Oracle® Retail Point-of-Service

Operations Guide

Release 12.0.9IN

July 2009

ORACLE®

Oracle® Retail Point-of-Service Operations Guide, Release 12.0.9IN

Primary Author: Graham Fredrickson

Contributing Author: Divya Begur

Contributor: Sneha Kumari

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Preface

Oracle Retail Operations Guides contain the requirements and procedures that are necessary for the retailer to configure Point-of-Service, and extend code for a Point-of-Service implementation.

Audience

The audience for this document is developers who develop code for Oracle Retail Point-of-Service. Knowledge of the following techniques is required:

- Java Programming Language
- Object-Oriented Design Methodology (OOD)
- Extensible Markup Language (XML)

Related Documents

For more information, see the following documents in the Oracle Retail Point-Of-Service documentation set:

- *Oracle Retail Point-Of-Service Release Notes*
- *Oracle Retail Point-Of-Service Installation Guide*
- *Oracle Retail Point-Of-Service User Guide Addendum*
- *Oracle Retail Strategic Store Solutions Data Model*

See also:

- Oracle Retail Merchandising System 12.0.10IN documentation
- Oracle Retail Integration Bus 12.0.9IN documentation
- Oracle Retail Invoice Matching 12.0.8.4IN documentation
- Oracle Retail Store Inventory Management 12.0.10IN documentation
- Oracle Retail Price Management 12.0.10IN documentation
- Oracle Retail Back Office 12.0.9IN documentation
- Oracle Retail Strategic Store Solutions 12.0.9IN documentation
- Oracle Retail Central Office 12.0.9IN documentation
- Oracle Retail Security Manager 12.0.4 documentation

Customer Support

To contact Oracle Customer Support, access My Oracle Support at the following URL:

- https://metalink.oracle.com

When contacting Customer Support, please provide:

- Product version and program/module name
- Functional and technical description of the problem (include business impact)
- Detailed step-by-step instructions to recreate
- Exact error message received
- Screen shots of each step you take

Review Patch Documentation

If you are installing the application for the first time, you install either a base release (for example, 12.0) or a later patch release (for example, 12.0.10IN). If you are installing a software version other than the base release, be sure to read the documentation for each patch release (since the base release) before you begin installation. Patch documentation can contain critical information related to the base release and code changes that have been made since the base release.

Oracle Retail Documentation on the Oracle Technology Network

In addition to being packaged with each product release (on the base or patch level), all Oracle Retail documentation is available on the following Web site (with the exception of the Data Model which is only available with the release packaged code):

http://www.oracle.com/technology/documentation/oracle_retail.html

Documentation should be available on this Web site within a month after a product release. Note that documentation is always available with the packaged code on the release date.

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1

Backend System Administration and Configuration

This chapter covers options for configuring Point-of-Service normally carried out by an administrator before the system goes into general use. It covers the following topics:

Defining Security with Roles

In Point-of-Service, you specify user access to the application by assigning a role to each user. Each role contains a list of the security access points of the application, specifying which access points that role is allowed to use. You can create as many roles as you need.

Roles are typically named for job titles; by creating a manager role and a clerk role, for example, you define two classes of employees with different access to Point-of-Service functions. All clerks, however, would have the same access rights.

The procedures in this section describe how to modify existing roles or add new ones. For a list of security access points, see "Secured Features".

Modifying a Role

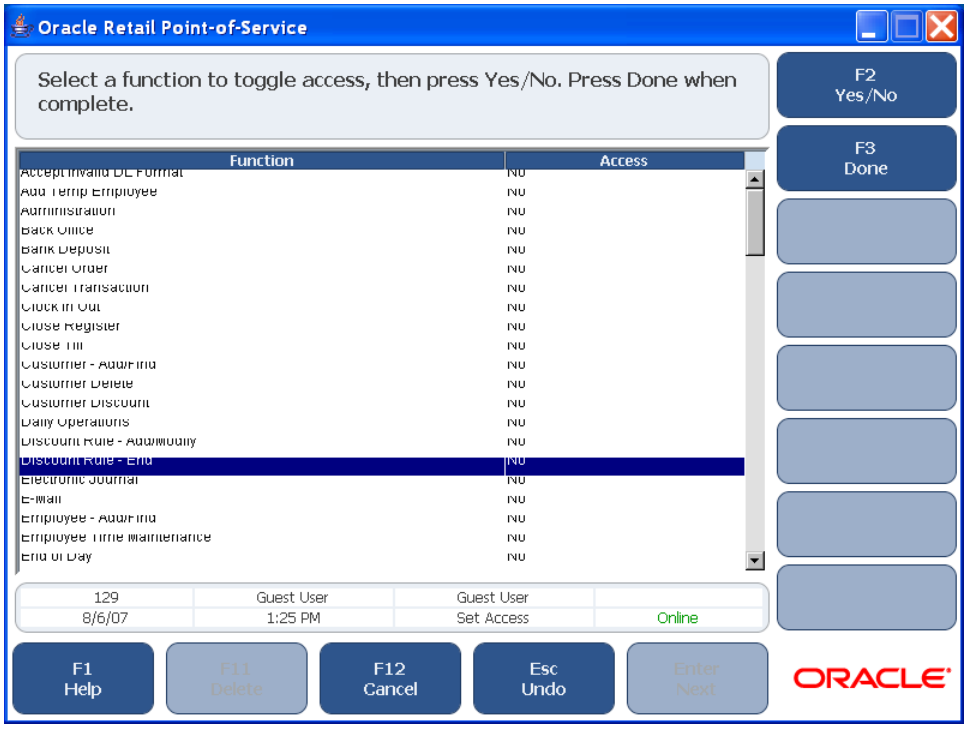
To modify a role:

1. From the Main Options screen, choose **F4/Administration**, **F4/Security**, **F3/Roles**, and **F2/Find**.
2. Select a role name from the list and choose **Enter/Next**.

   The Edit Role screen appears with the selected role displayed.

3. Choose **Enter/Next** to display the Set Access screen for the selected role.

Figure 1–1 Set Access Screen



4. To edit the role, scroll through the list of functions. While a function is selected, choose **F2/Yes/No** to toggle the access for that function.
5. When you are finished, choose **F3/Done** to save the settings.

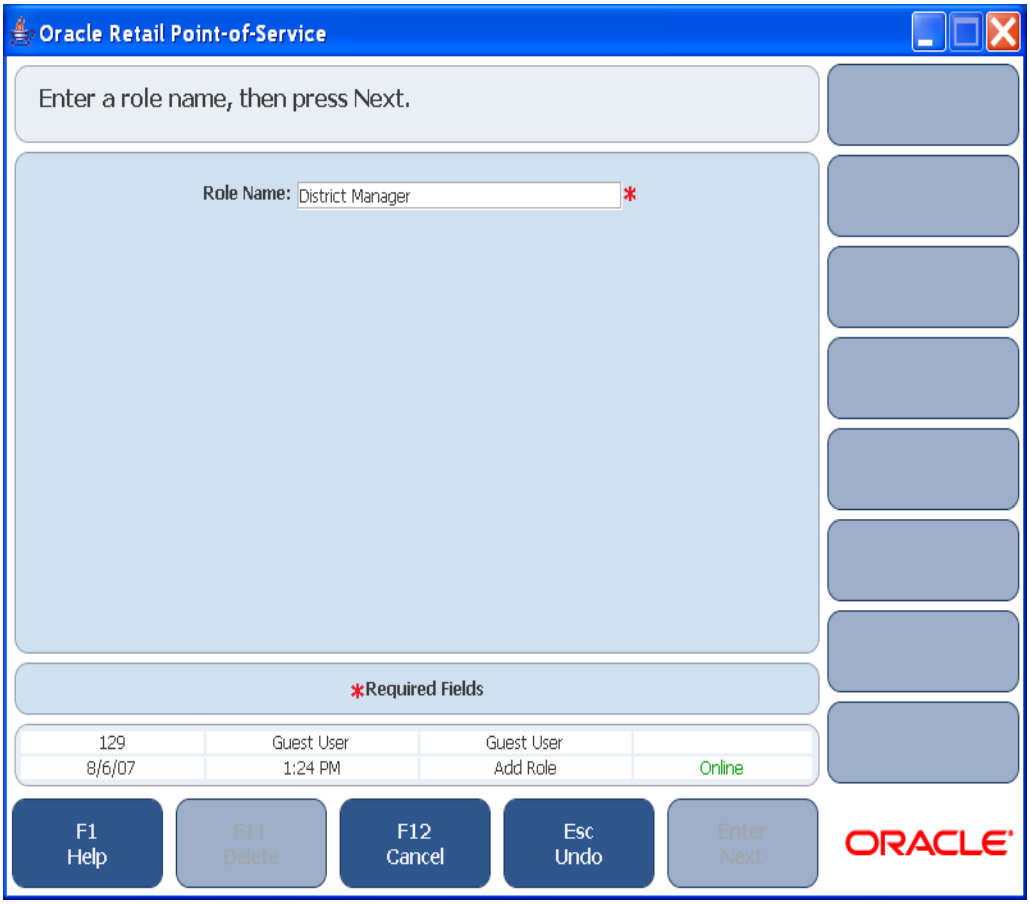
Adding a Role

To add a role:

1. From the Main Options screen, choose **F4/Administration**, **F4/Security**, **F3/Roles**, and **F3/Add**.

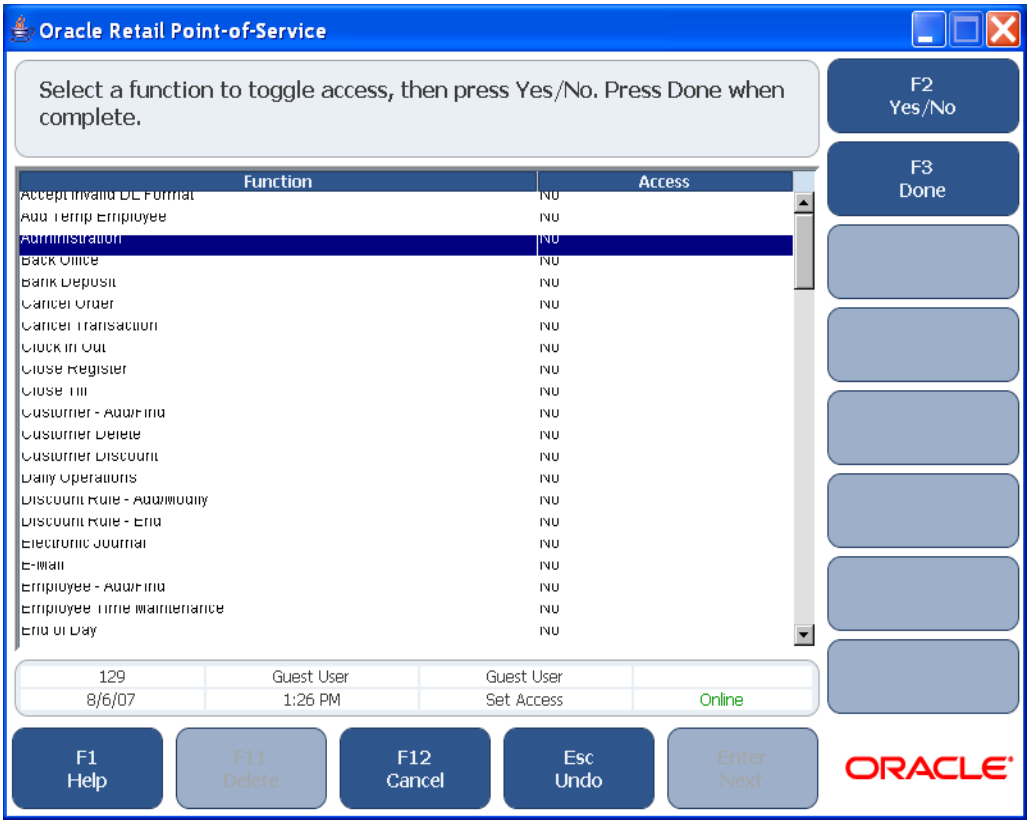
The Add Role screen appears.

Figure 1–2 Add Role Screen



2. Enter the new role name and choose **Enter/Next**. The Set Access screen appears. Initially, access for all functions is set to No.

Figure 1–3 Set Access Screen



3. Select the functions that need to be enabled or disabled for the role and choose **F2/Yes/No** to toggle to between Yes and No.
4. Continue selecting all functions that need to be changed. When finished, choose **F3/Done** to save the settings.
5. Choose **Esc/Undo** or F12/Cancel to return to the Security Options screen.

Secured Features

The following table lists all of the functions within Point-of-Service for which security access points exist. When a user attempts to use a function protected by one of these security access points, the system checks whether the user's role allows that function.

Table 1–1 identifies Point-of-Service security access points.

Table 1–1 Security Access Points

Access Point	Access Point	Access Point	Access Point
Accept Invalid DL Format	Administration	Override of Soft Declined Check	Back Office
Bank Deposit	Call Referral Accept for check, credit, or gift card	Cancel Special Order	Cancel Transaction
Close Register	Close Till	Reprint Gift Receipt	Customer - Add/Find

Table 1–1 Security Access Points

Access Point	Access Point	Access Point	Access Point
Customer Delete	Daily Operations	Reprint Receipt	Discount Rule Add/Modify
Discount rule End	Electronic Journal	E-mail	Employee - Add/Find
Employee Time Maintenance	End of Day	Training Mode - Enter/Exit	Item Maintenance
Item/Transaction Discounts	Item/Transaction Gift Registry	Item/Transaction Sales Associate	Item/Transaction Tax Modifications
Job Queue	Kit Maintenance	Layaway Delete	Modify Layaway Fees
Modify Markdowns	No Sale	Open Register	Open Till
Orders	Override Declined Check	Override Declined Credit	Override Restocking Fee
Override Tender Limits	Parameters Add/Modify	Customer Discount	Point-of-Service
Price Change	Price Override	Price Promotion	Queue Management
Reason Codes	Receiving	Transaction Details	Register Reports
Reset Hard Totals	Return	Role - Add/Find	Schedule Jobs
Service Alert	Start of Day	Parameter Groups Access	Store Operations
Till Pay-in	Till Pay-out	Till Pickup/Loan	Till Reconcile
Transfer	Void	Web Store	Add Temp Employee
Cancel Order	Clock In Out	Customer Discount	Money Order
Redeem	Reentry On/Off		

Security Implementation -- Warnings and Advice

Oracle Retail is committed to providing our customers software, that when combined with overall system security, is capable of meeting or exceeding industry standards for securing sensitive data. By maintaining solutions based on standards, Oracle Retail provides the flexibility for retailers to choose the level and implementation of security without being tied to any specific solution.

Each retailer should carefully review the standards that apply to them with special emphasis on the Payment Card Industry (PCI) best practices. The Oracle Retail applications represent one portion of the entire system that must be secured; therefore, it is important to evaluate the entire system including operating system, network, and physical access.

The following recommendations are required by Visa:

1. Don't use database or operating systems administrative accounts for application accounts. Administrative accounts and any account that has access to sensitive data should require complex passwords as described below. Always disable default accounts before use in production.
2. Assign a unique account to each user. Never allow users to share accounts. Users that have access to more than one customer record should use complex passwords.
3. Complex passwords should have a minimum length of 7 characters, contain both numeric and alphabetic characters, be changed at least every 90 days, and not repeat for at least 4 cycles.

4. Unused accounts should be disabled. Accounts should be temporarily disabled for at least 15 minutes after six invalid authentication attempts.
5. If sensitive data is transmitted over a wireless network, the network must be adequately secure, usually through use of WPA, 802.11i, or VPN.
6. Never store sensitive data on machines connected to the internet. Always limit access using a DMZ and/or firewall.
7. For remote support, be sure to use secure access methods such as two-factor authentication, SSH, SFTP, and so forth. Use the security settings provided by third-party remote access products.
8. When transmitting sensitive data, always use network encryption such as SSL.

Following these recommendations does not necessarily ensure a secure implementation of the Oracle Retail products. Oracle recommends a periodic security audit by a third-party. Please review the PCI standards for additional information.

Password Policy

One of the most efficient ways to manage user access to a system is through the use of a password policy. The policy can be defined in the database. One policy is defined and applied to all users for Oracle Retail Point-of-Service. The Password Policy consists of the following set of out-of-the-box criteria. For this release, customizing the password policy criteria is permitted through enabling status code system settings and updating password policy system settings to the desired setting.

In order to be PCI compliant the Password Policy needs to be set to the following:

- Force user to change password after 90 days.
- Warn user of password expiration 5 days before password expires.
- Lockout user 3 days after password expires or password is reset.
- Lockout user after 6 consecutive invalid login attempts.
- Password must be at least 7 characters in length.
- Password must not exceed 22 characters in length.
- Password must not match any of the 4 previous passwords.
- Password must include at least 1 alphabetic character(s).
- Password must include at least 1 numeric character(s).

Once the desired password policy has been defined, it is applied to all authorized users of the Oracle Retail Point-of-Service, Oracle Retail Mobile Point-of-Service, Oracle Retail Back Office, Oracle Retail Labels and Tags, and Oracle Retail Central Office application once per database.

Password Reset

Users locked out of the system must request the assistance of an administrator to have his/her password reset. The administrator resets the password by selecting the reset password option in Oracle Retail Central Office, Oracle Retail Back Office or Oracle Retail Point-Of-Service, when applicable. When a user password is reset the system generates a temporary random password. The reset password status is immediately set to 'expired' prompting the user to change the temporary password at the next successful login.

Each time a password is changed, the previous password is stored according to the 'Passwords must not match any of the N previous passwords' criteria set for the policy associated with the assigned user role. Temporary passwords may not comply with the password policy and are not stored in the password list.

Do the following to change the password of another user:

1. Click **Administration**.
2. Log in.
3. Click **Security**.
4. Click **Employee**.
5. Click **Find**.
6. Search for the user whose password you are resetting. You can search by user ID, name or role. For example, to search by name, click **Emp. Name**, then enter the user's first name and last name.
7. Review the user's information.
8. Click **Reset Password**.

   You will see a message asking if you are sure you want to reset the password. Click **Yes**.
9. A screen with the user's new temporary password is shown.

   Note: This temporary password is provided on this screen only. Record this temporary password. The password is not recorded or logged, and is not provided by email. Administrators must provide this temporary password to the user.

10. Click **Enter**.

Viewing or Modifying the Password in the Database

To reset the password in the database, modify the following tables to disable password criteria:

- SELECT ID_PLCY, SC_PLCY, NM_PLCY, DE_PLCY FROM CO_PLCY_PW
- SELECT ID_CRTR, CD_CRTR, QY_VL_CFG_DFLT, DE_CRTR FROM CO_CRTR_PW
- SELECT ID_PLCY, ID_CRTR, SC_PLCY_CRTR, QY_VL_CFG FROM CO_CRTR_PLCY_PW

The following is an example of how to disable the criteria:

```
UPDATE CO_CRTR_PLCY_PW SET SC_PLCY_CRTR = '0' WHERE ID_CRTR = 1 AND ID_PLCY = 1
```

Note that **0** is used for disabling the criteria. You can disable as many criterias as you want.

Password Policy and Password Change

Do the following to change your password:

1. Click **Administration**.
2. Click **Change Password**.
3. Provide the following:
   - Your user ID
   - Your current password
4. Enter a new password.
5. Enter the new password again.
6. You will see a confirmation screen.
7. Click **Enter**.

Do the following to add a user:

1. Click **Administration**.
2. Log in.
3. Click **Security**.
4. Click **Employee**.
5. Click **Add**.
6. Click **Standard** or **Temp**.
7. Enter the following:
   - First name
   - Last name
   - Employee ID
8. Select a role, for example, Administrator.
9. Select a status, for example, Active.
10. Select a Preferred Language, for example, English (United States).
11. Click **Enter**.
12. A screen with the new user's temporary password is shown.

> **Note:** This temporary password is provided on this screen only. Record this temporary password. The password is not recorded or logged, and is not provided by email. Administrators must provide this temporary password to the user.

Reason Codes

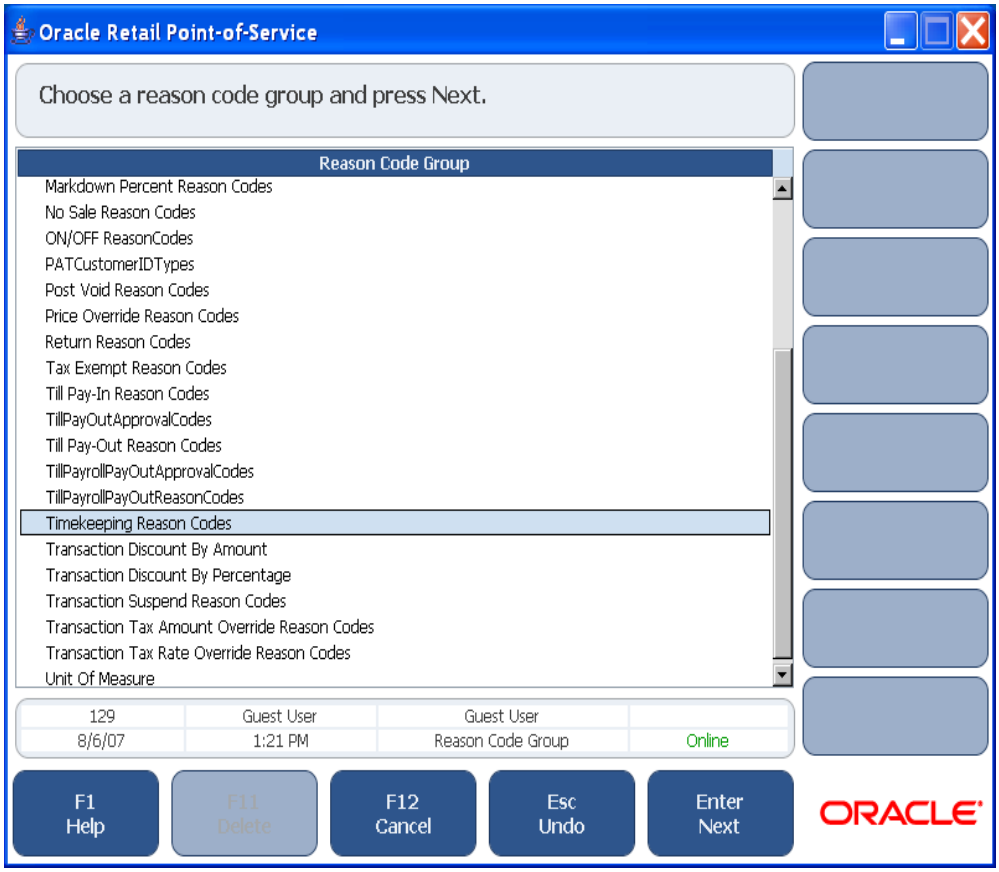
Reason codes are items offered to the end user as choices in lists, for example, the set of possible reasons for a price override. These choices normally vary for each corporation, and they must be configured to suit your local requirements and policies. The system comes with a predetermined set of reason code groups; within each group, you can add, remove, and modify the list of codes, all from within Point-of-Service interface.

