Names

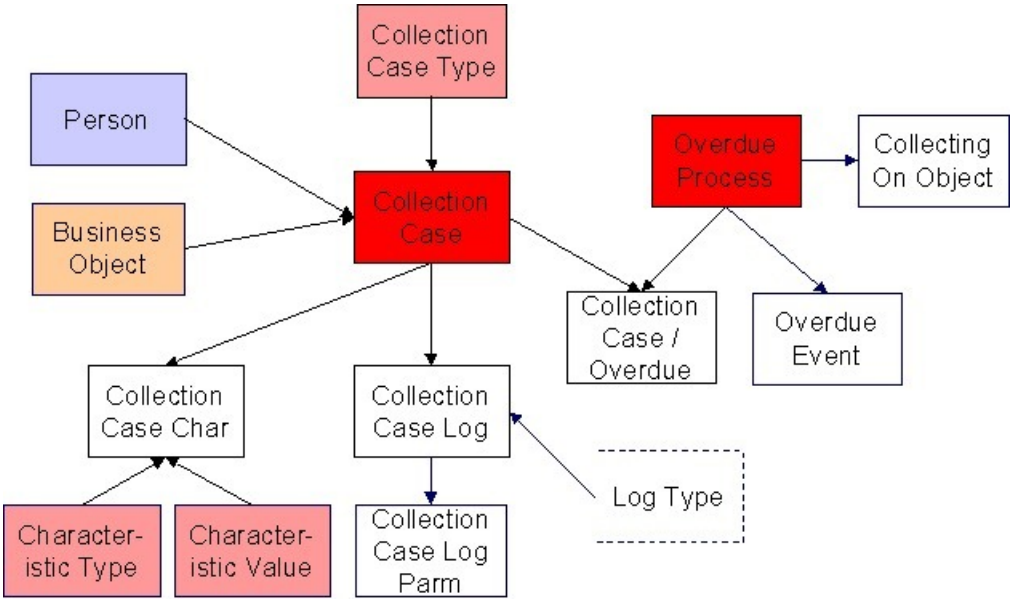
Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Overdue Process	*CI_OD_PROC*	Yes. *CI_OD_PROC_K*	VAL-ODPR	CIPVODPV	CIPVODPK *Has dependencies*	CIPVODPI
Overdue Process Collecting On Object	*CI_OD_PROC_OBJ*	No. The key is Overdue Process ID and Sequence.		CIPVODOV		CIPVODOI
Overdue Process Event	*CI_OD_EVT*	No. The key is Overdue Process ID and Sequence.		CIPVODEV		CIPVODEI
Overdue Process Event Dependencies	*CI_OD_EVT_DEP*	No. The key is Overdue Process ID, Event Sequence and Sequence.		CIPVODDV		CIPVODDI
Overdue Process Log	*CI_OD_PROC_LOG*	No. The key is Overdue Process ID and Sequence.		CIPVODLV		CIPVODLI
Overdue Process Log Parameter	*CI_OD_PROC_LOGPARM*	No. The key is Overdue Process ID, Sequence		CIPVOLPV		CIPVOLPI

	and Message Parameter Sequence.

Collection Case

Collection Case Data Model

The following data model illustrates the Collection Case object.



Collection Case Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Collection Case	*CI_COLL_CASE*	Yes.*CI_COLL_CASE_K*	VAL-CLCS	CIPVCCSV	CIPVCCSK *Has dependencies*	CIPVCCSI
Collection Case Characteristic	*CI_COLL_CASE_CHAR*	No. The key is Collection Case ID. Characteristic Type, and Sequence.		CIPVCCCV		CIPVCCCI
Collection Case Log	*CI_COLL_CASE_LOG*	No. The key is Collection Case ID and Sequence.		CIPVCCLV		CIPVCCLI
Collection Case Log Parameter	*CI_COLL_CASE_LOG_PARM*	No. The key is Collection Case ID, Sequence,		CIPVCCPV		CIPVCCPI

		and Message Parameter Sequence.		
Collection Case Overdue Process	*CI_COLL_CASE_OD*	No. The key is Collection Case ID and Overdue Process ID.	CCIPVCCOV	CCIPVCCOI

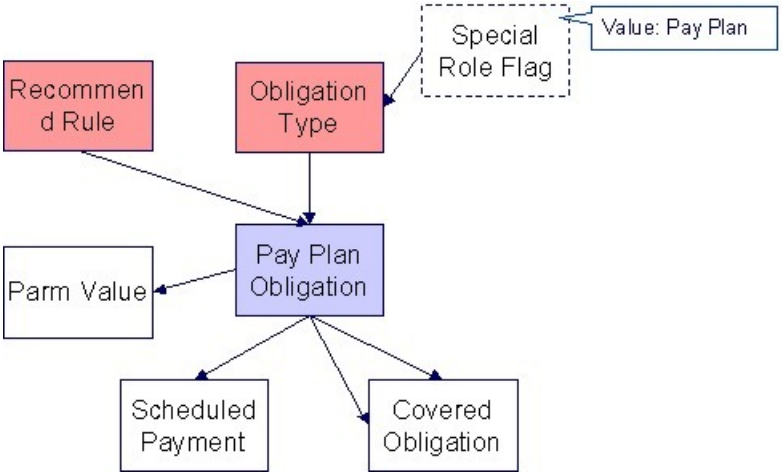
Collection Case Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Payment Plan

Payment Plan Data Model

The following data model illustrates the Payment Plan objects.