For a complete list of available reason code groups, contact Oracle Retail for a copy of the Reason Codes Functional Requirements.

To modify reason codes:

1. From the Main Options screen, choose **F4/Administration**, **F4/Security**, and **F5/Reason Codes**.

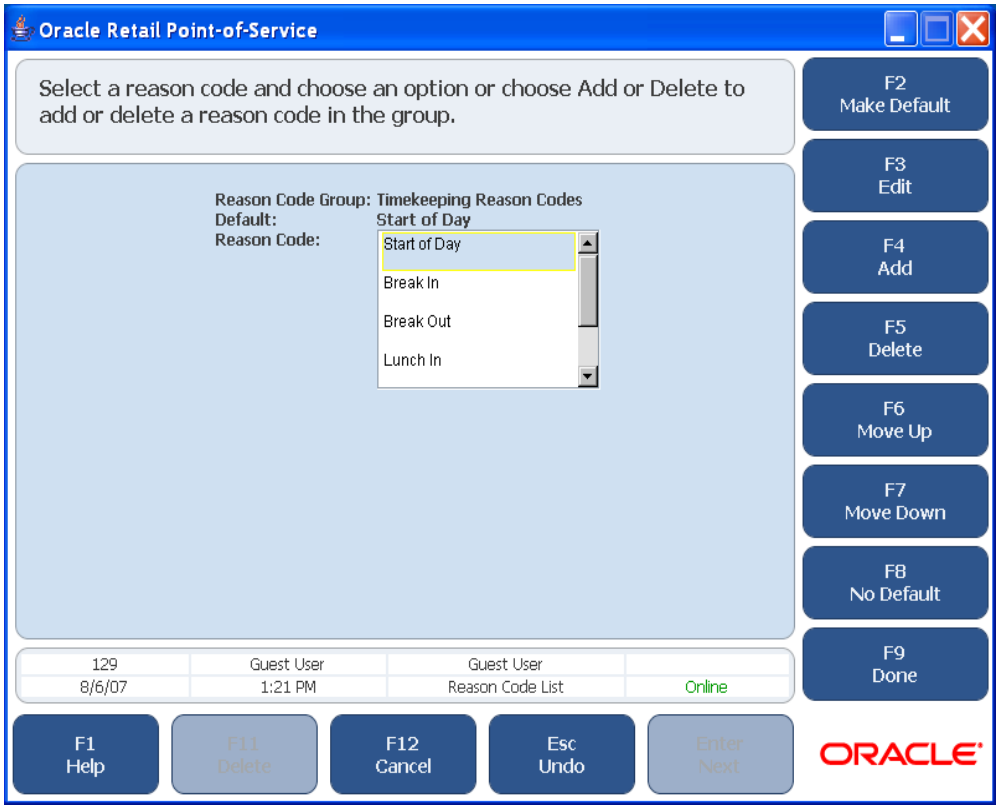
Figure 1–4 Reason Code Group Screen



2. From the Reason Code Groups screen, select the group you want to view or edit. The Reason Code List screen appears.

Note: If the Edit Reason Codes parameter is set to No, the reason codes are for viewing only and the ability to set default, edit, add, delete, or change a reason code is not offered.

Figure 1–5 Reason Code List Screen

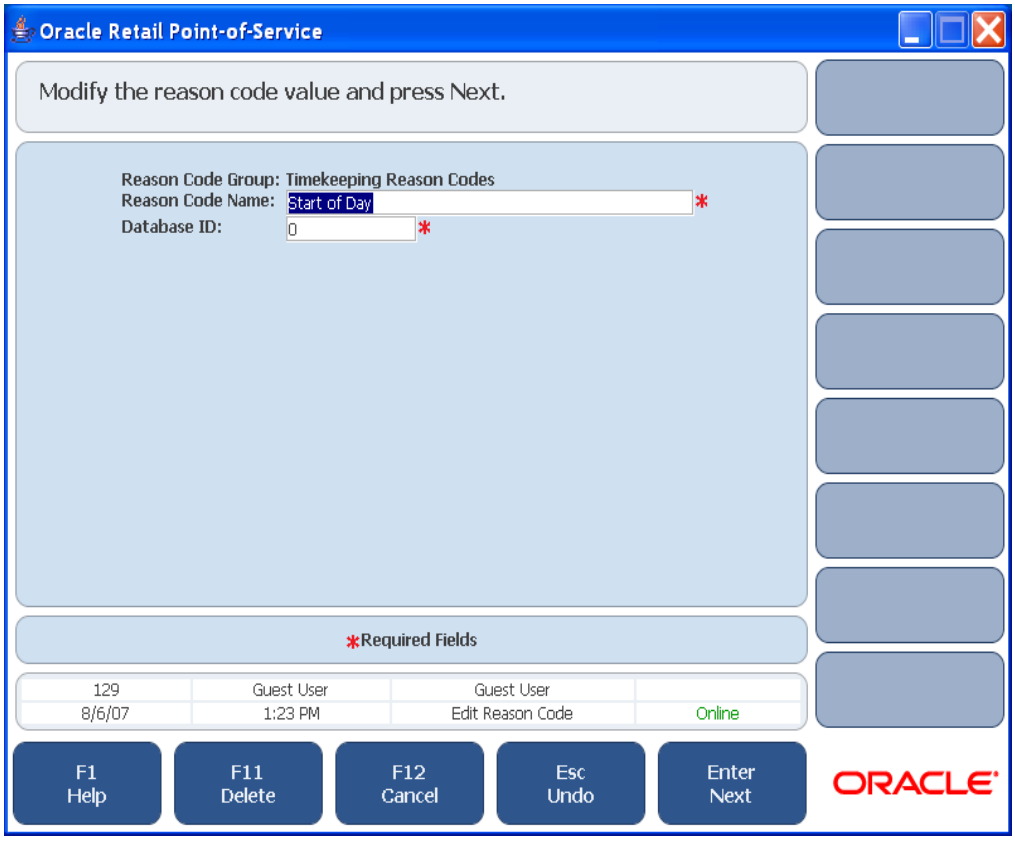


3. Select one of the following:

   - To delete a code, select it, then choose **F5/Delete**.
   - To change the position of a code in the list, select it, then choose **F6/Move Up** or **F7/Move Down**.
   - To add a code, choose **F4/Add**. The Add Reason Code screen appears. Enter a name and database ID, then choose **Enter/Next**.
   - To change the name or database ID of a code, select the code in the list and choose **F3/Edit**.

The system displays the Edit Reason Code screen. Edit the values shown, then choose **Enter/Next**.

Figure 1–6 Edit Reason Code Screen



4. Press **F2/Make Default** to save your changes and make the selected settings the new default.
5. Choose **Enter/Next**. The changes are saved, and the system displays the Reason Code Group screen.

Configuring Transaction ID Lengths

You can change the lengths of some of the most common data values associated with transactions. These changes affect every aspect of the software and should not be undertaken lightly. Changes should only be performed before Point-of-Service is installed. Changes to these settings can require substantial testing to establish that no problems result from the change.

Understanding Transaction IDs

A transaction ID is a composite key made from the store number, register number, and sequence number. When combined, these attributes create a unique number for each transaction. Transaction IDs can also include an eight-digit date to ensure that they are unique. For example, if you restart your sequence numbers on a daily basis, the date value prevents transaction ID repetition.

Key points about the transaction ID and related properties:

- You can change the length of the store, register, and sequence numbers which contribute to the Transaction ID. You cannot directly configure the length of the transaction ID itself.
- System-generated unique Layaway numbers, Special Order numbers, and Web Order numbers are not affected by changes to the transaction ID rules.
- A maximum of 20 digits of transaction ID can be printed on receipts using Point-of-Service current barcode format.
- If the value of a store, register, or sequence number has fewer than the specified number of digits, Point-of-Service uses leading zeroes to pad the number to the required number of digits; a four-digit sequence number whose value is 22 shows up within the transaction ID as 0022.
- Dates can be used in transaction IDs to help ensure unique IDs. If they are used, they are expressed as an 8-digit number; this is set by the `TransactionIDBarcodeDateFormat` property in the `domain.properties` file. The only valid values for this property are no value and `yyyyMMdd`. The date format does not vary from one locale to another.
- You can set the transaction sequence start number in the database.
- When you enter a transaction ID manually, the trailing date is optional.

Changing Transaction ID Lengths

To change ID lengths, edit the values in the Transaction ID section of the `\OracleRetailStore\domain\config\domain.properties` file in your source code control system. See "Understanding Transaction IDs" for more information on what these properties mean.

Example 1–1 Changing Transaction ID Length

```
# Transaction ID
TransactionIDStoreIDLength=5
TransactionIDWorkstationIDLength=3
TransactionIDSequenceNumberLength=4
#TransactionIDBarcodeDateFormat=yyyyMMdd
TransactionIDBarcodeDateFormat=
TransactionIDSequenceNumberSkipZero=false
TransactionIDSequenceNumberMaximum=9999
```

Configuring the Purchase Date Field for Returns and Voids

You must configure Point-of-Service to display the Purchase Date field in the Receipt Info screen when conducting a return or a void.

To do this, you must modify the domain.properties file in the `OracleRetailStore\<Client or Server>\pos\config` folder. Uncomment the following field:

```
TransactionIDBarcodeDateFormat=yyyyMMdd
```

By default, this field in domain.properties contains no defined date format. This prevents the Purchase Date field from being displayed in the Receipt Info screen.

Configuring RMI Timeout Intervals

You can configure remote method invocation (RMI) timeout intervals at two levels:

- The JVM level (Linux installs only)
- The level of managers and technicians

If you are performing a Linux installation, configure the JVM as described in "Setting the RMI Timeout Interval for the JVM Under Linux", below. If you determine that RMI connections are timing out, you can use one of the other procedures in this section, "Setting the RMI Timeout Interval for All Manager and Technician Calls" or "Setting the RMI Timeout Interval for a Specific Technician".

Setting the RMI Timeout Interval for the JVM Under Linux

Oracle Retail has found it useful to change the RMI timeout interval for the JVM under Linux. To do this, change the command that launches the JVM, adding the JVM flag: `Dsun.rmi.transport.connectionTimeout=<X>` where `<X>` represents the time-out period in milliseconds.

This tells the JVM to time out socket connections used by RMI after X milliseconds of inactivity. Linux quickly notifies the JVM when a socket connection cannot be established. Linux is slow, however, to notify the JVM when an open socket connection has been broken. By setting the connection time-out low, you can cause the sockets to disconnect quickly after each RMI call, thereby requiring a connect for each subsequent RMI call.

Modifying the TCP Connection Timeout on Linux

Sometimes, Linux keeps the tcp connection active even after Point-of-Service determines that the socket has timed out. There are three OS level settings that work together to determine how long to keep the tcp connection open, which affects the observed system performance. To modify these level settings, at a Linux command line, enter:

```
sysctl -w net.ipv4.tcp_keepalive_time=<value>
sysctl -w net.ipv4.tcp_keepalive_intvl=<value>
sysctl -w net.ipv4.tcp_keepalive_probes=<value>
```

where <*value*> is an interval you specify.

Setting the RMI Timeout Interval for All Manager and Technician Calls

You can change the RMI timeout interval values for connections and reads in the `\OracleRetailStore\<Client or Server>\pos\bin\comm.properties` file. The value for the following properties apply to all manager and technician calls, unless overridden by a communication scheme for a specific call.

- `comm.socket.connectTimeout` - Specifies how long to wait for a socket connection to succeed. The value is in milliseconds.
- `comm.socket.readTimeout` - Specifies how long to wait before a read times out. The value is in milliseconds. This property causes the read to time out even if the socket is alive and well and transmitting data.

Setting the RMI Timeout Interval for a Specific Technician

To set the time-out for a specific technician, edit the `\OracleRetailStore\<Client or Server>\pos\bin\comm.properties` file and the conduit script as follows:

1. Add a new communication scheme to the `\OracleRetailStore\<Client or Server>\pos\bin\comm.properties` file. The following lines provide an example:

   ```
   comm.rmi_longread.readTimeout=120000
   comm.rmi_longread.connectTimeout=1000
   ```

   These lines establish a new communication scheme called rmi_longread with a read time-out of 120 seconds and a connect time-out of one second (since the values are in milliseconds).

2. Add the following property to the appropriate technician definition in the conduit script:

   ```
   <PROPERTY propname="commScheme" propvalue="rmi_longread"/>
   ```

   This sets the communication time-outs for all managers that connect to this technician. A manager who is sending a valet to this technician times out if the valet fails to complete within 120 seconds. It only attempts to connect to the technician for 1 second before giving up.

Configuring Third-party Tender Authorization

Initially, Point-of-Service system simulates tender authorization. You can connect Point-of-Service to a third-party tender authorization service to verify tenders. Setting up this connection requires two configuration steps:

- "Enabling the Financial Network Technician"
- "Setting the Merchant Number"

Enabling the Financial Network Technician

In your conduit script, locate a technician tag with the name `FinancialNetworkTechnician` and replace it with the tag shown in the following example.

```
<TECHNICIAN name="FinancialNetworkTechnician"
                class="ISDTechnician"
                package="com.extendyourstore.domain.manager.tenderauth.isd"
                export="Y">
        <PROPERTY
            propname="hostName"
            propvalue="<enter a URL here>"
        />
        <PROPERTY
            propname="hostPort"
            propvalue="<enter a port number here>"
            proptype="INTEGER"
        />
        <PROPERTY
            propname="reversalFile"
            propvalue="testRev.ser"
        />
        <PROPERTY
            propname="logFile"
            propvalue="isd.log"
        />
   </TECHNICIAN>
```

Setting the Merchant Number

Set the Merchant Number parameter to the appropriate value for the authorization service you are using. Merchant Number is an XML parameter in the Tender Authorization group. For information on changing the parameter, see the Oracle Retail Strategic Store Solutions Configuration Guide.

System Settings

System settings are values set in the Oracle Retail database. Changes to these settings must be made in the database by a database administrator or an application developer.

System settings can have significant effects on Point-of-Service system; do not make changes unless you are confident that you understand the effects. For a description of all available system settings, refer to the Oracle Retail Strategic Store Solutions Configuration Guide.

Adding or Changing Language Bundles

Point-of-Service supports additional languages when the appropriate strings are provided, bundled in a `.jar` file. The procedures in this section describe how to create new bundles and make them available to the application.

Naming Convention for Language Bundles

Use the following syntax to name language bundles:

<lowercase two-letter language abbreviation>_<uppercase two-letter country abbreviation>

The following table shows some sample uses of the convention.

Table 1–2 identifies sample language bundle names.

Table 1–2 Sample Bundle Names

Language	Bundle Directory	.jar file
United States English	`en_US`	`en_US.jar`

Creating a New Language Bundle

To create a new language bundle:

1. Create a new source code directory in `\OracleRetailStore\<Client or Server>\pos\locales` for the language bundle, starting with a copy of the `en_US` directory.
2. Replace the English text in the properties files and help files in your new directory with translated text.
3. Generate a `.jar` file using the naming convention described in the preceding section.

Configuring the System to Use a New Language Bundle

To add a new language and change the default language:

1. Store the new `.jar` file in `\OracleRetailStore\<Client or Server>\pos\lib\locales`.
2. Edit the `\OracleRetailStore\<Client or Server>\pos\config\application.properties` file.
   a. If you want the new locale to be the default locale, replace the value of the default_locale property with your new locale name.
   b. Add your new locale name to the list in the `supported_locales` property.

```
default_locale=en_US
supported_locales=en_US
```

3. If the standard installation script is not used, then include the new .jar in the classpath ahead of `pos.jar`.

Configuring Logging

Point-of-Service logging uses the Log4J tool. Configure Log4J by editing `\OracleRetailStore\<Client or Server>\pos\config\log4j.xml`. See the Apache documentation for Log4J at `http://logging.apache.org/log4j` for more information; a how-to can be found at `http://wiki.apache.org/logging-log4j/Log4jXmlFormat`.

2

Technical Architecture

This chapter contains information about the Oracle Retail Point-of-Service architecture. It begins with a general overview of the Oracle Retail architecture. Then it describes the layers of the Point-of-Service architecture, its frameworks, and design patterns.

Retailers have an increasing demand for enterprise information and customer service capabilities at a variety of points of service, including the Internet, kiosks and handheld devices. The retail environment requires that new and existing applications can be changed quickly in order to support rapidly changing business requirements. Oracle Retail Platform and Commerce Services enable application developers to quickly build modifiable, scalable, and flexible applications to collect and deliver enterprise information to all points of service.

The following image shows a high level view of the Oracle Retail architecture and components.

Figure 2–1 Oracle Retail Architecture

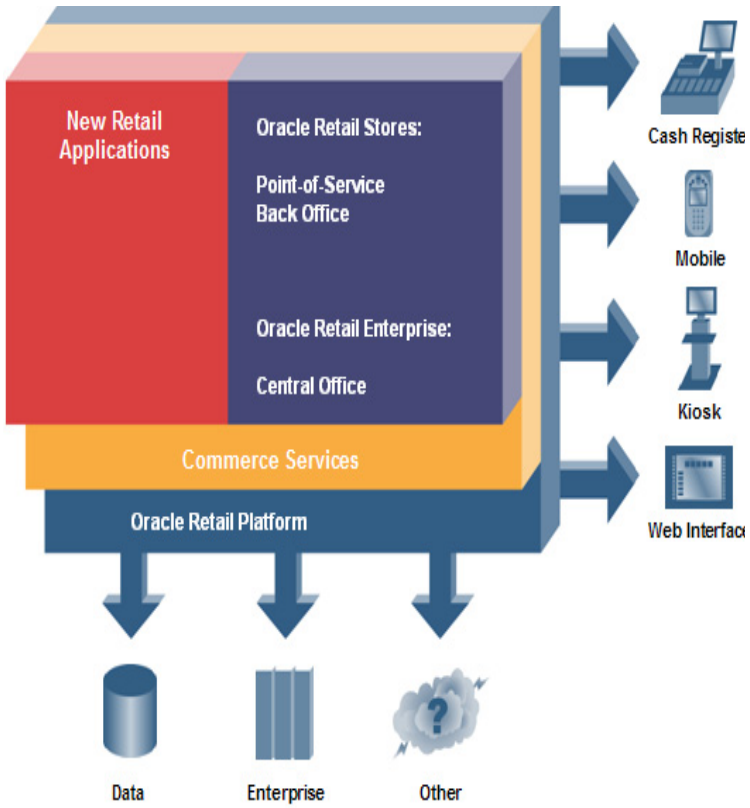


Table 2–1 describes the components in the diagram.

Table 2–1 Oracle Retail Architecture Components

Component	Description
Oracle Retail Platform	Oracle Retail Platform provides services to all Oracle Retail applications. It contains the tour framework, UI framework, and Manager/Technician frameworks. Oracle Retail Platform is not retail-specific.
Commerce Services	Commerce Services implement business logic. Commerce Services define data and behavior for retail applications. This component is referred to as Retail Domain in Point-of-Service.
Oracle Retail Applications	All Oracle Retail applications leverage the frameworks and services provided by Oracle Retail Platform and Commerce Services.
External Interfaces	Using frameworks and services, the applications are able to interface to other applications and resources.

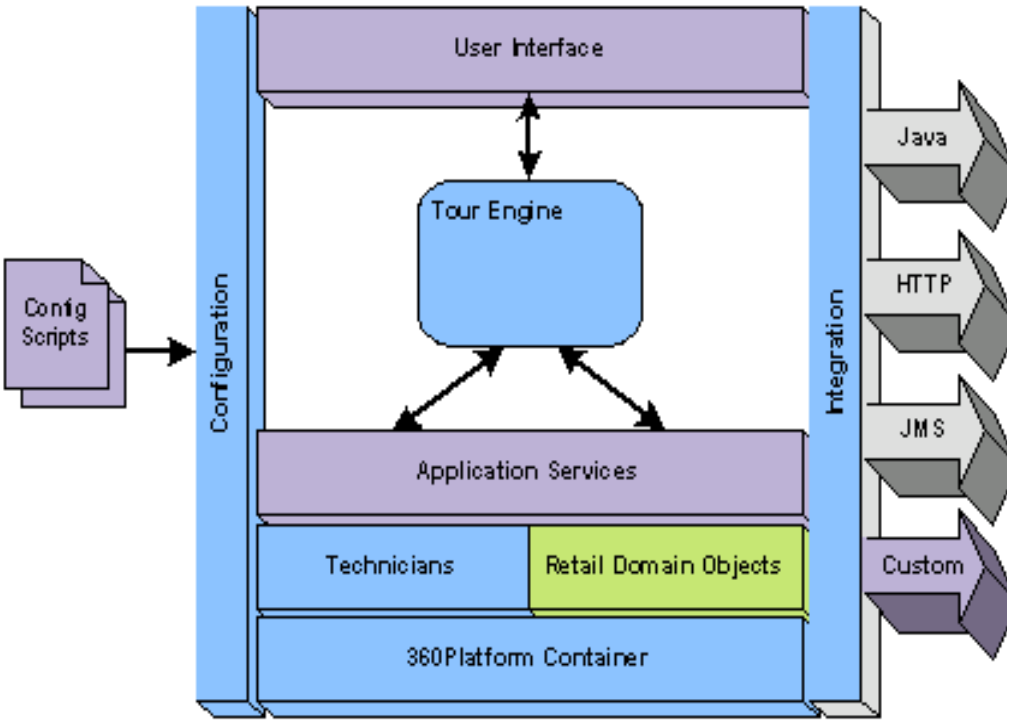
Advantages of the Oracle Retail architecture include its object-oriented design and scalability. The system is designed to support existing systems and customer extensions. Oracle Retail Platform frameworks support integration by adhering to retail and technology standards. The multi-tier design of the architecture allows the application to support numerous types of infrastructure.

Point-of-Service Architecture

Oracle Retail Platform contains reusable, highly customizable components for building and integrating retail applications with user interfaces, devices, databases, legacy systems, and third-party applications. Oracle Retail Platform also contains integration points for communicating with external resources.

The following diagram shows how the Tour engine controls the Point-of-Service system. This diagram is a more detailed view of the components that form the Commerce Services and Oracle Retail Platform tiers in the previous diagram.

Figure 2–2 Point-of-Service Architecture Layers



Beginning with configuration of the UI and Managers/Technicians, events at the user interface are handled by the tour engine, which interacts with tour code (Application Services) and Managers/Technicians (foundation services) as necessary, capturing and modifying the data stored in Retail Domain objects. Any communication with an integration point is handled by the Oracle Retail Platform container.

Table 2–2 describes the layers of the Point-of-Service architecture.

Table 2–2 Point-of-Service Architecture Layers

Component	Description
Configuration	Application and system XML scripts configure the layers of the application.
User Interface	This layer provides client presentation and device interaction.
Tour Engine	This mechanism handles the workflow in the application. The tour engine is the controller for Point-of-Service.
Application Services	This layer provides application-specific business processes. A tour is an application service for Point-of-Service.
Foundation Services	This layer provides stateless, application-independent technical services. Combined with the Retail Domain objects, it forms the Commerce Services layer. Technicians provide location-transparent services in Point-of-Service.
Retail Domain Objects	Pure retail-specific business objects that contain application data.
Oracle Retail Platform Container	This is an execution platform and application environment. The Tier Loader is the Oracle Retail Platform container for Point-of-Service.
Integration	This layer provides an integration framework for building standard and custom interfaces using standard integration protocols.

Frameworks

The Oracle Retail architecture uses a combination of technologies that make it flexible and extensible, and allow it to communicate with other hardware and software systems. The frameworks that drive the application are implemented by the Java programming language, distributed objects, and XML scripting. Described below, the User Interface, Business Object, Manager/Technician, Data Persistence, and Navigation frameworks interact to provide a powerful, flexible application framework.

Manager/Technician

The Manager/Technician framework is the component of Oracle Retail Platform that implements the distribution of data across a network. A Manager provides an API for the application and communicates with its Technician, which implements the interface to the external resource. The Manager is always on the same tier, or machine, as the application, while the Technician is usually on the same tier as the external resource.

The following figure shows an example of the Manager/Technician framework distributed on two different tiers.

Figure 2–3 Manager/Technician Framework

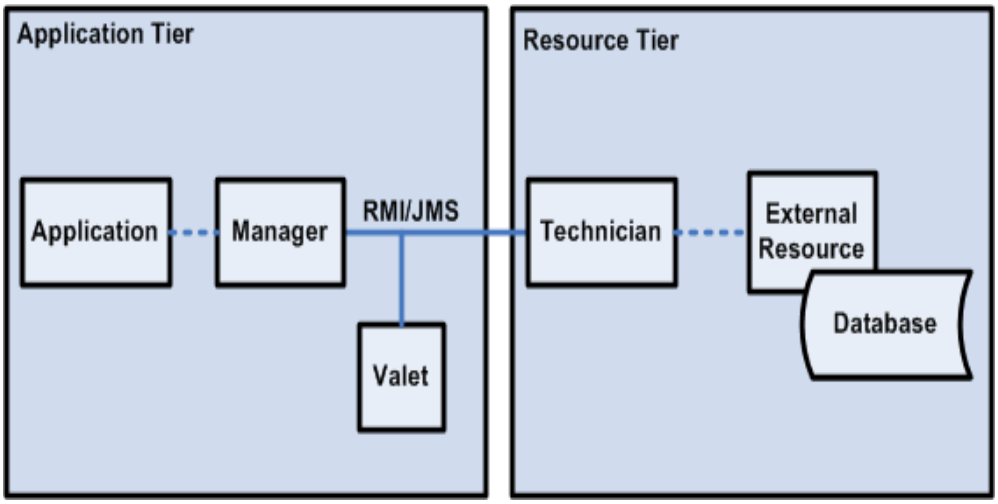


Table 2–3 describes the component of the Point-of-Service architecture.

Table 2–3 Manager/Technician Framework Components

Component	Description
Manager	Managers provide a set of local calls to the application. There are various types of managers to handle various types of activity. For example, the Data Manager receives the request to save data from Point-of-Service. It locates the appropriate Technician that should perform the work and insulates the application from the process of getting the work accomplished. The Manager is available only on the local tier.
Valet	The valet is the object that receives the instructions from the Manager and delivers them to the Technician. The valet handles data transfer across machines with RMI or JMS.
Technician	The Technician is responsible for communicating with the external resource. When a Technician receives a valet, it can handle it immediately or queue it for later action. The Technician can be remote from the Manager or on the local tier.

User Interface

The UI framework includes all the classes and interfaces in Oracle Retail Platform to support the rapid development of UI screens. In the application code, the developer creates a model that is handled by the UI Manager in the application code. The UI Manager communicates with the UI Technician, which accesses the UI Subsystem.

The following figure illustrates components of the UI framework.

Figure 2–4 UI Framework

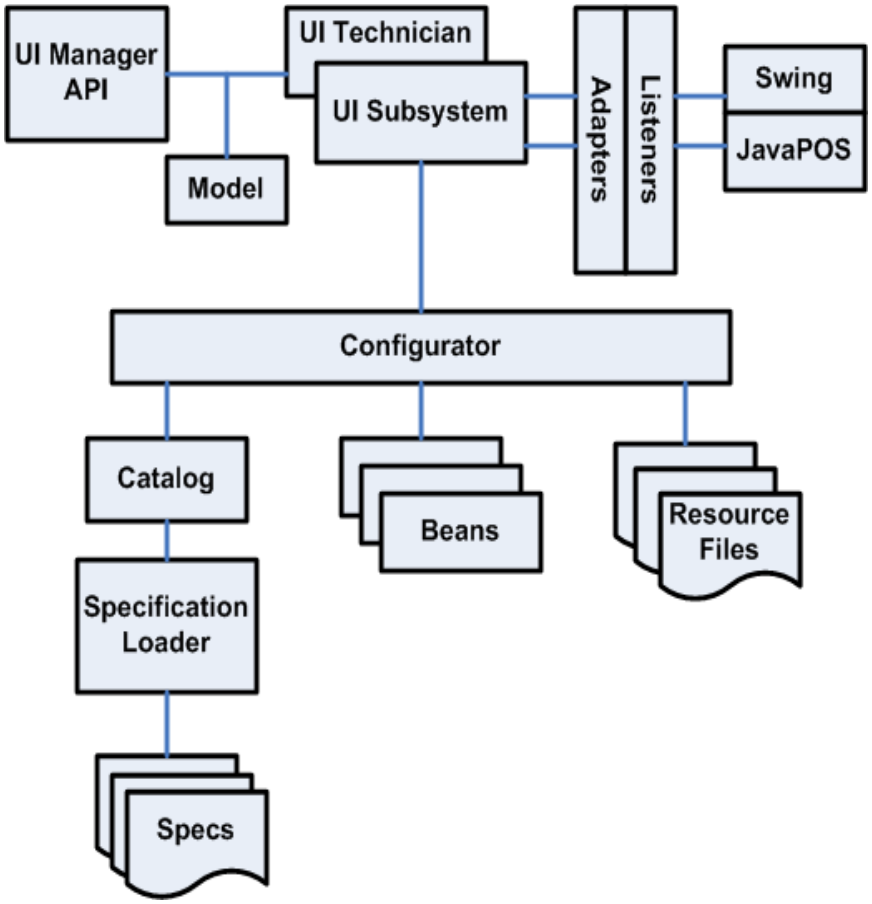


Table 2–4 describes the components of the UI framework.

Table 2–4 UI Framework Components

Component	Description
Resource Files	Resource files are text bundles that provide the labels for a screen. They are implemented as properties files. Text bundles are used for localizing the application.
Bean	Beans are reusable Java program building blocks that can be combined with other components to form an application. They typically provide the screen components and data for the workpanel area of the screen.
Specs	Specifications define the components of a screen. Display specifications define the width, height, and title of a window. Template specifications divide displays into areas. Bean specifications define classes and configurators and additional screen elements for a component. Default screen specifications map beans to the commonly used areas and define listeners to the beans. Overlay screen specifications define additional mappings of beans and listeners to default screens.
Specification Loader	Loaders find external specifications and interpret them. The loader instantiates screen specifications such as overlays, templates, and displays, and places the objects into a spec catalog.
Catalog	A Catalog provides the bean specifications by name. The UI Technician requests the catalog from the loader to simplify configurations.

Table 2–4 UI Framework Components

Component	Description
Configurator	The UI framework interfaces with beans through bean configurator classes, which control interactions with beans. A configurator is instantiated for each bean specification. They apply properties from the specifications to the bean, configure a bean when initialized, reset the text on a bean when the locale changes, set the bean component data from a model, update a model from the bean component data, and set the filename of the resource bundle.
Model	The business logic communicates with beans through screen models. Each bean configurator contains a screen model, and the configurator must determine if any action is to be taken on the model. Classes exist for each model.
UI Manager	The UI Manager provides the API for application code to access and manipulate user interface components. The UI Manager uses different methods to call the UI Technician.
UI Technician	The UI Technician controls the main application window or display. The UI Technician receives calls from Point-of-Service tours, locates the appropriate screen, and handles the setup of the screens through the UI Subsystem.
UI Subsystem	The UI Subsystem provides UI components for displaying and editing Point-of-Service screens. The UI subsystem enables application logic to be completely isolated from the UI components. This component is specific to the technology used, such as Swing or JSP.
Adapters	Adapters are used to provide a specialized response to bean events. Adapters can handle the events, or the event can cause the adapter to manipulate a target bean. Adapters implement listener interfaces to handle events on the UI. Adapters come from the Swing API of controls and support JavaPOS-compliant devices.
Listeners	Listeners provide a mechanism for reacting to user interface events. Listeners come from the Swing API of controls and support JavaPOS-compliant devices.

Business Object

The Commerce Services layer of the architecture contains the Business Object framework that implements the instantiation of business objects. The Business Object framework is used to create new business objects for use by Point-of-Service. The business objects contain data and logic that determine the path or option used by an application.

Figure 2–5 Business Object Framework

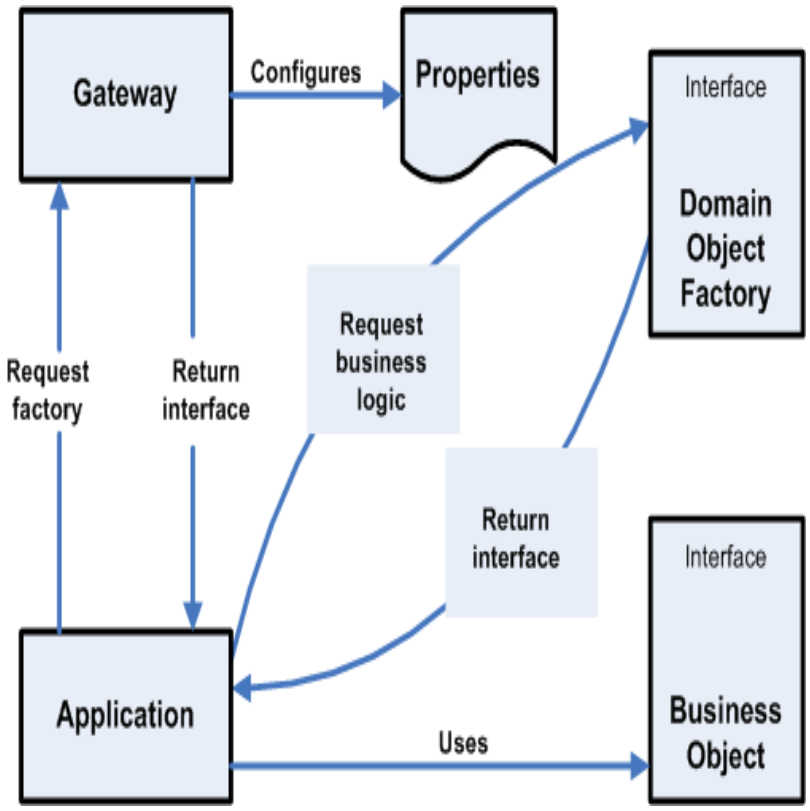


Table 2–5 describes the components in the Business Object framework.

Table 2–5 Business Object Framework Components

Component	Description
DomainGateway	The DomainGateway class provides a common access point for all business object classes. It also configures dates, times, decimals, percentages, currency, and numbers.
Domain Object Factory	The Domain Object Factory returns instances of business object classes. The application requests a Factory from the DomainGateway.
Business Object	Business objects define the attributes for application data. New instances are created using the Domain Object Factory.

Data Persistence

A specific Manager/Technician pair is the Data Manager and Data Technician used for data persistence. The Data Persistence framework illustrates how data gets saved to a persistent resource, such as the database or flat files on the register.

Figure 2–6 Data Persistence Framework

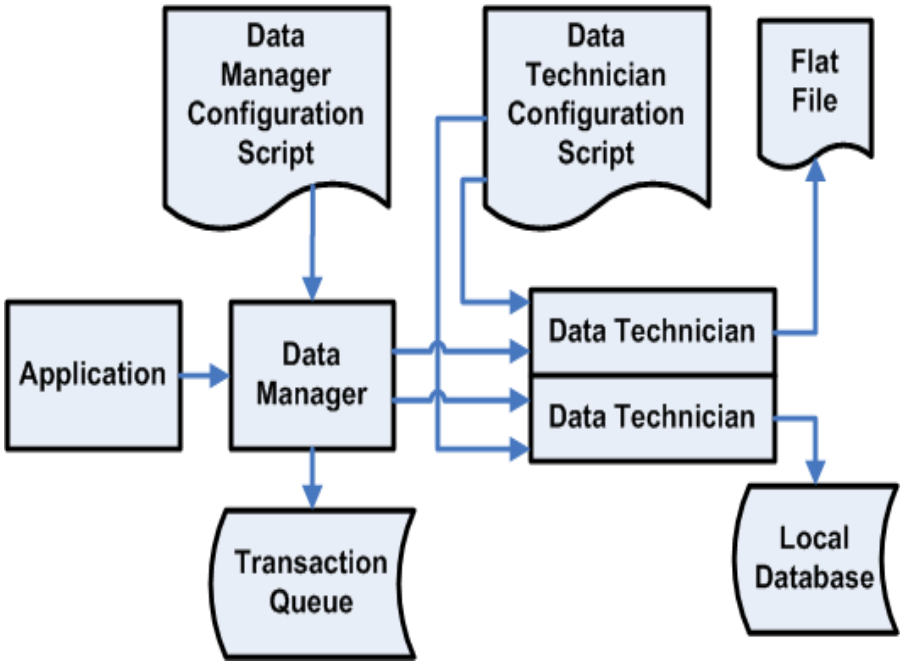


Table 2–6 describes the components in the Data Persistence framework.

Table 2–6 Data Persistence Framework Components

Component	Description
Data Manager	The Data Manager defines the application entry point into the Data Persistence Framework. Its primary responsibility is to contact the Data Technician and transport any requests to the Data Technician.
Data Manager Configuration Script	The Data Manager processes data actions from the application based on the configuration information set in the Data Manager Configuration Script. The Configuration Script defines transactions available to the application.
Data Technician	The Data Technician provides the interface to the database or flat file. This class is part of the Oracle Retail Platform framework. It provides entry points for application transactions sent by the Data Manager and caches the set of supported data store operations. It also contains a pool of physical data connections used by the supported data operations.
Data Technician Configuration Script	The Data Technician Configuration Script specifies the types of connections to be pooled, the set of operations available to the application, and the mapping of an application data action to a specific data operation.
Transaction Queue	The Transaction Queue holds data transactions and offers asynchronous data persistence and offline processing for Point-of-Service. When the database is offline, the data is held in the queue and posted to the database when it comes back online. When the application is online, the Data Manager gets the information from the Transaction Queue to send to the database.

Tour

The Tour framework establishes the workflow for the application. It models application behavior as states, events and transitions. The Oracle Retail Platform engine is modeled on finite state machine behavior. A finite state machine has a limited number of possible states. A state machine stores the status of something at a given time and, based on input, changes the status or causes an action or output to occur. The Tour framework provides a formal method for defining these nested state machines as a traceable way to handle flow through an application.

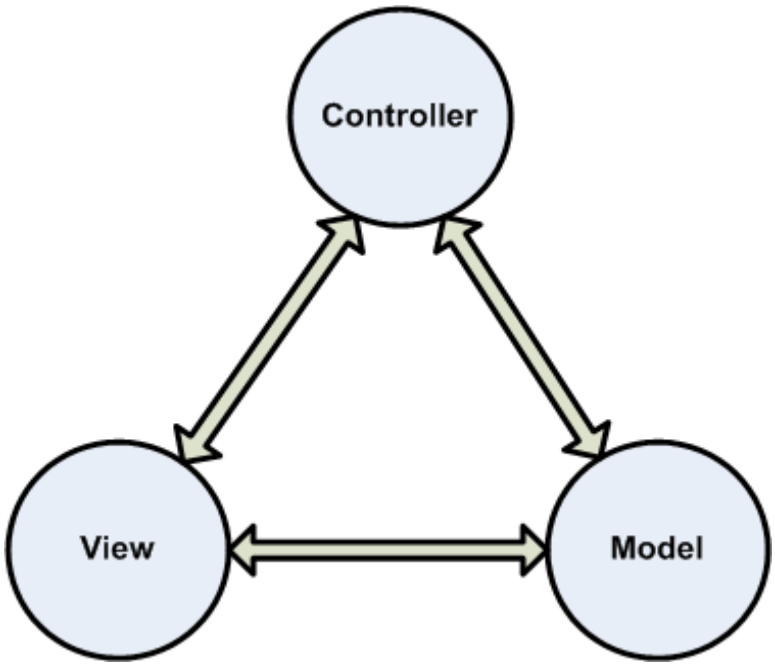
Design Patterns

Design patterns describe solutions to problems that occur repeatedly in object-oriented software development. A pattern is a repeatable, documented method that can be applied to a particular problem. This section describes four patterns used in the architecture of Point-of-Service: MVC, Factory, Command, and Singleton.

MVC Pattern

The MVC Pattern divides the functionality of an application into three layers: model, view, and controller. Different functionality is separated to manage the design of the application. A model represents business objects and the rules of how they are accessed and updated. The model informs views when data changes and contains methods for the views to determine its current state. A view displays the contents of a model to the user. It is responsible for how the data is presented. Views also forward user actions to the controller. A controller directs the actions within the application. The controller is responsible for interpreting user input and triggering the appropriate model actions. The following diagram illustrates the MVC Pattern.

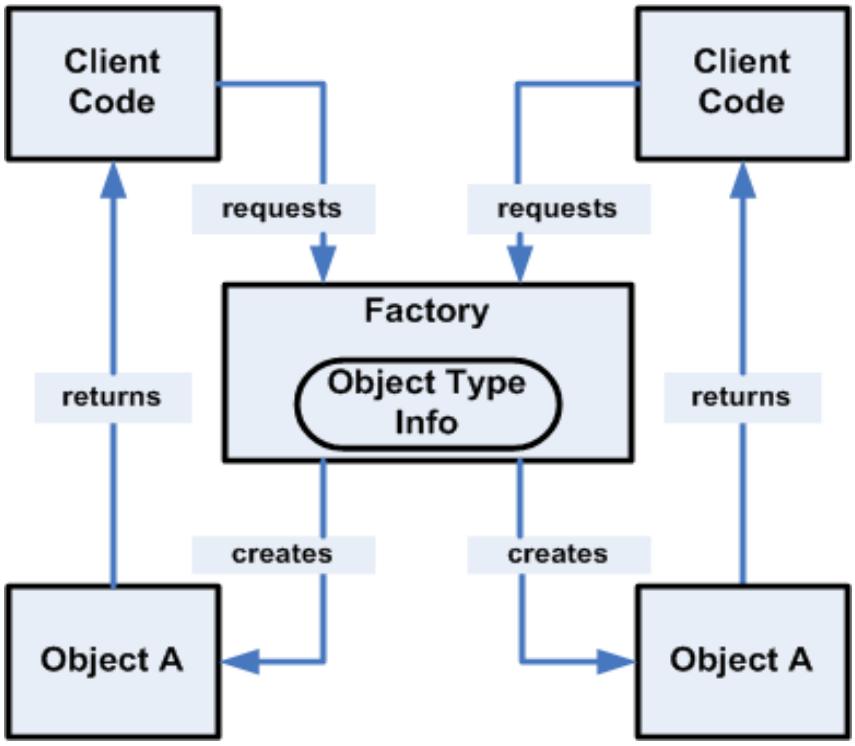
Figure 2–7 MVC Pattern



Factory Pattern

Another design pattern used in Point-of-Service code is the Factory pattern. The intent of the Factory pattern is to provide an interface for creating families of related or dependent objects without specifying their concrete classes. The application requests an object from the factory, and the factory keeps track of which object is used. Since the application does not know which concrete classes are used, those classes can be changed at the factory level without impacting the rest of the application. The following diagram illustrates this pattern.

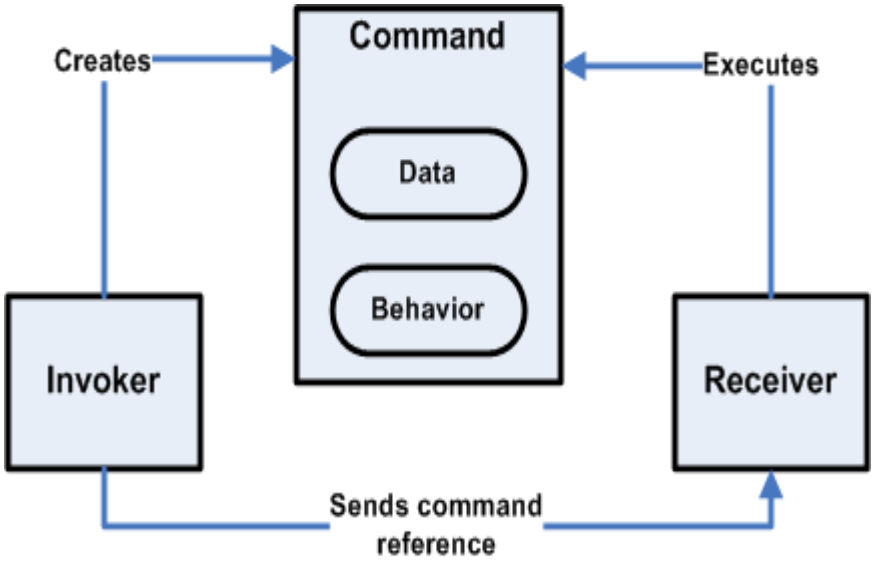
Figure 2–8 Factory Pattern



Command Pattern

Sometimes it is necessary to issue requests to objects without knowing anything about the operation being requested or the receiver of the request. The Command pattern encapsulates a request as an object. The design abstracts the receiver of the Command from the invoker. The command is issued by the invoker and executed on the receiver. The following diagram illustrates the Command pattern. It is used in the design of the Manager/Technician framework.