Payment Plan Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Covered Obligation	*CI_NB_SA*	No. The key is SA_ID plus CVRD_SA_ID	CIPVNBSV		CIPVNBSI
Scheduled Payments	*CI_NB_SCHED_PAY*	Yes *CI_NB_SCHED_PAY_K*	CIPVNSPV	CIPVNSPK *Has dependencies*	CIPVNSPI
Pay Plan Parameters	*CI_SA_NB_PARM*	No. The key is SA_ID plus Sequence Number.	CIPVNPMV		CIPVNPMI

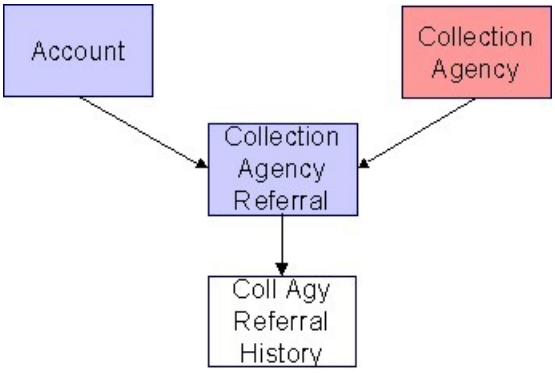
Payment Plan Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Collection Agency Referral

Collection Agency Referral Data Model

The following data model illustrates the Collection Agency Referral object.



Collection Agency Referral Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Collection Agency Referral	*CI_COLL_AGY_REF*	Yes. *CI_COLL_AGY_REF_K*	CIPVCARV	CIPVCARK	CIPVCARI
Collection Agency Referral History	*CI_COLL_AGY_HIS*	No. The key is collection agency referral id and characteristic type code	CIPVARHV		CIPVARHI

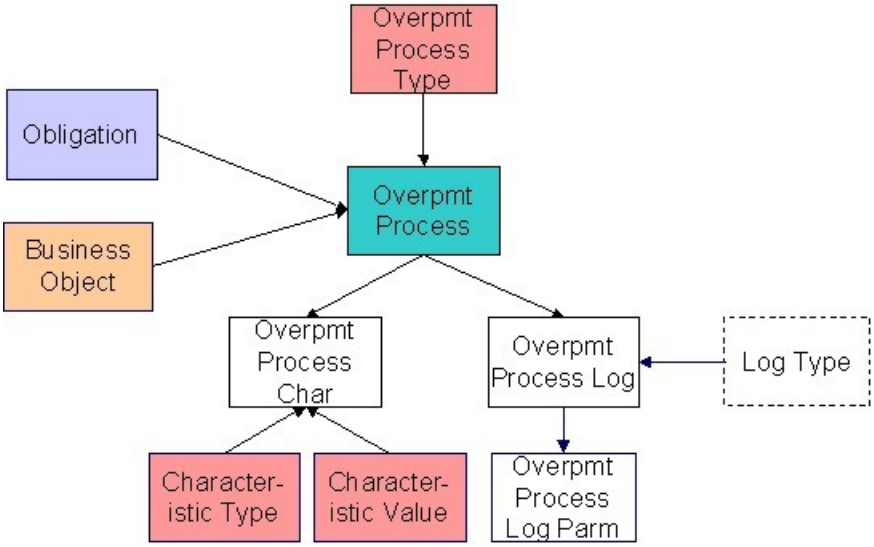
Collection Agency Referral Suggestions

N/A

Overpayment Process

Overpayment Process Data Model

The following data model illustrates the Overpayment Process object.



Overpayment Process Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Overpayment Process	*CI_OP_PROC*	Yes. *CI_OP_PROC_K*	VAL-OVPY	CIPVOPPV	CIPVOPPK	CIPVOPPI
Overpayment Process Character	*CI_OP_PROC_CHAR*	No. The key is Overpayment Process ID, Characteristic Type, and Sequence.		CIPVOPCV		CIPVOPCI
Overpayment Process Log	*CI_OP_PROC_LOG*	No. The key is Overpayment Process ID and Sequence.		CIPVOPLV		CIPVOPLI
Overpayment Process Log Parameter	*CI_OP_PROC_LOG_PARM*	No. The key is Overpayment Process ID, Sequence, and Message Parameter Sequence.		CIPVOPMI		CIPVOPMI

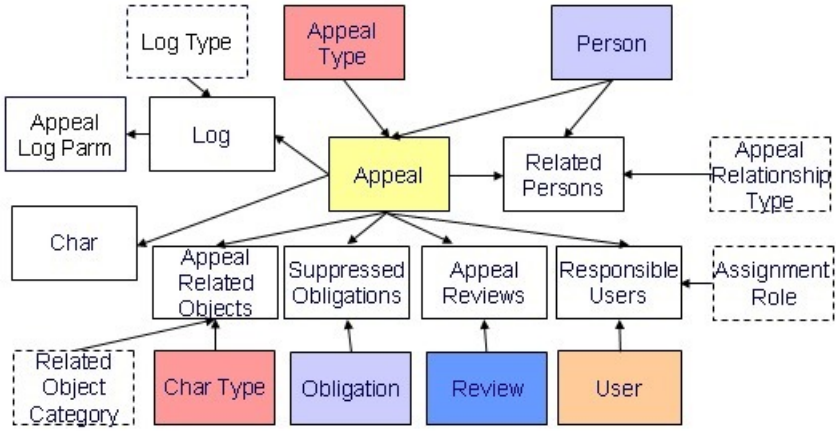
Overpayment Process Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Appeal

Appeal Data Model

The following data model illustrates the Appeal object.