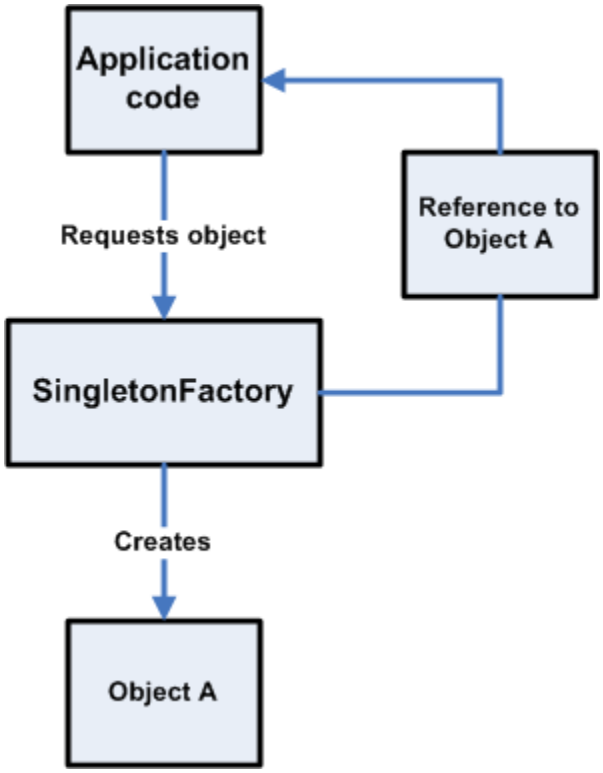
Figure 2–9 Command Pattern



Singleton Pattern

The Singleton pattern ensures a class only has one instance and provides a single, global point of access. It allows extensibility through subclassing. Singletons allow retailers to access the subclass without changing application code. If a system only needs one instance of a class across the system, and that instance needs to be accessible in many different parts of a system, making that class a Singleton controls both instantiation and access. The following patterns illustrates the Singleton pattern:

Figure 2–10 Singleton Pattern



3

Extracting Source Code

Much of this guide deals with the structure and function of Oracle Retail Point-of-Service code, and how you can modify and extend it to serve the needs of your organization. It is assumed that you have been given access to the Point-of-Service source code, present on Oracle's ARU site.

The source code is downloadable in a single .zip file. See the Oracle Retail Point-of-Service Installation Guide for the name of the source code .zip file.

This .zip file contains the following:

File Name	Comments
cmnotes.txt	Configuration Management notes. Describe how to set up and build the source.
ORPOS-<*release_number*>_source.zip	The Point-of-Service source
ORSSS-<*release_number*>_data_model.zip	Data Model (database schema) documentation
README.html	

Using pkzip, WinZip or similar utilities, you can extract ORPOS-<*release_number*> onto your local hard disk. Choose the option to preserve the directory structure when you extract. Then all the source files will be placed under some directory like the following:

```
<Path to disk root>/ORPOS-<release_number>_source
```

From this point on, this directory is referred to as:

```
<POS_SRC_ROOT>
```

The following is the first-level directory structure under <POS_SRC_ROOT>:

Directory	Comments
applications	This has one sub-directory centraloffice, which contains Point-of-Service-specific code. Other directories contain code that might be common to Oracle Retail Strategic Store Solutions applications like Back Office, or Central Office.
build	Files used to compile, assemble and run functional tests
clientinterfaces	Interface definitions, between different code modules
commerceservices	Commerce Services code

Directory	Comments
modules	A collection of various code modules some of which are the foundation for Commerce Services. The utility module contains SQL files used for database creation and pre-loading.
thirdparty	Executable (mostly .jar files) from third-party providers.
webapp	Web-based user interface code. Also contains the Application Managers.

In subsequent chapters, all pathnames of a code file are made relative to one of these directories. You must prepend <POS_SRC_ROOT> to the file path, to get its actual location on disk.

4

Customization

This chapter covers additional customization options. Frequently, it is necessary to customize Point-of-Service to integrate with existing systems and environments.

Parameters

Parameters are used to control flow, set minimums and maximums for data, and allow flexibility without recompiling code. A user can modify parameter values from the UI without changing code. Parameter values can be modified by Point-of-Service, and the changes can be distributed by other Oracle Retail applications. For example, the maximum cash refund allowed and the credit card types accepted are parameters that can be defined by Point-of-Service. To configure parameters, you need to understand the parameter hierarchy, define the group that the parameter belongs to, and define the parameter and its properties.

Parameter Hierarchy

Parameters are defined in XML files that are organized in a hierarchy. Different XML files represent different levels in a retail setting at which parameters may be defined. Understanding the parameter hierarchy helps you define parameters at the appropriate level.

Table 4–1 lists the parameter directories, XML filenames, and file descriptions.

Table 4–1 Parameter Directories, Files, and Descriptions

Directory	Parameter-Related XML File	Description
application	application.xml	Default parameter information provided by the base product
corporate	corporate.xml	Company information
store	store.xml	Local store information
register	workstation.xml	Register-level information
user role	operator.xml	User-level information

Higher-level parameters by default are overridden by lower-level parameter settings. For example, store-level configuration parameters override application-level parameters. The FINAL element in a parameter definition signifies whether the parameter can be overridden. The following is an excerpt from `config\manager\PosParameterTechnican.xml`, showing the order of precedence from highest level to lowest level.

Example 4–1 Default Parameter Settings

```
<SELECTOR name="defaultParameters">
        <SOURCE categoryname="application" alternativename="application">
        <SOURCE categoryname="corporate" alternativename="corporate">
        <SOURCE categoryname="store" alternativename="store">
        <SOURCE categoryname="service" alternativename="NO_OP">
        <SOURCE categoryname="uidata" alternativename="NO_OP">
        <SOURCE categoryname="register" alternativename="workstation" >
        <SOURCE categoryname="userrole" alternativename="operator" >
    </SELECTOR
```

The `categoryname` specifies the directory name and the `alternativename` specifies the name of the XML file. All parameter subdirectories reside in config\parameter.

Parameter Group

Each parameter belongs to a group, which is a collection of related parameters. The groups are used when modifying parameters within the UI. The user selects the group first, then has the option to modify the related parameters that belong to that group. Examples of groups are Browser, Customer, Discount, and Employee.

Adding a parameter requires adding it to the proper group. The following excerpt from application.xml shows the Tender group and a parameter definition inside the group. The "hidden" attribute indicates whether or not the group is displayed in the UI.

Example 4–2 Definition of Tender Group

```
<GROUP name="Tender"
            hidden="N">
      <PARAMETER name="MaximumCashChange"
         ...
      <PARAMETER>
...
<GROUP>
```

Parameter Properties

Each parameter file contains parameter definitions organized by group. The following shows an example of two parameter definitions from `config/parameters/application/application.xml`.

Example 4–3 Parameter Definitions From application.xml

```
<PARAMETER name="CashAccepted"
         type="LIST"
         default="USD"
         final="N"
         hidden="N">
         <VALIDATOR class="EnumeratedListValidator"
            package="com.extendyourstore.foundation.manager.parameter">
            <!-- Use ISO 3 letter currency code -->
            <PROPERTY propname="member" propvalue="None" />
            <PROPERTY propname="member" propvalue="USD" />
            <PROPERTY propname="member" propvalue="CAD" />
         </VALIDATOR>
```

```
            <VALUE value="USD"/>
            <VALUE value="CAD"/>

<PARAMETER name="MaximumCashChange"
            type="CURRENCY"
            final="N"
            hidden="N">
            <VALIDATOR class="FloatRangeValidator"
               package="com.extendyourstore.foundation.manager.parameter">
               <PROPERTY propname="minimum" propvalue="0.00" />
               <PROPERTY propname="maximum" propvalue="99999.99" />
            </VALIDATOR>
            <VALUE value="25.00"/>
         </PARAMETER>
```

The FINAL attribute indicates whether the property definition is final, meaning it cannot be overridden by lower-level parameter file settings. The VALUE element is the current setting of the parameter. If multiple values are set, that means the value of the parameter is a list of values. The three types of VALIDATOR classes are listed in the following table.

Table 4–2 lists the three types of VALIDATOR classes.

Table 4–2 Validator Types

Validator	Description
EnumeratedListValidator	Determines whether a value supplied is one of an allowable set of values
FloatRangeValidator	Ensures that the value lies within the specified minimum and maximum float range
IntegerRangeValidator	Ensures that the value of a parameter lies within the specified minimum and maximum integer range

Devices

Point-of-Service devices are configured with the posdevices.xml file, device-specific property files, and other JavaPOS configuration files. The device vendor typically provides a JavaPOS configuration file to support the JavaPOS standards. If necessary, you can create your own configuration file to meet your device requirements. Interaction of the Point-of-Service application with devices is managed by the Device Manager and Device Technician.

Set Up the Device

To configure a device to work with Point-of-Service, first consult the user manual for that device for specific setup requirements. Set up the device drivers and configuration file so the device is available to applications.

Test the Device

Use the POStest application available internally or at http:www.javapos.com to determine if a device adheres to existing JavaPOS standards. POStest is a GUI-based utility for exercising Point-of-Service devices using JavaPOS. Currently it supports the following devices: POSPrinter, MICR, MSR, Scanner, Cash Drawer, Line Display, Signature Capture, and PIN Pad. Perform the following steps to use POStest. See http:www.javapos.com for more details.

1. Configure the classpath for JavaPOS. This means that the classpath should include the location of POStest, jpos.jar, jcl.jar and the JavaPOS services for the devices.
2. To build POStest, compile the classes in <location of POStest>\upos\com\jpos\POStest.
3. To run POStest, enter the following at a command line:

```
java com.jpos.POStest.POStest
```

Sometimes, the hardware vendor provides test utilities that come with the JavaPOS implementation. You should test with these tools as well.

Create a Session and ActionGroup

In Point-of-Service code, devices require a Session and an ActionGroup. If you need to interact with a new JavaPOS device, you must create a new Session and ActionGroup.

Sessions capture input for the application. In UI scripts, device connections are defined that allow the application code to receive input from a device by connecting the Session with the screen specification. The Session listens to JavaPOS controls on the device.

ActionGroups provide the commands that can be used to control the device. ActionGroups are instantiated by Tour code. When a method on an ActionGroup is called in Tour code, the DeviceTechnician talks to JavaPOS controls on the device.

To create or modify a Session and ActionGroup, perform the following steps.

1. Configure the Session and ActionGroup in config\pos\posdevices.xml.

   To do this, enter the name of the Session and ActionGroup in posdevices.xml. You must specify the name of the object, its class and its package. In addition, you can set some attributes available in the corresponding class in posdevices.xml. This file creates a hash table of ActionGroups and Sessions, which are part of the DeviceTechnician. Below is a definition of an ActionGroup and Session from posdevices.xml.

Example 4–4 ActionGroup Configuration

```
<ACTIONGROUP name="LineDisplayActionGroupIfc"
           class="LineDisplayActionGroup"
           package="com.extendyourstore.pos.device"/>
```

Example 4–5 Session Configuration

```
<SESSION name="ScannerSession"
           devicename = "defaultScanner"
           class="ScannerSession"
           package="com.extendyourstore.foundation.manager.device"
           defaultmode = "MODE_RELEASED"
           />
```

2. Define a Session class to get input that extends InputDeviceSession or DeviceSession.

   Each type of device has a Session class defined in `src\com\extendyourstore\foundation\manager\device`. A device session like CashDrawerSession would extend DeviceSession, whereas an input device session like a ScannerSession would extend InputDeviceSession.

   Sessions are not instantiated in Tour code but are accessed by UI scripts in device connections.

3. Define an ActionGroupIfc interface that extends DeviceActionGroupIfc.

   This class should also be located in `src\com\extendyourstore\pos\device`. The following line of code shows the header of the CashDrawerActionGroupIfc class.

   ```
   public interface CashDrawerActionGroupIfc extends DeviceActionGroupIfc
   ```

4. Create the ActionGroup class. This class should be located in `src\com\extendyourstore\pos\device`, and its purpose is to define specific device operations available to Point-of-Service. The following line of code shows the header of the CashDrawerActionGroup class.

   ```
   public interface CashDrawerActionGroup extends CashDrawerActionGroupIfc
   ```

5. If one does not already exist, create a device connection in the UI Subsystem file. Device connections in the UI Subsystem files allow the application to receive input data from the Session.

   The DeviceSession class is referenced in the device connections for the relevant screen specifications. For example, the following code is an excerpt from `src\com\extendyourstore\pos\services\tender\tenderuicfg.xml`.

Example 4–6 Example of Device Connection

```
<DEVICECONNECTION
            deviceSessionName="ScannerSession"
            targetBeanSpecName="PromptAndResponsePanelSpec"
            listenerPackage="java.beans"
            listenerInterfaceName="PropertyChangeListener"
            adapterPackage="com.extendyourstore.foundation.manager.gui"
            adapterClassName="InputDataAdapter"
            adapterParameter="setScannerData"
            activateMode="MODE_SINGLESCAN">
```

6. Access the device manager and input from the Session in the application code.

   Using the bean model, data from the Session can be accessed with methods in the device's ActionGroupIfc. Other devices such as the printer are accessed through a device manager as in the following code from `src\com\extendyourstore\pos\services\tender\CompleteTenderSite.java`.

Example 4–7 ActionGroup in Tour code

```
POSDeviceActions pda = new POSDeviceActions((SessionBusIfc) bus);
pda.clearText();
pda.displayTextAt(1,0,displayLine2);
```

Simulate the Device

It is often practical to simulate devices for development purposes until the hardware is available or the software is testable. Switching to a simulated device is easily accomplished by editing `config\pos\posdevices.xml`. In fact, when you install Point-of-Service and choose the option to run in Simulated mode, posdevices.xml is modified accordingly. By default, unselected devices are set up as simulated. The following code sample shows the configuration of SimulatedPrinterSession.

Example 4–8 Simulated Device Configuration

```
<SESSION name="SimulatedPrinterSession"
            devicename = "defaultPrinter"
            class="SimulatedPrinterSession"
            package="com.extendyourstore.foundation.manager.device"
            defaultmode = "MODE_RELEASED"
            />
```

Help Files

The Oracle Retail Point-of-Service application includes help files to provide information to assist the end-user. When the user chooses Help or F1 from the global navigation panel, a help browser appears in Point-of-Service to describe the current screen. An index is provided on the left so the user may choose additional topics to view. The help is implemented as JavaHelp and includes these components:

- One HTML help file for each screen. The product help files are Microsoft Word files saved as HTML. They can be edited with Word, an HTML editor or a text editor.
- A Table Of Contents file that defines the index that displays on the left.
- A properties file that associates overlay screen names with the corresponding HTML filenames.

Refer to `http://www.java.sun.com` for more information on JavaHelp.

Note: If the base product help files are modified, upgrades for help files will not be available, and you will not be able to take advantage of updates provided with future maintenance releases of the application.

Modifying Help Files

1. Locate the name of the help file associated with the overlay screen name that needs to be modified. The help file names are defined in helpscreens.properties located in config\ui\help.

Example 4–9 JavaHelp—helpscreens.properties

```
REFUND_OPTIONS                          refundoptionshelp.htm
```

2. Locate the help file in the `locales\en_US\config\ui\help` directory. Open the file in Microsoft Word or an HTML editor and edit the content. If you are using Word to edit, be sure to save the file as HTML when the edits are complete.
3. Make identical modifications to the help file for each of the supported languages. For example, the base product also has help files in locales\en_US\config\ui\help.
4. If the index location or text descriptions needs to be modified, change toc.xml located in locales\en_US\config\ui\help. The order of the items in the index is also defined by this file.

Example 4–10 JavaHelp—toc.xml

```
<tocitem target="REFUND_OPTIONS"    text="Refund Options" />
```

5

Development Environment

A development environment for Point-of-Service includes all files, tools and resources necessary to build and run the Point-of-Service application. While development environments may vary depending on the choice of IDE, database, and version control system, configuration of the development environment involves some common steps. This document addresses components that various development environments have in common.

Preparation

The following software resources must be installed and configured before the Point-of-Service development environment can be set up. Ensure that the following are in place:

Version control system
The Point-of-Service source code must be available from a source control system.

OracleRetailStore database
The OracleRetailStore database should be installed.

Eclipse version 3.0 or another IDE
If installing Eclipse, downloads and instructions are available from http://www.eclipse.org/downloads/.

JDK 1.4
Downloads and instructions are available at http://java.sun.com/downloads/

Setup

Setting up the development environment requires installing the Point-of-Service application, populating the database, creating a sandbox, configuring the IDE, and configuring the version control system.

Install Point-of-Service

Install Point-of-Service using the installation script. While running the Point-of-Service installation script, accept the default options even when nothing is selected, except for the options discussed in the following table.

Table 5–1 lists some Point-of-Service installation options.

Table 5–1 Point-of-Service Installation Options

Option	Instruction
Tier Type	Choose the Tier Type from the following options. Stand-alone—Choose this option to run the Point-of-Service client and server functions in one JVM. N-Tier Client and N-Tier Store Server—Choose both of these options to run client and server components on the same machine in separate JVMs.
Database Information	Specify the database type and its location. The default is Oracle 10g and DB2 v8.2
JRE Location	3rd Party Jars

Build the Database

The tables should be populated with the item, employee, coupon and other retail data that the store needs. If a database is being built from scratch, it needs to be populated with data. The following command can be executed to build the tables and insert a minimal data set.

```
C:\>OracleRetailStore\pos\bin\dbbuild.bat
```

To run the dbbuild.bat, it is necessary to pass an input parameter:

```
dbbuild.bat [data level]
```

[data level] can be base_data, seed_data, test_data, demo_data.

base_data contains just enough to get the build running.

seed_data should contain enough to build and run unit/functional tests.

test_data will contain the rest of the data that you expect from previous builds.

Create a Sandbox

If you plan to retrieve all the source code with the version control system, create a local sandbox with only one directory such as the following.

```
C:\mySandbox\
```

Otherwise, create a local working directory with src, config, and locales\en_US subdirectories. This allows the application code to find all the top-level directories. The following lists the directories that should be created.

```
C:\mySandbox\
C:\mySandbox\src
C:\mySandbox\config
C:\mySandbox\locales\en_US
```

Configure the IDE

The following configuration enables your IDE to build and run the Point-of-Service application.

1. Set the JRE System Library. In the IDE preferences, point to the JRE included in the JDK installed earlier.

   Point to the root of the Java directory in which JDK 1.4 was installed, not the JRE directory in the Point-of-Service installation directory. For example, if the JDK directory is named `C:\jdk1.4.1`, the JRE Home Directory would be `C:\jdk1.4.1`.

2. Specify the path for the source directories on the build path to be the same as the directory or directories created for the sandbox.

3. Specify the following jars on the build path in the order described in the following table. These directories are the same as the directories in `C:\OracleRetailStore\pos\logs\classpath.log`.

   Table 5–2 lists Point-of-Service build path orders.

Table 5–2 **Build Path**

Order	Directory
1	C:\OracleRetailStore\pos\lib
2	C:\OracleRetailStore\pos\lib\locales
3	C:\OracleRetailStore\pos\3rdparty\lib
4	C:\OracleRetailStore\pos\3rdparty\lib\ibm\surepos750
5	C:\OracleRetailStore\360common\lib

Note: 3rd Party folders specified during installation should also be added here.

4. Set the launch properties listed in the table below.

   The program arguments differ depending on the Server Tier type chosen during the Point-of-Service installation. This option is determined by the Server Tier Type selected.

Table 5–3 lists Point-of-Service launch properties.

Table 5–3 Launch Properties

Property	Value
main class	com.extendyourstore.foundation.config.TierLoader
program arguments	If the Tier type is Stand-alone, the program argument is classpath:\\config\conduit\CollapsedConduitFF.xml. If the Tier type is N-Tier Client and N-Tier Server, there are two sets of launch properties. The Store Server launch setting has its program argument set to classpath:\\config\conduit\StoreServerConduit.xml. The Client launch setting has its program argument set to classpath:\\config\conduit\ClientConduit.xml. Wait for the StoreServerConduit to finish starting before launching the ClientConduit.
classpath	Add the database runtime directory to the classpath. To find this path, open `C:\OracleRetailStore\pos\logs\classpath.log` and search for the local database directory. Also, add the installation config directory. Choose `C:\OracleRetailStore\pos\config`.

Update Java Security and Policy Files

Copy the java.security and java.policy files dropped by the Point-of-Service installation, located in `C:\OracleRetailStore\jre\lib\security`. Paste these files in the java\jre\lib\security directory for the JDK that the IDE is referencing.

Configure the Version Control System

Each file from the source code repository should be retrieved to the proper location in your sandbox. To do this, set the workfile location of the root of each of the product components displayed in the version control system, such as 360common. Each workfile location should be set to the local sandbox. For example, if your sandbox is named C:\mySandbox, the root of the product components should point to C:\mySandbox.

Run Point-of-Service

To verify the setup, run the Point-of-Service application using the following steps:

1. Start the OracleRetailStore Database.
2. Build the project.
3. Run Point-of-Service from the IDE.

6

General Development Standards

The following standards have been adopted by Oracle Retail product and service development teams. These standards are intended to reduce bugs and increase the quality of the code. The chapter covers basic standards, architectural issues, and common frameworks. These guidelines apply to all Oracle Retail applications.

Basics

The guidelines in this section cover common coding issues and standards.

Java Dos and Don'ts

The following dos and don'ts are guidelines for what to avoid when writing Java code.

- DO use polymorphism
- DO have only one return statement per function or method; make it the last statement.
- DO use constants instead of literal values when possible.
- DO import only the classes necessary instead of using wildcards.
- DO define constants at the top of the class instead of inside a method.
- DO keep methods small, so that they can be viewed on a single screen without scrolling.
- DON'T have an empty catch block. This destroys an exception from further down the line that might include information necessary for debugging.
- DON'T concatenate strings. Oracle Retail products tend to be string-intensive and string concatenation is an expensive operation. Use StringBuffer instead.
- DON'T use function calls inside looping conditionals (for example, while (i <=name.len())). This calls the function with each iteration of the loop and can affect performance.
- DON'T use a static array of strings.
- DON'T use public attributes.
- DON'T use a switch to make a call based on the object type.

Avoiding Common Java Bugs

The following fatal Java bugs are not found at compile time and are not easily found at runtime. These bugs can be avoided by following the recommendations in the following table.

Table 6–1 lists some fatal Java bugs and their preventative measures.

Table 6–1 Common Java Bugs

Bug	Preventative Measure
null pointer exception	Check for null before using an object returned by another method.
boundary checking	Check the validity of values returned by other methods before using them.
array index out of bounds	When using a value as a subscript to access an array element directly, first verify that the value is within the bounds of the array.
incorrect cast	When casting an object, use instanceof to ensure that the object is of that type before attempting the cast.

Formatting

Follow these formatting standards to ensure consistency with existing code.