Appeal Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Appeal	*C1_APPEAL*	Yes. *C1_APPEAL_K*	VAL-APPL	CIPVAPPV	CIPVAPPK	CIPVAPPI
Appeal Related Person	*C1_APPEAL_PER*	No. The key is Appeal ID, Relationship Type, and Person ID.		CIPVAPEV		CIPVAPEI
Appeal Related Object	*C1_APPEAL_REL_OBJ*	No. The key is Appeal ID, Characteristic Type, and Person ID.		CIPVAPOV		CIPVAPOI
Appeal Suppressed Obligation	*C1_APPEAL_SUPP_SA*	No. The key is Appeal ID and Obligation ID.		CIPVAPSV		CIPVAPSI
Appeal Review	*C1_APPEAL_REVIEW*	No. The key is Appeal ID and Review ID.		CIPVAREV		CIPVAREI
Appeal Responsible User	*C1_APPEAL_RESP_USER*	No. The key is Appeal ID, Assignment Role Flag, and User ID.		CIPVARUV		CIPVARUI

Appeal Characteristic	*C1_APPEAL_CHAR*	No. The key is Appeal ID, Characteristic Type, and Sequence.	CIPVAPHV	CIPVAPHI
Appeal Log	*C1_APPEAL_LOG*	No. The key is Appeal ID and Sequence.	CIPVAPLV	CIPVAPLI
Appeal Log Parameter	*C1_APPEAL_LOG_PARM*	No. The key is Appeal ID, Sequence, and Message Parameter Sequence.	CIPVALPV	CIPVALPI

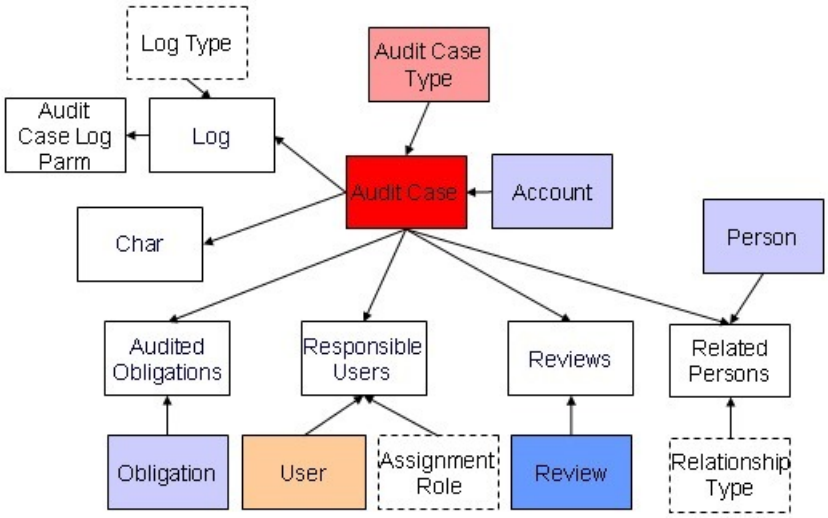
Appeal Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Audit Case

Audit Case Data Model

The following data model illustrates the Audit Case object.



Audit Case Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*

Audit Case	*C1_AUDIT_CASE*	Yes. *C1_AUDIT_CASE_K*	VAL-AUDT	CIPVAUDV	CIPVAUDK	CIPVAUDI
Audit Case Related Person	*C1_AUDIT_CASE_PER*	No. The key is Audit Case ID, Relationship Type, and Person ID.		CIPVAUPV		CIPVAUPI
Audit Case Audited Obligation	*C1_AUDIT_CASE_SA*	No. The key is Audit Case ID and Obligation ID.		CIPVAUSV		CIPVAUSI
Audit Case Review	*C1_AUDIT_CASE_REVIEW*	No. The key is Audit Case ID and Review ID.		CIPVAURV		CIPVAURI
Audit Case Responsible User	*C1_AUDIT_CASE_RESP_USER*	No. The key is Audit Case ID, Assignment Role Flag, and User ID.		CIPVAUUV		CIPVAUUI
Audit Case Characteristic	*C1_AUDIT_CASE_CHAR*	No. The key is Audit Case ID, Characteristic Type, and Sequence.		CIPVAUCV		CIPVAUCI
Audit Case Log	*C1_AUDIT_CASE_LOG*	No. The key is Audit Case ID and Sequence.		CIPVAULV		CIPVAULI
Audit Case Log Parameter	*C1_AUDIT_CASE_LOG_PARM*	No. The key is Audit Case ID, Sequence, and Message Parameter Sequence.		CIPVAUMV		CIPVAUMI

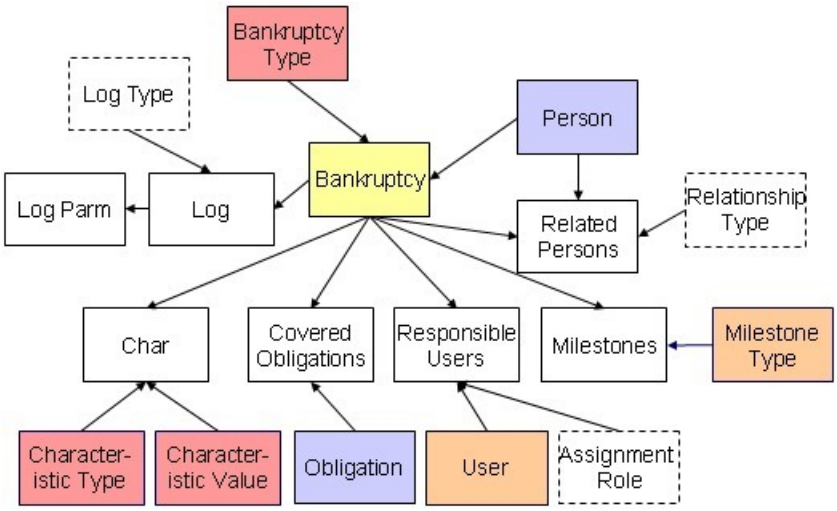
Audit Case Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Bankruptcy

Bankruptcy Data Model

The following data model illustrates the Bankruptcy object.



Bankruptcy Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Bankruptcy	*C1_ BANKRUPTCY*	Yes. *C1_ BANKRUPTCY_ K*	VAL-BKCY	CIPVBKCV	CIPVBKCK	CIPVBKCI
Bankruptcy Related Person	*C1_ BANKRUPTCY_ PER*	No. The key is Bankruptcy ID, Relationship Type, and Person ID.		CIPVBKPV		CIPVBKPI
Bankruptcy Covered Obligation	*C1_ BANKRUPTCY_ SA*	No. The key is Bankruptcy ID and Obligation ID.		CIPVBKOV		CIPVBKOI
Bankruptcy Milestones	*C1_ BANKRUPTCY_ MILESTONE*	No. The key is Bankruptcy ID, Milestone Type and Sequence Number.		CIPVBKMV		CIPVBKMI
Bankruptcy Responsible User	*C1_ BANKRUPTCY_ RESP_USER*	No. The key is Bankruptcy ID, Assignment Role Flag, and User ID.		CIPVBKUV		CIPVBKUI
Bankruptcy Characteristic	*C1_ BANKRUPTCY_ CHAR*	No. The key is Bankruptcy ID, Characteristic Type, and Sequence.		CIPVBKHV		CIPVBKHI

Bankruptcy Log	*C1_ BANKRUPTCY_ LOG*	No. The key is Bankruptcy ID and Sequence.	CIPVBKLV	CIPVBKLI
Bankruptcy Log Parameter	*C1_ BANKRUPTCY_ LOG_PARM*	No. The key is Bankruptcy ID, Sequence, and Message Parameter Sequence.	CIPVBKAV	CIPVBKAI

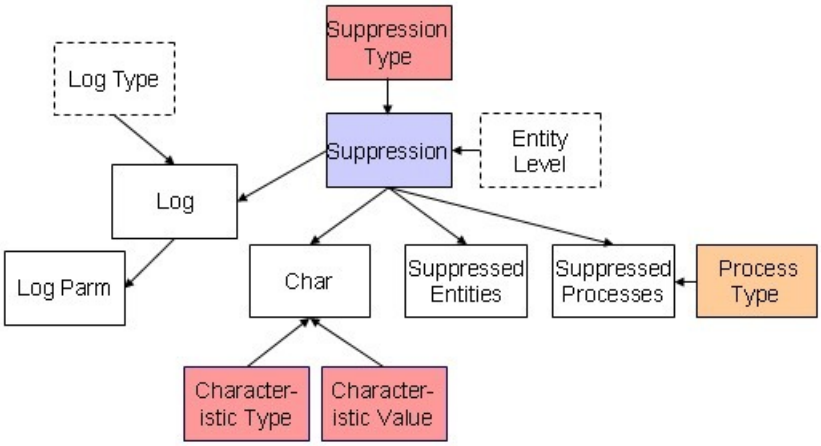
Bankruptcy Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Suppression

Suppression Data Model

The following data model illustrates the Suppression object.