- Indenting/braces—Indent all code blocks with four spaces (not tabs). Put the opening brace on its own line following the control statement and in the same column. Statements within the block are indented. Closing brace is on its own line and in same column as the opening brace. Follow control statements (if, while, etc.) with a code block with braces, even when the code block is only one line long.
- Line wrapping—If line breaks are in a parameter list, line up the beginning of the second line with the first parameter on the first line. Lines should not exceed 120 characters.
- Spacing—Include a space on both sides of binary operators. Do not use a space with unary operators. Do not use spaces around parenthesis. Include a blank line before a code block.
- Deprecation—Whenever you deprecate a method or class from an existing release is deprecated, mark it as deprecated, noting the release in which it was deprecated, and what methods or classes should be used in place of the deprecated items; these records facilitate later code cleanup.
- Header—The file header should include the PVCS tag for revision and log history.

Example 6–1 Header Sample

```
/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

    Copyright (c) 1998-2003 Oracle Retail, Inc.    All Rights Reserved.

    $Log$

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
package com._360commerce.samples;

// Import only what is used and organize from lowest layer to highest.
import com.ibm.math.BigDecimal;
import com._360commerce.common.utility.Util;

//------------------------------------------------------------------------------
/**
```

```
     This class is a sample class. Its purpose is to illustrate proper
     formatting.
     @version $Revision$
**/
//---------------------------------------------------------------------------
public class Sample extends AbstractSample
implements SampleIfc
{
    // revision number supplied by configuration management tool
    public static String revisionNumber = "$Revision$";
    // This is a sample data member.
    // Use protected access since someone may need to extend your code.
    // Initializing the data is encouraged.
    protected String sampleData = "";

    //-----------------------------------------------------------------------
    /**
        Constructs Sample object.
        Include the name of the parameter and its type in the javadoc.
        @param initialData String used to initialize the Sample.
    **/
    //-----------------------------------------------------------------------
    public Sample(String initialData)
    {
        sampleData = initialData;
        // Declare variables outside the loop
        int length = sampleData.length();
        BigDecimal[] numberList = new BigDecimal[length];

        // Precede code blocks with blank line and pertinent comment
        for (int i = 0; i < length; i++)
        {
            // Sample wrapping line.
            numberList[i] = someInheritedMethodWithALongName(Util.I_BIG_DECIMAL_
ONE,
 sampleData,
 length - i);
        }
    }
}
```

Javadoc

- Make code comments conform to Javadoc standards.
- Include a comment for every code block.
- Document every method's parameters and return codes, and include a brief statement as to the method's purpose.

Naming Conventions

Names should not use abbreviations except when they are widely accepted within the domain (such as the customer abbreviation, which is used extensively to distinguish customized code from product code).

Table 6–2 lists some additional naming conventions.

Table 6–2 Naming Conventions

Element	Description	Example
Package Names	Package names are entirely lower case and should conform to the documented packaging standards.	com.extendyourstore.packagename com.mbs.packagname
Class Names	Mixed case, starting with a capital letter. Exception classes end in Exception; interface classes end in Ifc; unit tests append Test to the name of the tested class.	DatabaseException DatabaseExceptionTest FoundationScreenIfc
File Names	File names are the same as the name of the class.	DatabaseException.java
Method Names	Method names are mixed case, starting with a lowercase letter. Method names are an action verb, where possible. Boolean-valued methods should read like a question, with the verb first. Accessor functions use the prefixes get or set.	isEmpty() hasChildren() getAttempt() setName()
Attribute Names	Attribute names are mixed case, starting with a lowercase letter.	lineItemCount
Constants	Constants (static final variables) are named using all uppercase letters and underscores.	final static int NORMAL_SIZE = 400
EJBs -- entity	Use these conventions for entity beans, where 'Transaction' is a name that describes the entity.	TransactionBean TransactionIfc TransactionLocal TransactionLocalHome TransactionRemote TransactionHome
EJBs — session	Use these conventions for session beans, where 'Transaction' is a name that describes the session.	TransactionService TransactionAdapter TransactionManager

SQL Guidelines

The following general guidelines apply when creating SQL code:

- Keep SQL code out of client/UI modules. Such components should not interact with the database directly.
- Table and column names must be no longer than 18 characters.
- Comply with ARTS specifications for new tables and columns. If you are creating something not currently specified by ARTS, strive to follow the ARTS naming conventions and guidelines.
- Document and describe every object, providing both descriptions and default values so that we can maintain an up-to-date data model.

- Consult your data architect when designing new tables and columns.
- Whenever possible, avoid vendor-specific extensions and strive for SQL-92 compliance with your SQL.
- While Sybase-specific extensions are common in the code base, do not introduce currently unused extensions, because they must be ported to the DataFilters and JdbcHelpers for other databases.
- All SQL commands should be uppercase because the DataFilters currently only handle uppercase.
- If database-specific code is used in the source, move it into the JdbcHelpers.
- All JDBC operations classes must be thread-safe.

Do the following to avoid errors:

- Pay close attention when cutting and pasting SQL.
- Always place a carriage return at the end of the file.
- Test your SQL before committing.

The subsections that follow describe guidelines for specific database environments.

DB2

Table 6–3 shows examples of potential problems in DB2 SQL code.

Table 6–3 DB2 SQL Code Problems

Problem	Problem Code	Corrected Code

Don't use quoted integers or unquoted char and varchar values; these cause DB2 to produce errors.	`CREATE TABLE BLAH`
	`(`
	`FIELD1 INTEGER,`
	`FIELD2 CHAR(4)`
	`);`
	`INSERT INTO BLAH (FIELD1,`
	`FIELD2) VALUES (`**`'5'`**`,` **`1020`**`);`
		`CREATE TABLE BLAH`
		`(`
		`FIELD1 INTEGER,`
		`FIELD2 CHAR(4)`
		`);`
		`INSERT INTO BLAH (FIELD1, FIELD2)`
		`VALUES (5, '1020');`

Don't try to declare a field default as NULL.	`CREATE TABLE BLAH`
	`(`
	`FIELD1 INTEGER` **`NULL`**`,`
	`FIELD2 CHAR(4) NOT NULL`
	`);`
		`CREATE TABLE BLAH`
		`(`
		`FIELD1 INTEGER,`
		`FIELD2 CHAR(4) NOT NULL`
		`);`

Oracle

Table 6–4 provides some examples of common syntax problems which cause Oracle to produce errors.

Table 6–4 Oracle SQL Code Problems

Problem	Problem Code	Corrected Code
Blank line in code block causes error.	CREATE TABLE BLAH (FIELD1 INTEGER, FIELD2 VARCHAR(20));	CREATE TABLE BLAH (FIELD1 INTEGER, FIELD2 VARCHAR(20));
When using NOT NULL with a default value, NOT NULL must follow the DEFAULT statement.	CREATE TABLE BLAH (FIELD1 INTEGER **NOT NULL** DEFAULT 0, FIELD2 VARCHAR(20));	CREATE TABLE BLAH (FIELD1 INTEGER DEFAULT 0 **NOT NULL**, FIELD2 VARCHAR(20));
In a CREATE or INSERT, do not place a comma after the last item.	CREATE TABLE BLAH (FIELD1 INTEGER, FIELD2 VARCHAR(20),);	CREATE TABLE BLAH (FIELD1 INTEGER, FIELD2 VARCHAR(20));

PostgreSQL

PostgreSQL does not currently support the command ALTER TABLE BLAH ADD PRIMARY KEY. However, it does support the standard CREATE TABLE command with a PRIMARY KEY specified. For this reason, the PostgresqlDataFilter converts SQL of the form shown in the first code sample, below, into the standard form shown in the second code example, below.

Example 6–2 SQL Code Before PostgresqlDataFilter Conversion

```
CREATE TABLE BLAH
(
 COL1 INTEGER NOT NULL,
 COL2 INTEGER NOT NULL,
 COL3 INTEGER,
);

ALTER TABLE ADD PRIMARY KEY (COL1, COL2)
```

Example 6–3 SQL Code After PostgresqlDataFilter Conversion

```
CREATE TABLE BLAH( COL1 INTEGER NOT NULL,
 COL2 INTEGER NOT NULL,
 COL3 INTEGER,
 PRIMARY KEY (COL1, COL2));
```

Sybase

Sybase does not throw errors if a table element is too large; it truncates the value. If using a VARCHAR(40), use less than 40 characters.

Unit Testing

For details on how to implement unit testing, see separate guidelines on the topic. Some general notes apply:

- Break large methods into smaller, testable units.
- Although unit testing may be difficult for tour scripts, apply it for Java components within Point-of-Service code.
- If you add a new item to the codebase, make sure your unit tests prove that the new item can be extended.
- In unit tests, directly create the data/preconditions necessary for the test (in a setup() method) and remove them afterwards (in a teardown() method). JUnit expects to use these standard methods in running tests.

Architecture and Design Guidelines

This section provides guidelines for making design decisions which are intended to promote a robust architecture.

AntiPatterns

An AntiPattern is a common solution to a problem which results in negative consequences. The name contrasts with the concept of a pattern, a successful solution to a common problem.

Table 6–5 identifies AntiPatterns which introduce bugs and reduce the quality of code.

Table 6–5 Common AntiPatterns

Pattern	Description	Solution
Reinvent the Wheel	Sometimes code is developed in an unnecessarily unique way that leads to errors, prolonged debugging time and more difficult maintenance.	The analysis process for new features provides awareness of existing solutions for similar functionality so that you can determine the best solution. There must be a compelling reason to choose a new design when a proven design exists. During development, a similar pattern should be followed in which existing, proven solutions are implemented before new solutions.
Copy-and-paste Programming, classes	When code needs to be reused, it is sometimes copied and pasted instead of using a better method. For example, when a whole class is copied to a new class when the new class could have extended the original class. Another example is when a method is being overridden and the code from the super class is copied and pasted instead of calling the method in the super class.	Use object-oriented techniques when available instead of copying code.

Table 6–5 Common AntiPatterns

Pattern	Description	Solution
Copy-and-paste Programming, XML	A new element (such as a Site class or an Overlay XML tag) can be started by copying and pasting a similar existing element. Bugs are created when one or more pieces are not updated for the new element. For example, a new screen might have the screen name or prompt text for the old screen.	If you copy an existing element to create a new element, manually verify each piece of the element to ensure that it is correct for the new element.
Project Mismanagement/ Common Understanding	A lack of common understanding between managers, Business Analysts, Quality Assurance and developers can lead to missed functionality, incorrect functionality and a larger-than-necessary number of defects. An example of this is when code does not match Functional Requirements, including details like maximum length of fields and dialog message text.	Read the Functional Requirement before you code. If there is disagreement with content, raise an issue with the Product Manager. Before you consider code for the requirement finished, all issues must be resolved and the code must match the requirements.
Stovepipe	Multiple systems within an enterprise are designed independently. The lack of commonality prevents reuse and inhibits interoperability between systems. For example, a change to till reconcile in Back Office may not consider the impact on Point-of-Service. Another example is a making change to a field in the Oracle Retail database for a Back Office feature without handling Point-of-Service effects.	Coordinate technologies across applications at several levels. Define basic standards in infrastructures for the suite of products. Only mission-specific functions should be created independently of the other applications within the suite.

Designing for Extension

This section defines how to code product features so that they may be easily extended. It is important that developers on customer projects whose code may be rolled back into the base product follow these standards as well as the guidelines in Chapter 8, "Extension Guidelines".

- Separate external constants such as database table and column names, JMS queue names, port numbers from the rest of the code. Store them in (in order of preference):
  - Configuration files
  - Deployment descriptors
  - “Constant” classes/interfaces
- Make sure the SQL code included in a component does not touch tables not directly owned by that component.

- Make sure there is some separation from DTO and ViewBean type classes so we have abstraction between the service and the presentation.
- Consider designing so that any fine grained operation within the larger context of a coarse grain operation can be factored out in a separate “algorithm” class, so that it can be replaced without reworking the entire activity flow of the larger operation.

Common Frameworks

This section provides guidelines which are common to the Oracle Retail Strategic Store Solutions applications.

Logging

Oracle Retail Strategic Store Solutions systems use Log4J for logging. When writing log commands, use the following guidelines:

- Use calls to Log4J rather than System.out from the beginning of your development. Unlike System.out, Log4J calls are naturally written to a file, and can be suppressed when desired.
- Log exceptions where you catch them, unless you are going to rethrow them. This is preserves the context of the exceptions and helps reduce duplicate exception reporting.
- Logging uses few CPU cycles, so use debugging statements freely.
- Use the correct logging level:
  - FATAL—crashing exceptions
  - ERROR—nonfatal, unhandled exceptions (there should be few of these)
  - INFO—life cycle/heartbeat information
  - DEBUG—information for debugging purposes

The following sections provide additional information on guarding code, when to log, and how to write log messages.

Guarding Code

Testing shows that logging takes up very little of a system’s CPU resources. However, if a single call to your formatter is abnormally expensive (stack traces, database access, network IO, large data manipulations, etc.), you can use Boolean methods provided in the Logger class for each level to determine whether you have that level (or better) currently enabled; Jakarta calls this a code guard:

Example 6–4 Wrapping Code in a Code Guard

```
if (log.isDebugEnabled()) {
    log.debug(MassiveSlowStringGenerator().message());
}
```

An interesting use of code guards, however, is to enable debug-only code, instead of using a DEBUG flag. Using Log4J to maintain this functionality lets you adjust it at runtime by manipulating Log4J configurations.

For instance, you can use code guards to simply switch graphics contexts in your custom swing component:

Example 6–5 Switching Graphics Contexts via a Logging Level Test

```
protected void paintComponent(Graphics g) {

    if (log.isDebugEnabled()) {
        g = new DebugGraphics(g, this);
    }

    g.drawString("foo", 0, 0);
}
```

When to Log

There are three main cases for logging:

- Exceptions—Should be logged at an error or fatal level.
- Heartbeat/Life cycle—For monitoring the application; helps to make unseen events clear. Use the info level for these events.
- Debug—Code is usually littered with these when you are first trying to get a class to run. If you use System.out, you have to go back later and remove them to keep. With Log4J, you can simply raise the log level. Furthermore, if problems pop up in the field, you can lower the logging level and access them.

Writing Log Messages

When Log4J is being used, any log message might be seen by a user, so the messages should be written with users in mind. Cute, cryptic, or rude messages are inappropriate. The following sections provide additional guidelines for specific types of log messages.

Exception Messages

A log message should have enough information to give the user a good shot at understanding and fixing the problem. Poor logging messages say something opaque like “load failed.”

Take this piece of code:

```
try {
    File file = new File(fileName);
    Document doc = builder.parse(file);

    NodeList nl = doc.getElementsByTagName("molecule");
    for (int i = 0; i < nl.getLength(); i++) {
        Node node = nl.item(i);
        // something here
    }

} catch {
   // see below
}
```

and these two ways of logging exceptions:

```
} catch (Exception e){
    log.debug("Could not load XML");
}
```

```
} catch (IOException e){
    log.error("Problem reading file " + fileName, e);
} catch (DOMException e){
    log.error("Error parsing XML in file " + fileName, e);
} catch (SAXException e){
    log.error("Error parsing XML in file " + fileName, e);
}
```

In the first case, you'll get an error that just tells you something went wrong. In the second case, you're given slightly more context around the error, in that you know if you can't find it, load it, or parse it, and you're given that key piece of data: the file name.

The log lets you augment the message in the exception itself. Ideally, with the messages, the stack trace, and type of exception, you'll have enough to be able to reproduce the problem at debug time. Given that, the message can be reasonably verbose.

For instance, the fail() method in JUnit really just throws an exception, and whatever message you pass to it is in effect logging. It's useful to construct messages that contain a great deal of information about what you are looking for:

Example 6–6 JUnit

```
if (! list.contains(testObj)) {

    StringBuffer buf = new StringBuffer();
    buf.append("Could not find object " + testObj + " in list.\n");
    buf.append("List contains: ");
    for (int i = 0; i < list.size(); i++) {
        if (i > 0) {
             buf.append(",");
        }
        buf.append(list.get(i));
    }
    fail(buf.toString());
}
```

Heartbeat or Life Cycle Messages

The log message here should succinctly display what portion of the life cycle is occurring (login, request, loading, etc.) and what apparatus is doing it (is it a particular EJB are there multiple servers running, etc.)

These message should be fairly terse, since you expect them to be running all the time.

Debug Messages

Debug statements are going to be your first insight into a problem with the running code, so having enough, of the right kind, is important.

These statements are usually either of an intra-method-life cycle variety:

```
log.debug("Loading file");

File file = new File(fileName);
log.debug("loaded.  Parsing...");
Document doc = builder.parse(file);
log.debug("Creating objects");
for (int i ...
```

or of the variable-inspection variety:

```
log.debug("File name is " + fileName);

log.debug("root is null: " + (root == null));
log.debug("object is at index " + list.indexOf(obj));
```

Exception Handling

The key guidelines for exception handling are:

- Handle the exceptions that you can (File Not Found, etc.)
- Fail fast if you can't handle an exception
- Log every exception with Log4J, even when first writing the class, unless you are rethrowing the exception
- Include enough information in the log message to give the user or developer a fighting chance at knowing what went wrong
- Nest the original exception if you rethrow one

Types of Exceptions

The EJB specification divides exceptions into the following categories:

JVM Exceptions

You cannot recover from these; when one is thrown, it's because the JVM has entered a kernel panic state that the application cannot be expected to recover from. A common example is an Out of Memory error.

System Exceptions

Similar to JVM exceptions, these are generally, though not always, "non-recoverable" exceptions. In the commons-logging parlance, these are "unexpected" exceptions. The canonical example here is NullPointerException. The idea is that if a value is null, often you don't know what you should do. If you can simply report back to your calling method that you got a null value, do that. If you cannot gracefully recover, say from an IndexOutOfBoundsException, treat as a system exception and fail fast.

Application Exceptions

These are the expected exceptions, usually defined by specific application domains. It is useful to think of these in terms of recoverability. A FileNotFoundException is sometimes easy to rectify by simply asking the user for another file name. But something that's application specific, like JDOMException, may still not be recoverable. The application can recognize that the XML it is receiving is malformed, but it may still not be able to do anything about it.

Avoid java.lang.Exception

Avoid throwing the generic Exception; choose a more specific (but standard) exception.

Avoid Custom Exceptions

Custom exceptions are rarely needed. The specific type of exception thrown is rarely important; don't create a custom exception if there is a problem with the formatting of a string (ApplicationFormatttingException) instead of reusing IllegalArgumentException.

The best case for writing a custom exception is if you can provide additional information to the caller which is useful for recovering from the exception or fixing the problem. For example, the JPOSExceptions can report problems with the physical device. An XML exception could have line number information embedded in it, allowing the user to easily detect where the problem is. Or, you could subclass NullPointer with a little debugging magic to tell the user what method of variable is null.

Catching Exceptions

The following sections provide guidelines on catching exceptions.

Keep the Try Block Short The following example, from a networking testing application, shows a loop that was expected to require approximately 30 seconds to execute (since it calls sleep(3000) ten times):

Example 6–7 Network Test

```
    for (int i = 0; i < 10; i++) {
        try {
            System.out.println("Thread " + Thread.currentThread().getName() + "
requesting number " + i);
            URLConnection con = myUrl.openConnection();
            con.getContent();
            Thread.sleep(3000);
        } catch (Exception e) {
            log.error("Error getting connection or content", e);
        }
    }
```

The initial expectation was for this loop to take approximately 30 seconds, since the sleep(3000) would be called ten times. Suppose, however, that con.getContent() throws an IOException. The loop then skips the sleep() call entirely, finishing in 6 seconds. A better way to write this is to move the sleep() call outside of the try block, ensuring that it is executed:

Example 6–8 Network Test with Shortened Try Block

```
    for (int i = 0; i < 10; i++) {

        try {
            System.out.println("Thread " + Thread.currentThread().getName() + "
requesting number " + i);
            URLConnection con = myUrl.openConnection();
            con.getContent();
        } catch (Exception e) {
            log.error("Error getting connection or content", e);
        }
        Thread.sleep(3000);
    }
```

Avoid Throwing New Exceptions When you catch an exception, then throw a new one in its place, you replace the context of where it was thrown with the context of where it was caught.

A slightly better way is to throw a wrapped exception:

Example 6–9 Wrapped Exception

```
1:   try {
2:       Class k1 = Class.forName(firstClass);
3:       Class k2 = Class.forName(secondClass);
4:       Object o1 = k1.newInstance();
5:       Object o2 = k2.newInstance();
6:
7:   } catch (Exception e) {
8:      throw new MyApplicationException(e);
9:   }
```

However, the onus is still on the user to call getCause() to see what the real cause was. This makes most sense in an RMI type environment, where you need to tunnel an exception back to the calling methods.

The better way than throwing a wrapped exception is to simply declare that your method throws the exception, and let the caller figure it out:

Example 6–10 Declaring an Exception

```
public void buildClasses(String firstName, String secondName)
       throws InstantiationException, ... {

       Class k1 = Class.forName(firstClass);
       Class k2 = Class.forName(secondClass);
       Object o1 = k1.newInstance();
       Object o2 = k2.newInstance();
   }
```

However, there may be times when you want to deal with some cleanup code and then rethrow an exception:

Example 6–11 Clean Up First, then Rethrow Exception

```
try {
        someOperation();
    } catch (Exception e) {
        someCleanUp();
        throw e;
    }
```

Catching Specific Exceptions There are various exceptions for a reason: so you can precisely identify what happened by the type of exception thrown. If you just catch Exception (rather than, say, ClassCastException), you hide information from the user. On the other hand, methods should not generally try to catch every type of exception. The rule of thumb is the related to the fail-fast/recover rule: catch as many different exceptions as you are going to handle.

Favor a Switch over Code Duplication The syntax of try and catch makes code reuse difficult, especially if you try to catch at a granular level. If you want to execute some code specific to a certain exception, and some code in common, you're left with either duplicating the code in two catch blocks, or using a switch-like procedure. The switch-like procedure, shown below, is preferred because it avoids code duplication:

Example 6–12 Using a Switch to Execute Code Specific to an Exception

```
    try{
        // some code here that throws Exceptions...
    } catch (Exception e) {
        if (e instanceof LegalException) {
            callPolice((LegalException) e);
        } else if (e instanceof ReactorException) {
            shutdownReactor();
        }
        logException(e);
        mailException(e);
        haltPlant(e);
    }
```

This example is preferred, in these relatively rare cases, to using multiple catch blocks:

Example 6–13 Using Multiple Catch Blocks Causes Duplicate Code

```
try{
        // some code here that throws Exceptions...
    } catch (LegalException e) {
        callPolice(e);
        logException(e);
        mailException(e);
        haltPlant(e);
    } catch (ReactorException e) {
        shutdownReactor();
        logException(e);
        mailException(e);
        haltPlant(e);
    }
```

Exceptions tend to be the backwater of the code; requiring a maintenance developer, even yourself, to remember to update the duplicate sections of separate catch blocks is a recipe for future errors.