Suppression Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Suppression	*C1_ SUPPRESSION*	Yes. *C1_ SUPPRESSION_ K*	VAL-SUPP	CIPVSUPV	CIPVSUPK	CIPVSUPI
Suppression Entity	*C1_ SUPPRESSION_ ENTITY*	No. The key is Suppression ID, Suppression Entity ID.		CIPVSUEV		CIPVSUEI

Suppression Process	*C1_ SUPPRESSION_ PROCESS*	No. The key is Suppression ID, Suppression Process flag.	CIPVSURV	CIPVSURI
Suppression Characteristic	*C1_ SUPPRESSION_ CHAR*	No. The key is Suppression ID, Characteristic Type, and Sequence.	CIPVSUCV	CIPVSUCI
Suppression Log	*C1_ SUPPRESSION_ LOG*	No. The key is Suppression ID and Sequence.	CIPVSULV	CIPVSULI
Suppression Log Parameter	*C1_ SUPPRESSION_ LOG_PARM*	No. The key is Suppression ID, Sequence, and Message Parameter Sequence.	CIPVSUMV	CIPVSUMI

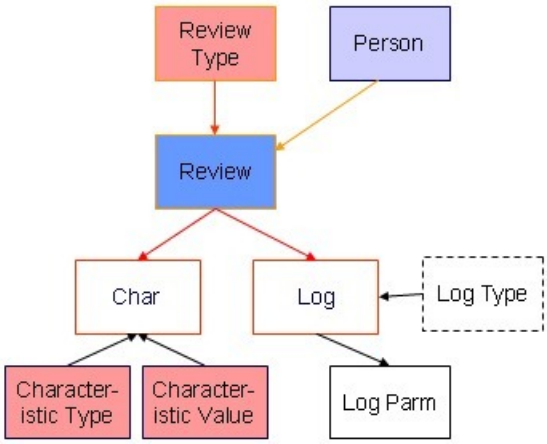
Suppression Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Review

Review Data Model

The following data model illustrates the Review object.



Review Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity*	*Key Assignment Batch Control*	*Insertion Batch Control*

				Validation Batch Control		
Review	*C1_REVIEW*	Yes. *C1_REVIEW_K*	VAL-REVW	CIPVREVV	CIPVREVK	CIPVREVI
Review Characteristic	*C1_REVIEW_CHAR*	No. The key is Review ID, Characteristic Type, and Sequence.		CIPVRVCV		CIPVRVCI
Review Log	*C1_REVIEW_LOG*	No. The key is Review ID and Sequence.		CIPVRVLV		CIPVRVLI
Review Log Parameter	*C1_REVIEW_LOG_PARM*	No. The key is Review ID, Sequence, and Message Parameter Sequence.		CIPVRLPV		CIPVRLPI

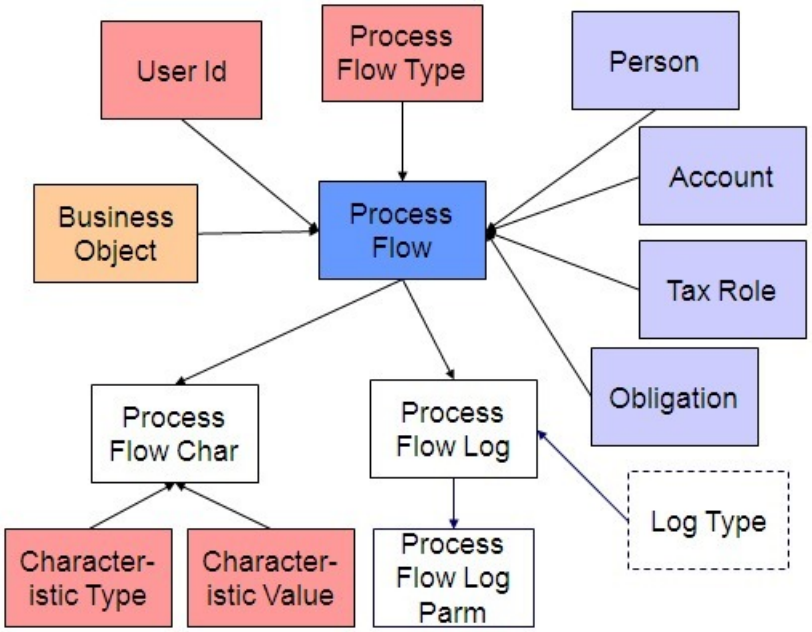
Review Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Process Flow

Process Flow Data Model

The following data model illustrates the process flow object.



Process Flow Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Process Flow	*CI_PROC_FLOW*	Yes.*CI_PROC_FLOW_K*	VAL-PRFL	CIPVPRFV	CIPVPRFK *Has dependencies*	CIPVPRFI
Process Flow Characteristic	*CI_PROC_FLOW_CHAR*	No. The key is Process Flow ID, Characteristic Type, and Effective Date.		CIPVPFCV		CIPVPFCI
Process Flow Log	*CI_PROC_FLOW_LOG*	No. The key is Process Flow ID and Sequence.		CIPVPFLV		CIPVPFLI
Process Flow Log Parameter	*CI_PROC_FLOW_LOG_PARM*	No. The key is Process Flow ID, Sequence and Message Parameter Sequence.		CIPVPLPV		CIPVPLPI

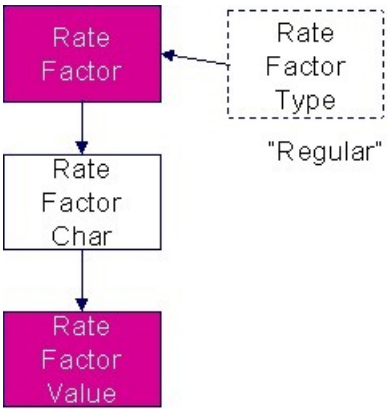
Process Flow Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Rate Factor Value

Rate Factor Value Data Model

The following data model illustrates the rate factor objects.



Rate Factor Value Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Rate Factor Value	*CI_BF_VAL*	No. The key is BF_CD plus CHAR_TYPE_CD plus CHAR_VAL plus EFFDT	CIPVBFVV		CIPVBFVI (Not threadable)

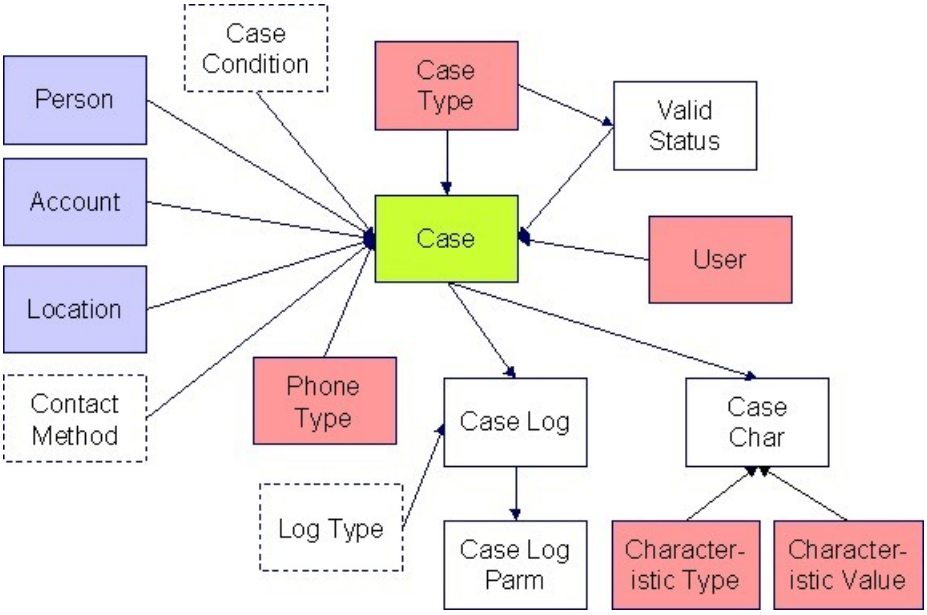
Rate Factor Value Suggestions

N/A.

Case

Case Data Model

The following data model illustrates the Case object.



Case Table Names

Data Model Name	*Table Name*	*Generated Keys*	*Object Validation Batch Control*	*Referential Integrity Validation Batch Control*	*Key Assignment Batch Control*	*Insertion Batch Control*
Case	*CI_CASE*	Yes. *CI_CASE_K*	VAL-CASE		CIPVCSEK	CIPVCSEI
Case Characteristic	*CI_CASE_CHAR*	No. The key is case id, char		CIPVCCHV		CIPVCCHI

		type code and a sequence number		
Case Log	*CI_CASE_LOG*	No. The key is case id and a log sequence number	CIPVCLGV	CIPVCLGI
Case Log Parameter	*CI_CASE_LOG_PARM*	No. The key is case id, log sequence number and a parameter sequence number	CIPVCPAV	CIPVCPAI