7

Point-of-Service Development Standards

The following standards specific to the Point-of-Service architecture have been adopted by Oracle Retail product and service development teams. These standards are intended to reduce bugs and increase the quality of the code.

Screen Design and User Interface Guidelines

- Avoid creating new screen beans and screen models for every new screen. Look for ways to reuse existing or generic beans, such as the Data Input Bean, to avoid complicating the code base.

Tour Framework

This section includes general guidelines as well as subsections on specific tour components.

Tour Architectural Guidelines

Consult these guidelines when making architecture decisions in tour framework designs.

- Services—When designing services, consider their size and reusability. Services that are overlarge create additional work when a portion must be extended.
- Utility Manager—Put methods used by multiple services in this manager so they can be easily extended.
- If the reusable behavior contains flow-dependent behavior, then it is best implemented as a Site and the Site action can be reused within a Service or across Services.
- Large bodies of reusable behavior can be implemented as Managers and Technicians. This pattern is especially useful if the user might offload the processing to a separate CPU.

General Tour Guidelines

- Code that uses bus resources must reside in a Site action, Lane action, Signal or Shuttle.
- Never mail a letter from a Road. This causes unpredictable results.
- Never define local data in a Site, Aisle, Road or Signal. Local data is not guaranteed when processing across multiple tiers. Sites and Lanes must be stateless. This is the purpose of Cargo.

- Traffic Signals should not modify Cargo. Signals should only be used to evaluate a condition as true or false. Anything else is a side effect, reducing the maintainability of the system.
- Never implement just one Signal. Always implement Signals when there is more than one Road that responds to the same letter, or when there is an Aisle and a Road that respond to the same letter. See "Signals" on page 11-5.
- Send letters at the end of methods. If the choice of which letter to send depends on conditions which occur during the method, store the method name and mail it at the end of the method.
- Do not mail letters from depart() and undo() in Sites, backup() and traverse() in Roads, roadClear() in Signals, and load() and unload() in Shuttles. Letters can be mailed from traverse() in Aisles.
- Define Shuttles in the calling Service package. If they are reusable Shuttles, define them in a common package.

Table 7–1 provides naming conventions for Tour components.

Table 7–1 Tour Naming Conventions

Element	Description	Example
Service	description of the related functionality	Login
Site element	VerbNoun—indicating the action taking place at the Site	EnterID
Site class	The same as the Site name, with Site as a suffix	EnterIDSite.java
Road element	NounVerb—indicating the event that caused the Road to be taken	IDEntered
Road class	The same as the Road name, with Road as a suffix	IDEnteredRoad.java
Aisle element	NounVerb- indicating the event that caused the Aisle to be taken	PasswordEntered
Aisle class	The same as the Aisle name, with Aisle as a suffix	PasswordEnteredAisle.java
Cargo	ServiceNameCargo	LoginCargo.java
Letter	One word action name indicating the event; see list defined in commonLetterIfc.java	Success Failure Continue Next Cancel OK Retry Invalid Add Yes No Undo Done

Table 7–1 Tour Naming Conventions

Element	Description	Example
Transfer Station element	NestedServiceNameStation	FindCustomerStation
Shuttle class	NestedServiceNameLaunchShuttle	FindCustomerLaunchShuttle.java
	NestedServiceNameReturnShuttle	FindCustomerReturnShuttle.java
Traffic Signal class	IsCondition.java-indicating the condition being tested	IsAuthRequiredSignal.java

Foundation

- The best reuse in the Foundation engine takes place at the Service level. Sites require extra thought because they can affect flow. Lane actions can be reused without flow implications. Signals and Shuttles are very well suited to reuse especially when interfaces are developed for accessing Cargo.
- If validation and database lookup are coded in Aisles, they may be good candidates for reuse in several Sites as well as in multiple Services.
- All component pieces need to be designed with care for reuse: they must be context insensitive or must do a lot of checking to make sure that the managers they access exist for the bus that is active, the Cargo contains the data they need, etc.
- Trying to maximize reuse can result in confusing code with too many discrete parts. If the reusable unit consists of one or two lines of code, consider whether there is sufficient payoff in reusing the unit of code. If the code contains a complex calculation that is subject to change over time, then isolating this logic in one place may be well worth the effort.

Tours and Services

- There is often a one-to-one mapping between a Use Case and a Service. The Service should provide the best opportunity for reuse. If you design for reuse, it should be focused at the Service level. This is where you get your best return on investment.
- Maintenance is a matter of choosing a style and implementing it consistently within a Service and sometimes within an entire application. When you are comfortable with how TourCam works, maintaining TourCam Services is easy. Maintenance is more difficult in general for TourCam Services, since these Services are more complex.
- Aisles help reduce the total number of Sites in a Service, but they may be harder to see because they are contained within a Site.
- When making choices, give making an application as consistent and easy to maintain as possible the top priority.
- Consider the performance costs of using TourCam or creating additional Sites when designing a Service.
- A Service can often be simplified by reducing the number of individual Sites. You can do this by using Aisles to replace Sites; Sites with one exit Road can be good candidates, and Aisles are good candidates for reuse. However, Aisles are less visible than Roads.

Sites

- Reusing a Site has flow implications. Site classes can be reused whenever the exit conditions are identical. Reusable Sites should be packaged in a common package as opposed to one of the packages that use them. A reusable Site must refer to a reusable Cargo or a common Cargo interface.
- Treat the sending of a letter like a return code: put it at the end of your arrive() or traverse() method. Sending letters in the middle of the arrive() method may cause duplicate letters (with unpredictable results), or no letters (with no results).
- Do not try to store state information in instance variables. Pass in state information through arguments.
- Do not put a lot of functionality in arrive(), traverse() methods. Decompose them into logical methods that each have one job. For methods not called from outside the package, protect the methods.

Managers and Technicians

- There is a high degree of reuse of Managers and Technicians across the applications. For example, the DataTransactions and DataActions are reusable. By design, it is the DataOperations that change with different database implementations. The UIManager and UITechnician expect a lot of reuse of beans, adapters, and specification objects. In fact, the UISubsystem looks in the UI Script for most of the configuration information that effects changes in screen layout, bean interactions and even bean composition.
- Utility methods can be useful for capturing behavior that is used by many Services, but does not lend itself to Site or Aisle behavior. Put Utility methods in a UtilityManager so they can be easily extended. The Point-of-Service application contains an example of this called the POSUtilityManager. Service developers can access these methods through the POSUtilityManagerIfc. The UtilityManager and UtilityManagerIfc classes can be extended and the new class is specified through the Conduit Script. For general-purpose behavior that can be called from a Site, Lane, or even from a Signal, use utility methods to capture the common reusable behavior rather than extending a common Site.
- Large bodies of reusable behavior can be implemented as Managers and Technicians. This pattern is especially useful if the user might off-load the processing to a separate CPU.

Roads

It is sometimes useful to define multiple Roads from an origin Site to the same destination if they capture different Road traversal conditions.

Do not trap and change the name of a letter just to reduce the number of Roads in a Service. This is a poor use of system resources and also hides useful information from the reader of the Tour Script. Do not rename letters except as noted in "Renaming Letters" page 12-8.

For example, the Return Transaction Service has two Roads with the same origin (LookupItem) and the same destination (EnterReturnItemInformation), but the letters that invoke these two Roads are different.

The use of Road actions is dependent on a number of factors: use of TourCam, developer conventions for an application, number of classes generated, and maintainability.

Use Road actions for outcome-specific behavior. If you need to store some data in Cargo on the sending of a specific letter, do the Cargo storage in the traverse() method of the Road that is associated with that letter. If the data must be stored in Cargo before leaving a Site, put the logic in the Site's depart() method. Code in a Site or Aisle's depart() method should not check to see what letter was sent before taking an action; use a Road in that case.

Aisles

Aisles are used to implement behavior that occurs within a Site. When there is interaction with an external source (e.g. user, database) use a Site. When you are doing business validation which may keep you in the same screen, use an Aisle.

While it makes sense to create Roads without corresponding Road actions, Aisles are useless without an Aisle action. The important thing about an Aisle is that it is not part of a transition from one Site to another, so the only code that gets executed in an Aisle is the traverse() method. The arrive() and depart() methods are never executed on a Site when an Aisle is processed. The Aisle can initiate an action that causes a transition to another Site, but it cannot transition itself.

Aisle actions can be used to validate data, compute values, provide looping behavior, and do database lookups. Aisle actions are useful for capturing repeatable behavior that can occur while the bus is still in a Site.

For example, suppose you define a Site that gathers data from the user. The data validation is implemented as an Aisle. Because it is an Aisle, the user can repeat the process of entering data, validating, and re-entering until the data is correct, with little system overhead. The Aisle behavior can be triggered over and over without calling the arrive() method on the Site (a Road back to the Site calls the arrive() method).

Aisles are also useful for looping through a list of items when each item may require error handling. This is done by placing the loop index in the Cargo.

Signals

You cannot use a signal alone; they must be used in groups of two or more. If there is more than one Lane that responds to the same letter, each Lane must implement a Signal. The logic in the Signals must be mutually exclusive; there should be only one valid Road that can be traversed at any time; otherwise, unexpected (and difficult to debug) behavior could occur.

When there are more than two Signals, each of the Signals should evaluate in such a way that only one Signal is green at any given time. But the presence of more than two Signals should raise a red flag. Track down the source of the following issues; determine if the UI or other letter generator needs to be sending more unique letters.

- Why are there so many Signals?
- What are they checking?
- Is the same letter being sent for many different conditions?

Use a Signal only to decide which road to take when you could go to two different places (such as Sites) with the same Letter, based on Cargo information. It should not be used to update cargo. The road you take after making a decision at the Signal should do the updating

Choosing Among Sites, Aisles, and Signals

There are many times when an Aisle can do the same work as a Site. Sometimes a Signal can contain behavior that could be implemented in an Aisle. Sometimes a separate Service does the work that was once a Site if the Site needs to be reused or becomes too complicated. Consult the guidelines for your application development team in order to be consistent with the rest of your team.

If you have the following customer requirement:

- Display a UI screen that gathers search criteria to be used in a database lookup (for example, customer lookup). After the user enters the data, validate the data. Once the data has been validated, do the database lookup.

you have the following design choices:

- Implement as separate Sites and take advantage of TourCam to back up when the data is invalid or database lookup results are not correct.
- Implement as one Site with Aisles that do the validation and lookup.

The database lookup may result in a success or failure letter whether it is coded as a Site or an Aisle. When using an Aisle for database lookup, the failure letter triggers another Aisle that could display an error message but allow the user to re-enter the data and retry the lookup. This can occur without exiting the original Site. When using a Site, the failure condition can trigger a flow change to back up through the lookup Site back to the data entry Site.

If the validation and database lookup are coded in Aisles, they may be good candidates for reuse in several Sites as well as in multiple Services. Reusing the Site is also possible, especially if the TourCam's ability to back up to the last indexed Site is used. But there may be more considerations involving flow when trying to reuse a Site.

Renaming Letters

Use the following guidelines when deciding whether to rename letters:

- Do rename Letters when the application developer does not have power over the Letter that is mailed and there is more than one event associated with a single Letter.

  For example: a single Letter is sent from a button on the UI (such as dialog box OK), but the content of the retrieved data associated with the UI signals a different event notification (such as error message notification).
- Do rename Letters when a common exit Letter from a nested Service is needed.
- Don't rename Letters to reduce the number of Roads in a Service.

Shuttles

If you are creating a sub-tour (i.e. a tour called from other tours via a Station) from scratch, use only the following final letters:

- Success
- Failure
- Cancel
- Undo

If you need to provide a reason for a Failure or need to return data to the calling service on a Success, use the Return Shuttle to update the calling service's cargo. Do not use letters to reflect sub-tour results.

Shuttle Type	Launch Shuttle	Return Shuttle
Description	Used to send parameter data to a sub-service	Used to return data to the parent service.
Methods	load()—can only see the parent Service's Cargo unload()—can only see the sub-service's Cargo	load()—can only see the sub-service's Cargo unload()—can only see the parent service's Cargo

Within the Tour Framework, Shuttles are used to transfer data in and out of Services. Shuttles are good candidates for reuse given a common Cargo interface.

Cargo

All Cargo classes should implement the CargoIfc interface.

Log Entry Format

This section describes the format and layout of log entries for the Point-of-Service application.

Log Entry Description

Log entries adhere to the following format:

```
LLLLL yyyyy-mm-dd hh:mm:ss,ttt bbbbbbb (<classname>):
      [<classname>.<methodname>(<filename>:<linenumber>)]
      <Log entry content>
```

Fixed Length Header

The entry begins with a fixed length record header (38 bytes) that adheres to the following layout:

```
LLLLL yyyyy-mm-dd hh:mm:ss,ttt bbbbbbb
12345678901234567890123456789012345678
```

LLLLL is the log message level and consists of one of the substrings in the following table:

Table 7–2 provides log message levels and their descriptions.

Table 7–2 Log Message Level

Log Message Level	Description
ERROR	Highest severity entry; critical
WARN	Application warning; serious
INFO	For information only
DEBUG	For developer use (not displayed by default application configuration

`yyyy-mm-dd` is the date.

`hh:mm:ss,ttt bbbbbbb` is the time stamp of the entry, comprised of the sub-fields described in the following table:

Table 7–3 provides time stamp fields and their descriptions.

Table 7–3 Time Stamp Fields

Field	Description
hh	Time of entry in hours, in 24-hour format
mm	Minutes past the full hour
ss	Seconds past the last full minute
ttt	Milliseconds past the last full second
bbbbbbb	Milliseconds since the application was started. Left justified and blank filled on the right, out to 7 places

Additional Logging Info

The fixed length record header is followed by a blank space followed by the parenthesized, fully qualified class name of the logging entity followed by a colon followed by a carriage return/line feed pair.

```
(<classname>):<cr><lf>
```

The next line in a log entry begins with 6 blank spaces and a square-bracketed sequence containing the following information:

```
<classname>.<methodname>(<filename>:<linenumber>)
```

Parentheses are included in the sequence. This sequence reflects the fully qualified name of the method invoking the logging action and the source line number in the file where the logging call was made.

The next line(s) in a log entry are the log entry content. The content is comprised of freeform text supplied by the calling routine. The content reflected in the freeform text may be multiple lines in length.

The next log entry is delineated with another 38 byte fixed length header beginning in column one of the text log file.

Example Log Entry

```
INFO  2004-09-02 11:12:41,253 23697
(main:com.extendyourstore.foundation.manager.gui.DefaultBeanConfigurator):

[com.extendyourstore.foundation.manager.gui.DefaultBeanConfigurator.applyPropertie
s(DefaultBeanConfigurator.java:198)]
      Applying property cachingScheme to Class: DialogBean (Revision 1.9)
@12076742
```

8

Extension Guidelines

Customers who purchase Point-of-Service extend the product to meet their particular needs. These guidelines speed implementation and simplify the upgrade path for future work.

Developers on customer projects should also refer to the Development Standards. The Development Standards address how to code product features to make them less error-prone and more easily maintained. They are especially important if code from the customer implementation may be rolled back into the base product.

Conventions

This section describes conventions used throughout this chapter.

Terms

The following definitions are used throughout the chapter:

- Product source tree — A directory tree that contains the Oracle Retail product code. The contents of this tree do not change, with the exception of product patches. In production code, these files are accessed as external .jar files.
- Customer source tree — A directory tree separate from the product code that contains customer-specific files. Some of these files are new files for customer-specific features; others are extensions or replacements of files from the product source tree. The customer tree should not contain packages from the product tree.
- Customer abbreviation — A short name that represents the customer. For example, a company named My Bike Store might use MBS as their customer abbreviation. The MBS example is used throughout this chapter; replace MBS with the customer abbreviation for your own project when writing code. The customer abbreviation is added to filenames to clarify that the file is part of the customized code, and is used as part of the package name in the customer source tree.

Filename Conventions

Filenames in the customer source tree usually include the customer abbreviation. Name files according to the following rules:

- If a class in the customer source tree extends or replaces a class in the product source tree, use the customer abbreviation followed by the original filename as the new filename (for example, SaleReceipt.java becomes MBSSaleReceipt.java).
- New Java classes should also begin with the customer abbreviation.

- Script or properties file names that are hard-coded in Foundation classes must use the same filename in the customer source tree as was used in the product source tree (for example, posfoundation.properties).

Modules

The Point-of-Service system is divided into a number of different modules, and each module corresponds to a project in an integrated development environment (IDE). When setting up a development environment for modifying code, building Point-of-Service, and testing changes, you must configure your system to make MBSpos dependent on all the other modules.

To set up your development environment:

1. Check out each of the required customer modules as shown in the following table.
2. Reference each of the standard modules as external .jar files.
3. Add the required modules to your CLASSPATH environment variable in the order shown in the following table, with all of the customer modules preceding the set of standard modules.

Table 8–1 identifies required customer and standard modules in their respective dependency orders.

Table 8–1 Required Modules in Dependency Order

Customer Modules	Standard Modules
MBS pos (root, src, locales_US and other language directories)[1]	pos (root, src, locales_US and other language directories)
MBS domain (root and src)	domain (root and src)
MBS commerce services	360common
MBS common	commerce services
MBS 3rd-party	foundation
	3rd party

[1] Directory names in parentheses must be specified individually in the classpath.

Directory Paths

Paths given in this chapter are relative, starting either with the module or with the source code, as follows:

- Paths beginning with a module name start from the module location. pos\config refers to the config directory within the pos module, wherever that module is located on your system.
- Paths beginning with com refer to source code. Source code paths are nested within modules, in \src directories. Multiple \src\com file hierarchies are built together into one file structure during compilation. For example, a reference to `com\_360commerce\pos\services\tender` can be found in the pos module's src directory. If your pos module is in `c:\workspace\OracleRetailStore`, then the full path is:

  ```
  C:\workspace\OracleRetailStore\pos\src\com\_360commerce\pos\services\tender
  ```

POS Package

This section addresses extension of files in the pos package.

> **Note:** The pos module may be nested within a OracleRetailStore directory in the source code control system.

Tour

You extend tours mainly by editing proprietary XML scripts developed by Oracle Retail. This section describes how to customize tours, beginning with replacing the Tour Map, and continuing with customization of individual tours or parts of tours.

Tour Map

The product code references tours at transfer stations by logical names, so that you can change a single tour without having to update references to that tour in various tour scripts. Tour maps tell the system the specific tour files to use for each logical name.

The tour map also enables overlays of tour classes. If a tour script does not need to be customized, but some of the Java classes do, the tour map can specify individual classes to customize. Note that any class files must still use their own unique names (such as MBScashSelectedAisle.java for a new Aisle used in place of CashSelectedAisle.java).

Typically, the base product Tour Map file, tourmap.xml, does not change. Instead, you create a custom Tour Map for your project, and an additional one for each supported locale beyond your default locale. Each of these Tour Map files contains only the differences it adds to the base Tour Map.

Follow these steps to add new Tour Map files:

1. Create one custom Tour Map file for each supported country in the pos\config directory of the customer source tree. Initially, these Tour Map files may be empty; as you customize tour components, you can add tags. The following sample shows the initial state of the file:

Example 8–1 MBStourmap_CA.xml: Sample initial tourmap file for Canadian locale

```
<?xml version="1.0" encoding="UTF-8"?>
<tourmap
   country="CA"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:noNamespaceSchemaLocation="com/extendyourstore/foundation/tour/dtd/tourmap.xsd
">

...Tour tags can be added here...

</tourmap>
```

2. Copy the pos\config\posfoundation.properties file to the customer source tree. Modify the tourmap.files property in this file, adding the names of the new Tour Map files. Do not rename the posfoundation.properties file, since this filename is referenced by Foundation classes. It is important to keep the customized tour map files after the product tour map file in the list, since the files listed later override earlier files.

Example 8–2 posfoundation.properties: Adding new Tour Maps

```
# comma delimited list of tourmap files to overlay
tourmap.files=tourmap.xml, MBStourmap.xml, MBStourmap_CA.xml
```

3. Refer to the procedures that follow to modify tour scripts and Java components of a tour.

Tour Scripts

If you need to change the workflow of a tour, you must replace the tour script; you cannot extend a tour script. To replace a tour script, follow these steps:

1. Create a new XML tour script in the customer source tree.
2. Modify the tour map in the customer source tree to specify the correct package and filename for the new tour script. The logical tour name must stay the same.

Example 8–3 tourmap_CA.xml: Replacing one tour script

```
<tour name="tender">
       <file>classpath://com/mbs/pos/services/tender/tender.xml</file>
</tour>
```

3. Copy and modify sites, roads, aisles, shuttles and signals.

Site

Extending siteactions in the traditional object-oriented sense is not recommended; letters mailed in the original arrive method would conflict with the arrive method in the extended class. Since siteactions represent relatively small units of code, they should be replaced instead of extended. Follow these steps:

1. Create a new siteaction class in the customer source tree, such as MBScashSelectedSite.java.
2. If you are overlaying a siteaction class, but not modifying the tour script, then all letters that were mailed from the product version of the siteaction class should also be mailed from the new version. Do not mail new letters that are not handled by the product code, unless the tour script and related Java classes are also modified.
3. Edit the appropriate Tour Map for the locale, using the replacewith property in the <SITEACTION> tag to define the new package and filename for the siteaction class.

Example 8–4 tourmap_CA.xml: Replacing a siteaction

```
<tour name="tender">
   <file>classpath://com/mbs/pos/services/tender</file>
   <SITE
      name="cashSelected"
      useaction="com.extendyourstore.pos.services.tender.cashSelectedSite"/>
   <SITEACTION
      class="cashSelectedSite"
      replacewith="com.mbs.pos.services.tender.MBScashSelectedSite"/>

</tour>
```

Lane—Road or Aisle

As with siteactions, extending laneactions in the traditional object-oriented sense is not recommended, as letters from the original and extended classes could conflict. Replace laneactions instead of extending them, using the following steps:

1. Create a new laneaction class in the customer source tree, such as MBSOpenCashDrawerAisle.java.
2. If you are overlaying a siteaction class, but not modifying the tour script, then all letters that were mailed from the product version of the laneaction class should also be mailed from the new version. Do not mail new letters that are not handled by the product code, unless the tour script and related Java classes are also modified.
3. Edit the appropriate Tour Map for the locale, using the replacewith property in the <LANEACTION> tag to define the new package and filename for the laneaction.