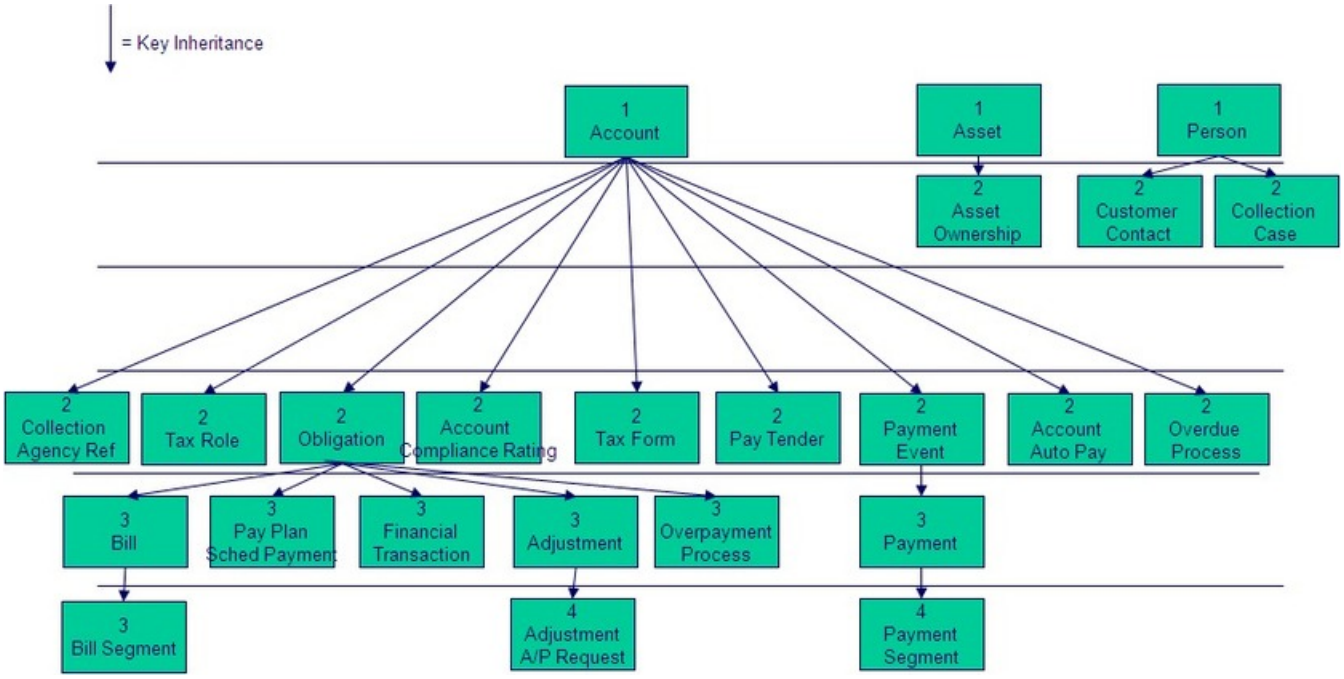
Case Suggestions

This maintenance object includes a character large object field that your organization may be using to capture implementation specific data as defined by your business objects. For records of this type, the process to insert the records to the staging table is responsible for populating the data in this CLOB as per the record's business object schema.

Program Dependencies

The programs used to assign production keys are listed under *Master Data* and *Transaction Data* (in the Table Names matrices). Most of these programs have no dependencies (i.e., they can be executed in any order you please). The only exceptions to this statement are illustrated in the following diagram.

The tiers in this diagram contain a box for each table whose key assignment program is dependent on the successful execution of other key assignment programs. The numbers that appear in the boxes describe the order in which these programs must be executed.

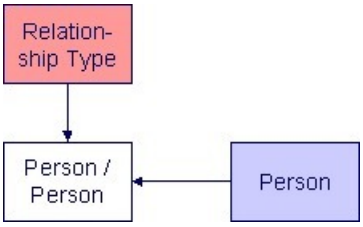


Please refer to the staging tables sections above for the respective names of the programs to allocate each table's keys.

CAUTION: Prior to running the key generation program for a particular object, it is required that any previously generated keys be cleared from the key allocation tables and the key allocation temporary storage table. It is recommended that the key allocation tables be analyzed between runs to maximize performance.

Appendix A - Entity Relationship Diagramming Standards

Because all data is stored in relational table, you need to be able to read diagrams that illustrate relationships between the various tables. The following entity diagram uses every diagramming notation used in this course:



Entity

Every box on the above diagram represents an entity (i.e., a table). An entity may be a physical entity, such as a Person, or a logical construct, such as an Account.

Color Coding

If you can view this document in color, you will notice that each entity is colored. The color indicates a logical grouping of entities. For example, form related entities are one color and taxpayer information related entities are a different color.

Some entities are not color-coded (i.e., they are white). These entities do not have a dedicated page, as they are part of a parent entity. For example, the Person / Person entity is related to the Person object and does not have its own maintenance object.

The following table describes the colors utilized in the documentation:

Color	*Grouping*
	Taxpayer Information
	Admin (Control) Table. These tables are referenced as foreign keys on master and transaction tables. We do not document the names of these tables in this document as the table names are easily accessible using the Table transaction.
	Child table - the entity is maintained in respect of a higher level entity.
	Lookup - the values in these types of entities are defined in a special table referred to as the lookup table. In order to determine the valid values for a column that references a lookup table, use the name of the column as the search value on the Lookup user interface.
	Metadata.
	Adjustment
	Financial Transaction

	Rates
	Billing
	Collection
	Overpayment
	Forms
	Case

Relationships

The solid line connecting the two entities that is terminated by an arrow represents a relationship between two entities. You read the relationship from the entity without the arrow to the entity with the arrow. For example, the line between account type and Account illustrates that an account type may have many Accounts, but an Account may be part of a single account type.

Appendix B - Multiple Owners In A Single Database

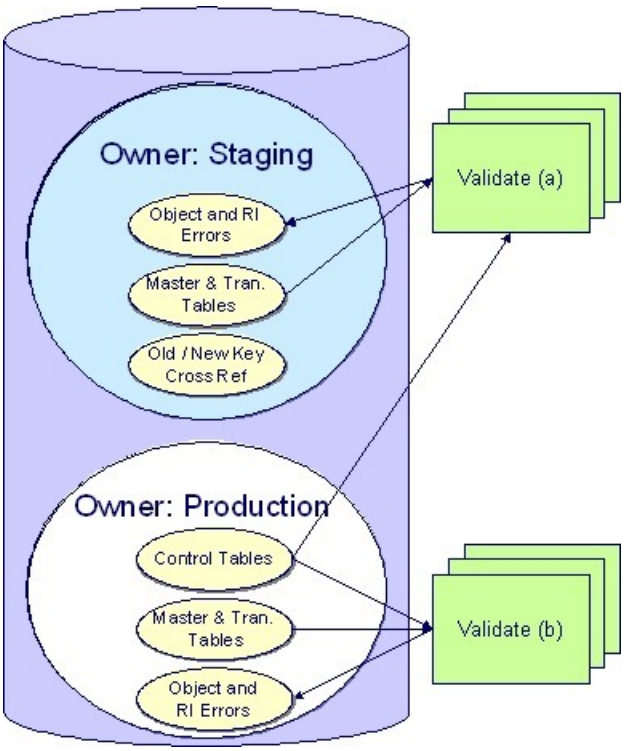
In the schematic referenced in the *Introduction*, you'll notice that there are two table owners in the system database. We refer to the first owner as "staging" and the second owner as "production".