Example 8–5 tourmap_CA.xml: Replacing a laneaction

```
<tour name="tender”>
       <file>classpath://com/mbs/pos/services/tender</file>
       <SITE
          name="RefundDueUI"
          useaction="com.mbs.pos.services.tender.refundDueUISite">"/>
       <LANEACTION
          class="OpenCashDrawerAisle"
          replacewith="com.mbs.pos.services.tender.MBSOpenCashDrawerAisle"/>

    </tour>
```

Shuttle

Since shuttles do not mail letters, they may be extended or replaced; however extending them is recommended. Follow these steps in either case:

1. Modify the shuttle class.

   Create a new class in the customer source tree. If it extends or replaces the product bean class, add the customer abbreviation to the filename. For example, TenderAuthorizationLaunchShuttle.java becomes MBSTenderAuthorizationLaunchShuttle.java.
2. Edit the appropriate Tour Map for the locale, using the replacewith property in the <SHUTTLE> tag to define the new package and filename for the shuttle.

Example 8–6 tourmap_CA.xml: Replacing or Extending a shuttle

```
<tour name="tender”>
       <file>classpath://com/mbs/pos/services/tender</file>
       <SITE
          name="RefundDueUI"
          useaction="com.mbs.pos.services.tender.refundDueUISite">"/>
       <SHUTTLE
          class="TenderAuthorizationLaunchShuttle"

replacewith="com.mbs.pos.services.tender.MBSTenderAuthorizationLaunchShuttle"/>

    </tour>
```

3. Modify the calling and nested tour scripts as necessary to adjust to the change.

Signal

Extending signals in the traditional object-oriented sense is not recommended. This is because signals are typically so small that extending an original signal class makes them overly complex.

The REPLACEWITH tag of the TourMap does not work for Signals. The tour script must be customized to refer to the package and filename of the new signal. Follow these steps:

1. Create a new signal class in the customer source tree. For example, create a replacement for IsAuthRequiredSignal.java in the Tender service by creating a class file com\mbs\pos\services\tender\MBSIsAuthRequiredSignal.java.
2. Customize the appropriate tour script.

Example 8–7 MBStender.xml: Tender tour script with customized signal

```
<SERVICECODE>
... non-signal declarations omitted...
     <SIGNAL class="IsReturnTransactionSignal" />
     <SIGNAL class="IsSaleTransactionSignal" />
     <SIGNAL class="IsNotVoidTransactionSignal" />
     <SIGNAL class="IsAuthNotRequiredSignal" />
     <SIGNAL class="MBSIsAuthRequiredSignal" package="com.mbs.pos.services.tender"
/>
     <SIGNAL class="IsRemoveTenderSignal" />
     <SIGNAL class="IsNoRemoveTenderSignal" />
     <SIGNAL  class="IsValidDriverLicenseSignal" />
     <SIGNAL  class="IsInvalidDriverLicenseSignal" />
... more declarations omitted...
</SERVICECODE>
... code omitted...
<ROAD name="AuthorizationRequested"
                     letter="Next"
                     destination="AuthorizationStation"
                     tape="ADVANCE"
                     record="OFF"
                     index="OFF">
                    <LIGHT signal="MBSIsAuthRequiredSignal"/>
```

Cargo

Since cargos do not mail letters, they may be extended or replaced. Cargo classes are typically part of a hierarchy of classes. Follow these steps:

1. Modify the cargo class by doing one of the following:
   - To extend the cargo, create a new class in the customer source tree that extends the cargo in the product source tree. Be sure to extend from the lowest-level subclass. Add the customer abbreviation to the beginning of the filename.
   - To replace the cargo, create a new cargo class in the customer source tree.
2. Edit the appropriate Tour Map for the locale, using the replacewith property in the <CARGO> tag to define the new package and filename for the cargo.

Example 8–8 tourmap_CA.xml: Replacing a Cargo

```
<tour name="tender">
       <file>classpath://com/mbs/pos/services/tender</file>
       <SITE
          name="RefundDueUI"
          useaction="com.mbs.pos.services.tender.refundDueUISite">"/>
       <CARGO
          class="TenderCargo"
          replacewith="com.mbs.pos.services.tender.MBSTenderCargo"/>

    </tour>
```

3. Modify the tour map and/or tour scripts and shuttles of the calling and nested tours to adapt to the cargo modifications. Be sure to address:
   - Classes in the same tour as the modified cargo
   - All tours for which this tour is a nested tour
   - All tours which are called by this tour

UI Framework

The UIManager and UITechnician classes are provided by Foundation. They are configurable through the Conduit Script and should not be modified directly. This section describes customization to the default UI configuration and individual screens.

Default UI Config

The product file pos\config\defaults\defaultuicfg.xml contains the building blocks for the UI (displays, templates and specs) and references to all tour-specific uicfg.xml files. If you change any UI script in the customer implementation, the defaultuicfg.xml file must be replaced. It also needs to be replaced if the displays, templates, and basic bean specs need to be replaced. Follow these steps to replace the file:

1. Copy the file defaultuicfg.xml to the pos\config\defaults directory in the customer source tree, and rename it (for example, to MBSdefaultuicfg.xml).
2. Modify the displays, templates, default screens, and specs as necessary to represent the customer's user interface.
3. Verify that the conduit script for the client tier has been customized and is located in the customer source tree.
4. Modify the client conduit script to include the new filename and package name for the MBSdefaultuicfg.xml file, in the configFilename property value in the UISubsystem section of the UITechnician tag.

Example 8–9 ClientConduit.xml: Conduit script modified to use custom UI configuration file

```
<TECHNICIAN
        name="UITechnician"
        class="UITechnician"
        package="com.extendyourstore.foundation.manager.gui" export="Y">

        <CLASS
            name="UISubsystem"
            package="com.extendyourstore.pos.ui"
            class="POSJFCUISubsystem">

            <CLASSPROPERTY
                    propname="configFilename"

propvalue="classpath://com/mbs/pos/config/defaults/MBSdefaultuicfg.xml"
                    proptype="STRING"/>
...additional class properties omitted...
</CLASS>
</TECHNICIAN>
```

UI Script

A UI script changes if the overlays or unique bean specifications of one or more screens in a tour need to be modified. Follow these steps:

1. Create a new UI script in the customer source tree. For example, copy the tenderuicfg.xml file from the product source tree to the customer source tree and rename it MBStenderuicfg.xml.
2. Modify the MBSdefaultuicfg.xml file in the customer source tree to refer to the new filename and package for the UI script.

Example 8–10 MBSdefaultuicfg.xml: Customized Default UI Configuration File

```
... other include statements omitted...
<INCLUDE filename="classpath://com/_360commerce/pos/services/sale/saleuicfg.xml"/>
    <INCLUDE
filename="classpath://com/mbs/pos/services/tender/MBStenderuicfg.xml"/>
<INCLUDE filename="classpath://com/_
360commerce/pos/services/tender/capturecustomerinfo/capturecustomerinfouicfg.xml"/
>
    <INCLUDE
filename="classpath://com/extendyourstore/pos/services/inquiry/inquiryoptionsuicfg
.xml"/>
... other include statements omitted...
```

Bean Model and Bean

The Point-of-Service product code provides generalized beans that are designed to be reused as-is, such as GlobalNavigationButtonBean.java for the global navigation button bar and DataInputBean.java for the work area of form layout screens. These classes are not intended to be extended for a specific implementation, though they may be extended if the general behavior or data must change in all cases.

The classes can be used for different screens within the application without changing to Java code by modifying parameter values and calling methods on the bean. Use the generalized beans whenever possible and avoid beans specialized for only one screen. However, bean and bean model classes in the product code that are specific to an individual screen, such as CheckEntryBean.java and CheckEntryBeanModel.java, may be customized. Follow these steps to modify a bean model:

1. Create a new bean model class.

   Create a new class in the customer source tree, and add the customer abbreviation to the filename.

2. Copy tour files that need to reference the new bean model into the customer source tree. Modify them to create and manipulate data for the new bean model.

Follow these steps to modify the bean:

1. Create a new bean class.

   Create a new class in the customer source tree, and add the customer abbreviation to the filename.

2. Modify the UI config scripts that reference the bean class in the customer source tree to refer to the new bean class filename and package.

Example 8–11 MBStenderuicfg.xml: Tender UI Configuration with Customized Bean Reference

```
<UICFG>

    <BEAN
        specName="TenderOptionsButtonSpec"
        configuratorPackage="com.extendyourstore.pos.ui"
        configuratorClassName="POSBeanConfigurator"
        beanPackage="com.mbs.pos.ui.beans"
        beanClassName="MBSNavigationButtonBean">

        <BUTTON
            actionName="Cash"
            enabled="true"
            keyName="F2"
            labelTag="Cash"/>
...other buttons omitted...
     </BEAN>
...other UI objects omitted...
</UICFG>
```

Other

This section covers customization of components other than the tour and the UI framework, including internationalization and localization changes as well as conduit scripts, PLAF, receipts, and reports.

Internationalization

The process of internationalization includes modifications to the code so that a single code base can support multiple languages. The base product supports US English. If additional languages need to be supported, additional internationalization steps need to be completed by the customer.

For additional internationalization support of Oracle Retail Point-of-Service, please contact Oracle Retail Services.

For India Localization

Inactive MRPs are purged from the POS system at regular intervals to reduce the impact on performance. A new purge script "PURGE_INACTV_MRP" is developed to purge the inactive MRP and the corresponding regular price records. The purge script accepts "Number of Days the Inactive MRP to be Retained" as a parameter. The purge script deletes only the MRPs having deactivation date less than or equal to current date (the date on which purge script is run) - the "Number of Days the Inactive MRP to be Retained".

Conduit Scripts

The conduit scripts provided with Oracle Retail applications define a typical tier configuration and are usually replaced with customer conduit scripts for a given implementation. Conduit scripts include an XML file and a .bat and .sh file to execute the XML; both .bat and .sh versions of the batch file are provided to support Windows and Linux.

Follow these steps to set up customer conduit scripts:

1. Copy the conduit scripts (client, server, and collapsed) to the customer source tree.

   Copy the XML and .bat and .sh files for each type of conduit script. Rename the scripts using the customer abbreviation (ClientConduit.xml becomes MBSClientConduit.xml).

2. Edit each XML file to include only the managers and technicians that should be loaded on the given tier.

3. Modify the class and package names for any managers, technicians and configuration scripts that have been customized.

```
MBSClientConduit.xml: Customized with New Data Manager
    <MANAGER name="DataManager" class="MBSDataManager"
             package="com.mbs.foundation.manager.data">
        <PROPERTY propname="configScript"
                  propvalue="classpath://config/manager/PosDataManager.xml" />
    </MANAGER>
```

4. Modify your development environment to pass in the new conduit XML file as a parameter to the TierLoader.

5. Edit the .bat and .sh files to pass the correct conduit XML files to the Java environment.

PLAF

Point-of-Service implements a pluggable look-and-feel (PLAF) so that customers may modify the look of the application including screen colors and images. To modify the PLAF, follow these steps:

1. Create a new properties file that is a copy of one of the following files. Place the file in the com\mbs\pos\config directory in the customer source tree.

   - tigerplaf.properties — yellow-and-purple, text-based LAF
   - imagePlaf.properties — blue and gold image-based LAF

2. Update the conduit scripts in the customer source tree to specify the package and filename for the new LAF file in the UI Technician tag.

3. Have new UI beans call uiFactory.configureUIComponent(this, UI_PREFIX) in the initialize() method to set the look-and-feel.

Receipts

Receipts are composed of two levels:

- A base receipt that manages data and behavior for all receipts
- Specific receipt types such as Layaway and Return

The receipt class names are specified in the tour code and there is no factory for creating receipts. Therefore, modifications to the tour code that accesses the receipts are required.

If the base receipt and specific receipt classes are both going to be extended, typical inheritance is not sufficient since Java does not support multiple inheritance. For example, the MBSLayawayReceipt.java class cannot extend both MBSPrintableDocument.java and MBSLayawayReceipt.java. The recommended approach is to extend both classes, and have MBSLayawayReceipt.java extend LayawayReceipt.java. MBSLayawayReceipt.java then includes an instance of MBSPrintableDocument.java and methods can be called on the extended class.

Follow these steps to customize receipts:

1. If modifications are required to the base receipt, create a class in the customer source tree named MBSPrintableDocumentUtility.java. This class is a utility class since the receipt classes delegate common functionality to it.
2. For each receipt type that needs to be customized, do one of the following:
   - To modify an existing receipt type, create a Java class in the customer source tree that extends the receipt class in the product code. Add the customer abbreviation to the beginning of the filename.
   - To create a new receipt type, create a Java class in the customer source tree that extends MBSPrintableDocument.java.
3. For extended classes, include an instance of the MBSPrintableDocumentUtility.java class. Call methods on the utility class when a customized method is required.
4. Modify tours in the customer source tree as necessary to call new() for the customized receipt types.
5. Modify parameters for the receipt header and footer as necessary.

Reports

Point-of-Service has a set of reports that print on the slip printer. These reports are in a proprietary format and do not use a reporting engine. The report class names are specified in the tour code and there is no factory for creating reports. Therefore, modifications to tours that access the reports are required.

To modify existing Point-of-Service reports, the report Java files can be extended. Follow these steps:

1. For each report, do one of the following:
   - To modify an existing report, create a Java class in the customer source tree that extends the reports class in the product code (found in pos\trunk\srb\com\extendyourstore\pos\reports).
   - To create a new report, create a Java class in the customer source tree that extends the abstract RegisterReport class in the product code. Use the customer abbreviation in the filename.
2. Create, modify or override data and methods as necessary to modify the report.

3. Modify the tour code that creates the report object to call new() for the new report class.

Domain Package

This section addresses customization of files in the domain package. The domain package can be found in the `\OracleRetailStore\domain` directory in your source control system.

Retail Domain

The Retail Domain provides a retail-specific implementation of business objects. These objects are easily extended to meet customer's requirements.

DomainObjectFactory

If any Retail Domain Objects (RDOs) are added or extended, the DomainObject Factory must be extended. This needs to be done only one time for the application. The extended class must include getXinstance() methods for all new and extended RDOs, where X is the name of the RDO. Follow these steps:

1. Create a new Java class that extends DomainObjectFactory.java. It should be named with the customer abbreviation in the filename MBSDomainObjectFactory.java and be located in the customer source tree.
2. Copy the domain.properties file to the domain\config directory of the customer source tree. Modify the setting for the DomainObjectFactory to refer to the new package and class name created in the previous step.

   ```
   DomainObjectFactory=com.acmebrick.domain.factory.MBSDomainObjectFactory;
   ```
3. Add getXInstance() methods as necessary for new Retail Domain Objects.

Retail Domain Object (RDO)

Follow these steps to create or extend an RDO:

1. Complete one of the following steps:
   - To create a new RDO, create a Java class in the customer source tree in the appropriate subdirectory of domain\src\com\mbs\domain. Extend an appropriate superclass from the product code. At a minimum, the new class must extend EYSDomainIfc.java.
   - To modify an existing RDO, create a Java class in the customer source tree that extends an RDO in the product code.

   Include the customer abbreviation in the filename; for example, you might name your class file MBSCustomer.java.
2. Add data attributes and methods required by the customer-specific functionality.
3. Create setCloneAttributes(), equals() and toString() methods to address the new data attributes and then reference the corresponding superclass method.
4. Complete one of the following steps:
   - For a new RDO, add a new getXInstance() method to MBSDomainObjectFactory.java for the new RDO.
   - For an extended RDO, override the existing getXInstance() method in MBSDomainObjectFactory.java to return an object of the new class type.

5. Access the new RDO data and methods from tours located in the customer source tree. If product tours need to access the new RDO data and methods, the tours must be modified.
6. If the RDO data is represented on a screen, modify the UI script, bean and bean model classes to reflect the change.
7. If the RDO is saved to the database, modify the data operation to save the new data attributes.

Database

This section details how to extend database behavior through changes to the data operations. The architecture of the Data Technician simplifies this somewhat, because changes to data operations can be implemented without changes to the Point-of-Service application code.

Data Manager and Technician Scripts

The Data Manager and Data Technician Scripts, DefaultDataManager.xml and DefaultDataTechnician.xml, are routinely customized when transactions, data actions, and data operations are customized. See the next section for details.

Data Actions and Operations

When a new or modified RDO contains data that need to be saved to the database, a data operation class must be created or extended. A Data Action must be modified if a unit of database work is changed.

1. Create class files.

   Create new class files for each new or modified item in the customer source tree. If an item extends a product class, add the customer abbreviation to the filename.
2. If a customized version of POSDataManager.xml does not already exist, copy it to the customer source tree and give it a new name, such as MBSPOSDataManager.xml.
3. For customized transactions with new filenames, modify the transaction name.
4. If a customized version of DefaultDataTechnician.xml does not already exist, copy it to the customer source tree and give it a new name, such as MBSDefaultDataTechnician.xml.
5. Edit the customized MBSDefaultDataTechnician.xml file, updating package and class names for data actions and data operations that have been modified.

Example 8–12 MBSDefaultDataTechnician.xml: Customizing a Data Operation

```
<OPERATION class="JdbcSaveTenderLineItems"
       package="com.mbs.domain.arts"
       name="MBSSaveTenderLineItems">
       <COMMENT>
           This operation saves all tender line items associated
           with the transaction.
       </COMMENT>
   </OPERATION>
```

6. Modify the conduit scripts to reference the new package and/or filename of the technician script.

Example 8–13 CollapsedConduitFF.xml: Customizing the Data Technician

```
<TECHNICIAN name="LocalDT" class="DataTechnician"
               package="com.mbs.foundation.manager.data"
               export="Y">
        <PROPERTY
            propname="dataScript"
            propvalue="classpath://config/manager/MBSDefautlDataTechnician.xml"
        />
    </TECHNICIAN>
```

Data Transactions

Data transactions are the valet classes that carry requests from the client to the server. A data transaction factory implements the factory pattern for data transaction classes. The application code asks the factory for a transaction object and the factory determines which Java class is used to create the object. To create or extend a data transaction class, follow these steps:

1. Create new or modified data transactions.

   Create a Java class in the customer source tree and prepend the customer abbreviation to the filename. If you are modifying an existing transaction, have the class extend the transaction class in the product code, and overwrite the methods you are modifying.

2. Copy POSDataManager.xml to the customer source tree.
3. For customized transactions with new filenames, modify the transaction name.
4. Copy DefaultDataTechnician.xml to the customer source tree.
5. Modify package and class names for data actions and data operations that have been modified.
6. If not already done, modify the conduit scripts to reference the new package and/or filename of the technician script.
7. Extend DataTransactionKeys.java as MBSDataTransactionKeys.java in the customer source tree to add or modify the static final String for each transaction (the file serves as a list of string constants).

Example 8–14 MBSDataTransactionKeys.java: Adding Strings

```
public static final String DATA_MAINTENANCE_TRANSACTION=”data.transaction.DATA_
MAINTENANCE_TRANSACTION
public static final String PLU_RETURN_TRANSACTION” =data.transaction.PLU_RETURN_
TRANSACTION”
```

8. Update domain.properties in the customer source tree to add or modify the name/value pairs for each transaction.

Example 8–15 domain.properties: Sample Modified and New Data Transactions

```
# Registry of DataTransactionIfc implementations
# (try to keep in alphabetical order)
#

data.transaction.ADVANCED_PRICING_DATA_
TRANSACTION=com.extendyourstore.domain.arts.AdvancedPricingDataTransaction
...code omitted here...
data.transaction.REGISTER_STATUS_
TRANSACTION=com.MBS.domain.data.transactions.RegisterStatusTransaction
```

```
data.transaction.REGISTRY_DATA_
TRANSACTION=com.extendyourstore.domain.arts.RegistryDataTransaction
data.transaction.STORE_LOOKUP_DATA_
TRANSACTION=com.MBS.domain.data.transactions.StoreLookupDataTransaction


MBSdata.transaction.DATA_MAINTENANCE_
TRANSACTION=com.MBS.domain.data.transactions.DataMaintenanceTransaction
MBSdata.transaction.PLU_RETURN_
TRANSACTION=com.MBS.domain.data.transactions.ReturnPluTransaction
```

9

Tour Framework

The Tour framework is a component of the Oracle Retail Platform layer of the Point-of-Service architecture. The Tour framework implements a state engine that controls the workflow of the application. Tour scripts are a part of this framework; they define the states and transitions that provide instructions for the state engine that controls the workflow. Java classes are also part of this framework; they implement the behavior that is accessed by the tour engine, based on instructions in the tour scripts.

Tour Components

The tour metaphor helps the user visualize how the Oracle Retail Platform engine interacts with application code. In the following description of the metaphor, the words in **italics** are part of a simple tour script language that Oracle Retail Platform uses to represent the application elements.

Tour Metaphor

For a moment, imagine that you are a traveler about to embark on a journey. You have the itinerary of a business traveler (changeable at any time), your luggage, and transportation. In addition, you have a video camera (TourCam) to record your tour so you can remember it later.

You leave on your journey with a specific goal to achieve. Your itinerary shows a list of tours that you can choose from to help you accomplish your task. Each tour provides a tour bus with a cargo compartment and a driver. Each driver has a map that shows the various service regions that you can visit. These regions are made up of sites (like cities) and transfer stations (bus stations, airports, etc.). The maps show a finite number of lanes, which are either roads joining one site to another or aisles within one site. To notify the driver to start the bus and drive, you must send a letter to the driver. The driver reads the name on the letter and looks for a lane that matches the letter.

When a matching letter is found, the driver looks for a traffic signal on the road. If there is no signal, the driver can traverse the road. If there is a signal, the driver can traverse the road only if the signal is green. If the signal is red, the driver attempts to traverse the next alternative road that matches the letter. If the driver cannot find any passable road, he or she returns to the garage. When you arrive at a site or traverse a lane, you may perform an action to achieve your goal, like take a picture of the countryside.

Upon arriving at a transfer station, you immediately transfer to another service, and you load a portion of your cargo onto a shuttle and board the shuttle. The shuttle takes you and your cargo to the bus that runs in the map of the other tour. Upon arrival at the new bus, you unload the shuttle and load the new bus. Then the new driver starts the bus and your journey begins in the new tour. When the transfer tour itinerary is complete, you load whatever cargo you want to keep onto a shuttle and return to the original tour bus. At that time, you unload the shuttle and continue your tour.

These tour script components map to terms in the metaphor. The tour metaphor provides labels and descriptions of these components that improve understanding of the system as a whole.

Table 9–1 includes a metaphor description and a technical description for the basic metaphor components.