The staging owner is linked to the tables into which you insert your pre-validated data. These tables have an owner ID of **CISSTG**.

> **NOTE: Multiple staging databases.** It is possible to have multiple staging databases. In this situation, each one would have a unique owner ID, e.g., **CISSTG1**, **CISSTG2**, etc.

The production owner is linked to the tables used by your production system. These tables have an owner ID of **CISADM**.

When the validation programs 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 master and transaction data need to use the staging owner (**CISSTG**). Whereas the SQL statements that access control tables need to use the production owner (**CISADM**).



But notice that when these same programs run against production (Validate (b)), the SQL statements will never access the staging owner. Rather, they all point at the production owner.

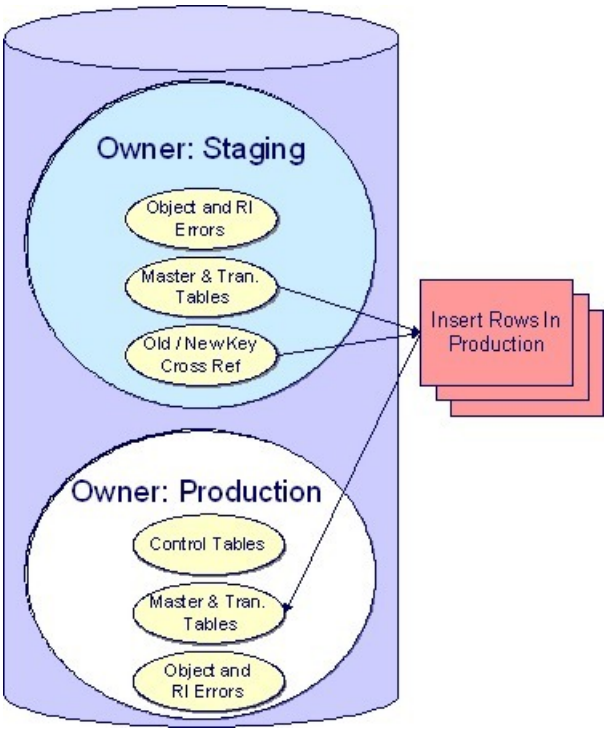
This is accomplished as follows:

- A separate application server must exist for each owner. Each application server points at a specific Tuxedo server. The Tuxedo server references a specific database user ID.
- The database user ID associated with the staging database 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 database uses **CISADM** as the owner for the master, transaction, and control tables.

You may wonder why we went to this trouble. There are several reasons:

- We wanted to re-use 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.

While the redirection of owner ID's is a useful technique for the validation programs, it cannot be used by the key assignment and production insert programs? Why, because these programs have to access the same tables but with different owners. For example, the program that inserts rows into the person table must select rows from staging.Person and insert them into production.Person.



This is accomplished as follows:

- Views exist for each table that exists in both databases. These views have hard-coded the database owner **CISADM** (production). For example, there is a view called CX_PER that points at person table in production.
- The key assignment and insertion programs use these views whenever then need to access production data.

Appendix C - Known Oddities

Be aware that the following tables reference master data (e.g., persons, accounts). This means that if you look at them using a user ID that defaults ownership to the staging level, you will not be able to see the related master data (because the person / account doesn't exist in the staging owner's tables).

- Collection Agency. References a person.
- Tender Source. References a suspense obligation.

Appendix D - Index Creation Script

The following script extracts the index DDL for CK tables and saves them in a script called ***create_ck_index.sql***.

```
set pagesize 0
set linesize 3000
set long 500000
set longchunksize 500000
set trimspool on
set feed off
spool alterindex.sql
```

```
SELECT 'ALTER INDEX '||
u.index_name||' PARALLEL 32 NOLOGGING ;' FROM USER_INDEXES u where u.table_name like 'CK%';
spool off
@alterindex.sql
spool create_ck_index.sql
SELECT REPLACE ( DBMS_METADATA.GET_DDL('INDEX',u.index_name),'"','')||';' FROM USER_INDEXES u where u.table_n
%';
SELECT 'ALTER INDEX '||
u.index_name||' NOPARALLEL LOGGING ;' FROM USER_INDEXES u where u.table_name like 'CK%';
spool off;
exit;
```

The ***create_ck_index.sql*** script can be used to recreate CX_ID and CI_ID indexes on the CK_<table_name> after all *key assignment tiers* have executed with MODE = "I":