Table 9–1 Metaphor Components

Name	Metaphor Description	Technical Description
Service	A group of related cities, for example "A Mediterranean Tour"	An implementation of workflow and behavior for a set of functionality
Bus	The vehicle that provides transportation from city to city	The entity that follows the workflow between the sites
Cargo	The baggage that the traveler takes with him/her from city to city	The data that follows the workflow, modified as necessary
Site	A city	A function point in the workflow
Road	A path the bus takes to get from one city to another	A transition that takes place based on an event that changes the state
Aisle	A path the traveler takes while staying on the same bus in the same city	An action that takes place based on an event, without leaving the current state
Letter	A message the bus driver receives instructing him/her to perform an action	A message that causes a road or aisle to be taken

When given a use case, create a tour script by identifying components for the tour metaphor. Strategies for identifying components are listed in the table below. The following sections describe each component in more detail.

Table 9–2 includes strategies for identifying components.

Table 9–2 Component Identification Strategies

Component	How to Identify
Service	A service generally corresponds to a set of related functionality.
Site	Sites generally correspond to points in the workflow that need input from outside the tour. Outside input sources include the user interface, the database, and devices among others.
Road	At a site, look at the ways control can be moved to another site. There is one road for each of these cases.
Aisle	At a site, there might be a task that you want to handle in a separate module and then return to the site when the task is complete. There is one aisle for each of these cases.
Letter	Letters generally correspond to buttons on a UI screen and responses from the database and devices. Look for the events that move control from one site to another or prompt additional behavior within a site to help identify letters.

Follow the naming conventions in the Development Standards when deciding the names for the components. It is important to understand that the tour metaphor is not only used to describe the interaction of the components, but the component's names are used in the code. By convention, a site named GetTender has a Java class in the package named GetTenderSite.java that performs the work done at the site.

Service and Service Region

Tours provide a way of grouping related functionality to minimize maintenance and increase reusability. All tours provide a bus to maintain state and cargo for data storage. All sites, lanes, and stations contained within a tour have access to these resources. Furthermore, in the Point-of-Service source code, the tours are found in the src\com\extendyourstore\pos\services directory. Generally, this chapter uses the word tour to refer to a tour. The word **service** and phrase **service region** are used in this section because they are elements in the XML code.

The service region contains all functionality related to running the application when no exceptions are encountered. The following code sample from src\com\extendyourstore\pos\services\tender\tender.xml shows the definition of a service and service region in a tour script.

Example 9–1 tender.xml: Definition of Service and Service Region

```
<SERVICE name="Tender" package="com.extendyourstore.pos.services.tender"
tourcam="ON">
<SERVICECODE>
...definition of letters, siteaction classes, and laneaction classes...
</SERVICECODE>
<MAP>
<REGION region="SERVICE" startsite="GetTender">
...definition of sites, stations, and lanes...
</REGION>
</MAP>
</SERVICE>
```

As shown in the code sample, there are two main sections of a tour script. The SERVICECODE element defines the Java classes in the tour and the letters that may be sent in the tour code or by the user. The MAP element links the classes and letters to the sites and lanes. In the following sections, code samples are shown from both sections of the tour script.

Bus

The bus object is passed as a parameter to all tour methods called by the tour engine. Methods can be called on the bus to get access to the cargo, managers and other state information. The following code sample from src\com\extendyourstore\pos\services\tender\GetCheckInfoSite.java shows a reference to the bus.

Example 9–2 GetCheckInfoSite.java: Retrieving Cargo from Bus

```
TenderCargo cargo = (TenderCargo) bus.getCargo();
```

Tourmap

One problem of tour scripts is that they can be difficult to customize for a particular retailer's installation. The new tourmap feature allows customizations to be made more easily on existing tour scripts. Tour components and tour scripts can be

referenced by logical names in the tour script and mapped to physical names in a tourmap file, making it easier to use the product tour and just change the pieces that need to be changed for a customer implementation. In addition, with tourmaps, components and scripts can be overridden based on a country, so files specific to a locale are implemented when appropriate.

The tourmap does not allow you to modify the structure of the tour, specifically the following:

- does not allow you to add or remove sites
- does not allow you to add or remove roads and aisles
- does not allow you to specify a tour spanning multiple files (i.e. “tour inheritance”)

Of particular note is the last bullet: the tourmap does not allow you to assemble fragments of xml into one cohesive tour script. After the application is loaded, there is only be one tour script that maps to any logical name.

The functionality of tourmapping is implemented via one or more tourmap files. Multiple tourmap files can be specified via the config\tourmap.files properties. tourmap.files is a comma delimited list of tourmap files. As each file is loaded, the application checks the country property of the tourmap file. The order of files is significant because later files override any values specified in previous files. A file that overrides a similarly-named file is called an overlay.

Each tourmap file begins with a root element, tourmap, which has an optional country attribute. The tourmap elements contains multiple tour elements, each one of which describes a tour's logical name, its physical file, and any overlays to apply. For instance, a simple tourmap might look like the following:

Example 9–3 Sample Tourmap

```
<?xml version="1.0" encoding="UTF-8"?>
<tourmap
   country="CA"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:noNamespaceSchemaLocation="com/extendyourstore/foundation/tour/dtd/tourmap.xsd
">

    <tour name="testService">

<file>classpath://com/extendyourstore/foundation/tour/engine/tourmap.testservice.x
ml</file>
       <SITE
          name="siteWithoutAction"

useaction="com.extendyourstore.foundation.tour.engine.actions.overlay.OverlaySiteA
ction"/>
       <SITEACTION
          class="SampleSiteAction"

replacewith="com.extendyourstore.foundation.tour.engine.actions.overlay.OverlaySit
eAction"/>

    </tour>
</tourmap>
```

In this instance, the tour with the logical name **testService** references the file com\extendyourstore\foundation\tour\engine\tourmap.testservice.xml. Additionally, the values for SITE and SITEACTION are replaced.

> **Note:** Because of the country in the tourmap element, this only happens when the default locale of the application is a Canadian locale.

Tourmaps are used not only to override XML attributes, but they are used also when the workflow needs to be changed.

Cargo

Cargo is data that exists for the length of the tour in which it is used. Any data that needs to be used at different tour components such as sites and aisles needs to be stored on the cargo. Cargo always has a Java class. The following code sample from tender.xml defines the Tender cargo.

Example 9–4 tender.xml: Definition of Cargo

```
<CARGO class="TenderCargo">
</CARGO>
```

With the concept of a tourmap, a cargo class can be overridden with another class. This allows you to override the class name for a customer implementation yet still keep the same workflow for the customer as in the product. The following tourmap definition specifies the class to override and the new class to use in place of the original class.

Note that replacewith is a fully qualified classname, with both package and classname specified, unlike the class attribute.

Example 9–5 tourmap.xml: Example of Overriding Cargo Class

```
<CARGO class="TenderCargo"
replacewith="com.extendyourstore.cargo.SomeCargo"/>
```

Sites

Sites correspond to nodes in a finite state machine and cities in the tour metaphor. Sites are usually used as stopping places within the workflow. Arrival at a site usually triggers access to an external interface, such as a graphical user interface, a database, or a device. Sites always have a corresponding siteaction class.

The tender.xml code sample below contains the site information from the two main parts of a tour script: the XML elements SERVICECODE and MAP, respectively.

Example 9–6 tender.xml: Definition of Site Class

```
<SITEACTION  class="GetTenderSite"/>
```

Example 9–7 tender.xml: Mapping of Site to SiteAction

```
<SITE  name="GetTender" siteaction="GetTenderSite">
... definition of lanes ...
</SITE>
```

With the concept of Tourmap, a site's siteaction can be overridden with another class. This allows you to override the class name for a customer implementation yet still keep the same workflow for the customer as in the product. The following tourmap definition specifies the class to override and the new class to use in place of the original class. Note that replacewith is a fully qualified classname, with both package and classname specified, unlike the class attribute.

Example 9–8 tourmap.xml: Overriding Siteaction With Tourmap

```
<SITEACTION
class="GetTenderSite"replacewith="com.extendyourstore.actions.SomeOtherSiteAction"
/>
```

System Sites

System sites are defined by the Oracle Retail Platform engine but can be referenced within a tour script. For example, a road defined by a tour script can have a system site as its destination. Each system site must have a unique name in the tour script file. The following code from tender.xml shows the definition of two system sites. The Final system site stops a bus and returns it to the parent bus, and LastIndexed resumes the normal bus operation after an exception.

Example 9–9 tender.xml: Definition of System Sites

```
<REGION>
<MAP>
...definition of sites, lanes, and stations...
<SYSTEMSITE name="Final" action="RETURN" />
<SYSTEMSITE name="LastIndexed" action="BACKUP" />
</MAP>
</REGION>
```

Letters

Letters are messages that get sent from the application code or the user interface to the tour engine. Letters indicate that some event has occurred. Typically, letters are sent by the external interfaces, such as the graphical user interface, database, or device to indicate completion of a task.

Lanes are defined as roads and aisles. When the system receives a letter, it checks all lanes defined within the current site or station to see if the letter matches the letter for a lane. If no matching lane is found, the letter is ignored. Letters do not have a Java class associated with them.

Standard letter names are used in the application, such as Success, Failure, Undo, and Cancel. The following code sample shows tender.xml code that defines letters. The definition is added to the SERVICECODE XML element.

Example 9–10 tender.xml: Definition of Letter

```
<LETTER  name="Credit"/>
```

Roads

Roads provide a way for the bus to move between sites and stations. Each road has a name, destination, and letter that activates the road. A road may have a laneaction class, depending on whether the road has behavior; only roads that have behavior require a class. Roads are defined within site definitions because they handle letters received at the site.

Following is tender.xml code that shows the definition of a road. The definition is added to the SERVICECODE XML element. After the first code sample is another sample that maps the road to a site and letter, which is contained in the MAP section of the tour script.

Example 9–11 tender.xml: Definition of Road Class

```
<LANEACTION  class="ValidCreditInfoEnteredRoad"/>
tender.xml: Mapping of Road to Site
<SITE  name="GetCreditInfo" siteaction="GetCreditInfoSite">
  <ROAD
    name="ValidCreditInfoEntered"
    letter="Valid"
    laneaction="ValidCreditInfoEnteredRoad"
    destination="GetTender"
    tape="ADVANCE"
    record="OFF"
    index="OFF">
  </ROAD>
...other lanes defined...
</SITE>
```

With the concept of Tourmap, a road's laneaction can be overridden with another class. This allows you to override the class name for a customer implementation yet still keep the same workflow for the customer as in the product. The following tourmap definition specifies the class to override and the new class to use in place of the original class. Note that replacewith is a fully qualified classname, with both package and classname specified, unlike the class attribute.

Example 9–12 tourmap.xml: Example of Overriding Site Laneaction

```
<LANEACTION class="ValidCreditInfoEnteredRoad"
replacewith="com.extendyourstore.actions.SomeOtherLaneAction"/>
```

Common Roads

The COMMON element is defined in the REGION element of the tour script. The COMMON element can contain roads that are available to all sites and stations in a tour. Common roads have the same attributes as roads defined within a site, but they are defined outside of a site so they can be accessed by all sites. If a common road and a tour road are both activated by the same letter, the site road is taken. The following is an example that differentiates common roads from tour roads.

Example 9–13 Example of Common Road

```
<MAP>
     <REGION region="SERVICE" startsite="Example">
          <COMMON>
               <ROAD name="QuitSelected" letter="exit"
                    destination="NamedIndex"
                    tape="REWIND"/>
                    <COMMENT>
                    </COMMENT>
               </ROAD>
          </COMMON>
          <SITE name="RequestExample" siteaction="RequestExampleSite">
               <ROAD name="ExampleSelected" letter="next"
                     laneaction="ExampleSelectedRoad"
                     destination="ShowExample"
                     tape="ADVANCE"
                     record="OFF"
                     index="ON"/>
                    <COMMENT>
                    </COMMENT>
               </ROAD>
     </REGION>
</MAP>
```

Aisles

Aisles provide a means for moving within a site and executing code. Aisles are used when a change is required but there is no reason to leave the current site or station. Each aisle contains a name, a letter, and a laneaction. Aisles always require a Java class because they must have behavior since they do not lead to a different site or station like roads.

Following is the tender.xml code that shows the definition of an aisle. The definition is added to the SERVICECODE XML element. The second code sample from the same tour script maps an aisle to the site and letter, which is contained in the MAP section.

Example 9–14 tender.xml: Definition of Aisle Class

```
<LANEACTION  class="CardInfoEnteredAisle"/>
```

Example 9–15 tender.xml: Mapping of Aisle to Site

```
<SITE  name="GetCreditInfo" siteaction="GetCreditInfoSite">
  <AISLE
    name="CardInfoEntered"
    letter="Next"
    laneaction="CardInfoEnteredAisle">
  </AISLE>
...other lanes defined...
</SITE>
```

With the concept of Tourmap, an aisle's laneaction can be overridden with another class. This allows you to override the class name for a customer implementation yet still keep the same workflow for the customer as in the product. The following tourmap definition specifies the class to override and the new class to use in place of the original class. Note that replacewith is a fully qualified classname, with both package and classname specified, unlike the class attribute.

Example 9–16 tourmap.xml: Example of Overriding Aisle Laneaction

```
<LANEACTION class="CardInfoEnteredAisle"
replacewith="com.extendyourstore.actions.SomeOtherLaneAction"/>
```

Stations and Shuttles

Transfer stations are used to transfer workflow to another tour and return once the tour workflow has completed. A transfer station describes a location where another tour is started and the passenger exits one bus and enters the bus for another tour.

Transfer stations specify the name of the nested tour and define data transport mechanisms called shuttles. Shuttles are used to transfer cargo to and from the nested tour. These shuttles are either launch shuttles or return shuttles. Launch shuttles transfer cargo to the nested tour and the return shuttles transfer newly acquired cargo from the nested tour to the calling tour. Shuttles have Java classes associated with them, but stations do not.

The following code samples from src\com\extendyourstore\pos\services\tender\tender.xml contain the station and shuttle information from the SERVICECODE and MAP elements in the tour script, respectively.

Example 9–17 tender.xml: Definition of Shuttle Class

```
  <SHUTTLE  class="TenderAuthorizationLaunchShuttle"/>
```

Example 9–18 tender.xml: Mapping of Station to Service and Shuttle Classes

```
  <STATION
    name="AuthorizationStation"

servicename="classpath://com/extendyourstore/pos/services/tender/authorization/Aut
horization.xml"
    targettier="APPLICATIONTIER"
    launchshuttle="TenderAuthorizationLaunchShuttle"
    returnshuttle="TenderAuthorizationReturnShuttle">
    ...lane definitions to handle exit letter from nested service...
</STATION>
```

The servicename can be defined as a logical name like “authorizationService” and mapped to a filename is the tourmap file. The shuttle names can also be overridden in the tourmap file. This allows you to override the class name for a customer implementation yet still keep the same workflow for the customer as in the product. The code samples below illustrate this.

Example 9–19 tourmap.xml: Example of Mapping Servicename

```
<tour name=”authorizationService”>
<file>classpath://com/extendyourstore/pos/services/tender/authorization/Authorizat
ion.xml</file>
</tour>
```

Example 9–20 tourmap.xml: Example of Overriding Shuttle Name

```
<SHUTTLE class="TenderAuthorizationLaunchShuttle"
replacewith="com.extendyourstore.shuttles.NewShuttle"/>
```

Nested tours operate independently, with their own XML script and Java classes. Stations and shuttles simply provide the functionality to transfer control and data between two independent tours.

Signals

Signals direct the tour to the correct lane when two or more lanes from the same site or station are activated by the same letter. The lane that has a signal that evaluates to true is the one that is traversed. Each signal has an associated Java class. Signal classes evaluate the contents of the cargo and do not modify data.

The following code sample lists the tender.xml code that relates to the definition of two roads with Light signals defined. The definition is added to the SERVICECODE XML element, whereas the road description is added to the MAP XML element. The negate tag negates the Boolean value returned by the specified signal class.

Example 9–21 tender.xml: Definition of Traffic Signal

```
<SIGNAL  class="IsAuthRequiredSignal"/>
```

Example 9–22 tender.xml: Signal Processing With Negate Tag

```
<STATION>
  name=”AuthorizationStation”
  <ROAD
    name="AuthorizationRequested"
    letter="Next"
    destination="AuthorizationStation"
    tape="ADVANCE"
    record="OFF"
    index="OFF">
    <LIGHT  signal="IsAuthRequiredSignal"/>
  </ROAD>
  <ROAD
    name="BalancePaid"
    letter="Next"
    destination="CompleteTender"
    tape="ADVANCE"
    record="OFF"
    index="OFF">
    <LIGHT  signal="IsAuthRequiredSignal" negate="Y"/>
  </ROAD>
  ...additional lane definitions...
</STATION>
```

Exception Region

Continuing the tour metaphor, the bus could break down at any time. If the bus driver detects that the bus has broken down, the bus driver takes the bus to the nearest Garage system site. Once the bus is in the garage, the mechanic assumes control of and diagnoses the breakdown.

- If the mechanic is able to restore the cargo to a valid state, the mechanic informs the bus driver by traversing to the Resume system site. The bus driver subsequently resumes driving by resetting the bus at the site where the breakdown occurred.
- If the mechanic is not successful in repairing the bus, the mechanic stops the bus, and mails the parent tour a letter informing it of the breakdown.
- If there is no mechanic within the tour, the bus driver stops the bus, and mails the parent tour a letter informing it of the breakdown. The bus completes its tour when it arrives at the final site.

The exception region includes the functionality for handling exceptions. It can contain sites, roads, and stations just like the service region. There are two ways to exit the exception region: at the Return system site or the Resume system site. Return shuts down the application, and Resume starts the application at the last visited site or station in the service region.

The mechanic operates within the exception region of the tour. Any exception that occurs within the tour region where the bus driver operates is converted to an Exception letter and is passed to the mechanic. When the exception is being processed, the mechanic assumes control of the bus and processes all incoming letters. If the application developer has created an exception region for the mechanic, the Exception letter is processed using application-specific actions and traffic lights. However, if the exception region does not exist, the mechanic stops the bus and informs the parent bus of the problem.

Depending on the application definition, recovery from exceptions can result in a rollback, resumption, or a restart of the bus.

Role of Java Classes

All the code samples in this chapter have been from tour scripts. Tour scripts exist in the form of one XML file per tour. The tour script refers to Java classes that implement specific behavior, such as the siteaction and laneaction attributes. A tour has the following Java classes:

- One for the cargo
- One for each site
- One for each aisle
- One for each road that implements behavior
- One for each shuttle
- One for each signal

Table 9–3 lists methods that the tour engine looks for when it arrives at a specified place in the tour.

Table 9–3 System-called Methods

Class	Method(s)
Site	arrive(), depart()
Road (if behavior)	traverse()
Aisle	traverse()
Shuttle	load(), unload()
Signal	roadClear()
Cargo	<none>

Tour Cam

TourCam allows you to navigate backward through your application in a controlled manner while requiring minimal programming to accomplish the navigation. It provides the ability to back up from a tour or process by tracking the state of the cargo and the location of the tours. TourCam is turned on or off at the tour level. If there is no reason to back up, TourCam should not be turned on.

The ability to backup or restore data to a previous state is accomplished using TourCam. TourCam is used to record the bus path through the map, as well as the associated cargo changes. TourCam is described using the TourCam metaphor. The words in italics in the following paragraphs are the TourCam-specific terms.

A bus driver records the progress along the bus route using TourCam. The bus driver records snapshots of the passenger cargo immediately before traversing a road. Each snapshot is mounted in a frame within the current tape. The frame is stamped with the current road. Using this method, the bus driver can retrace steps through the map. If the frame is indexed, the driver stops at that index when retracing his steps.

The bus driver may adjust the TourCam tape while the bus traverses a road between sites.

- The bus driver can advance the current TourCam tape, and add the next road and snapshot of the cargo as a frame in the tape.
- The bus driver can discard the current TourCam tape, and replace it with a blank tape.

- The bus driver can rewind the current tape to restore the cargo to be consistent with a previously visited site.
- The bus driver can splice the current TourCam tape by removing all frames that were recorded since a previously visited site.

When the passenger wants to back up, they instruct the bus driver to traverse a road whose destination is the Backup system site. The backup road can inform the bus driver to rewind or splice the TourCam tape while retracing its path along the last recorded road. Similarly, the passenger can instruct the bus driver to traverse a road to a specific, previously visited site. That road effectively backs up the bus when it instructs the bus driver to rewind or splice the TourCam tape.

When the passenger wants to end the trip, they instruct the bus driver to travel down a road whose destination is the Return system site. The final road may advance or discard the TourCam tape. A passenger may return to the tour if they back into the parent transfer station. If the TourCam tape is advanced, a return visit retraces the path through the map in reverse order. If the TourCam tape is discarded, all return visits start at the start site, as if the passenger were visiting the tour for the first time.

Attributes

The TourCam processing model places all undo actions on roads and treats sites and stations as black boxes. The tour attribute that turns TourCam on or off is tourcam. The following code from tender.xml shows the location in the tour script where the tourcam is set. The default value is OFF.

Example 9–23 tender.xml: Definition of tourcam

```
<SERVICE
    name="Tender"
    package="com.extendyourstore.pos.services.tender"
    tourcam="ON">
```

The rest of the TourCam attributes are set on the road element in the MAP section of the tour script. The following code from tender.xml shows a road definition with these attributes set.

Example 9–24 tender.xml: Definition of Road With TourCam Attributes

```
<SITE name="GetGiftCertificateInfo" siteaction="GetGiftCertificateInfoSite">
               <ROAD name="GiftCertificateInfoEntered"
                     letter="Next"
                     laneaction="GiftCertificateInfoEnteredRoad"
                     destination="GetTender"
                     tape="ADVANCE"
                     record="OFF"
                     index="OFF">
...definitions of lanes...
</SITE>
```

Table 9–4 lists TourCam attributes and their values.

Table 9–4 Road Tag Element Attributes

Tag	Description	Values	Default
tape	Indicates what tour action to take when traversing the road.	ADVANCE – Adds a frame representing this road to the tourcam tape DISCARD – Discards the entire tour cam tape REWIND – Back up to the site specified by the 'destination' while calling the backup method on all roads SPLICE – Back up to the site specified by the 'destination' without calling the backup method on any roads	ADVANCE
record	Indicates that a snapshot of the cargo should be recorded and saved on the tourcam tape	ON – Record a snapshot OFF – Do not record a snapshot	ON
index	Indicates that an index should be placed on the tourcam tape when this road is traversed	ON – Place an index on the tape OFF – Do not place an index on the tape	ON
namedIndex	Indicates that a named index should be placed on the tourcam tape when this road is traversed	Any string value is allowed	None
destination	Used when the tape has a value of REWIND or SPLICE to indicate where the tourcam should back the bus up to	<SITENAME> – The name of a site to back up to. The site must be in the current tour. LastIndexed – The backup should end at the site that is the origin of the first road found with an unnamed index. NamedIndex – The backup should end at the at the site that is the origin of the first road found with the named index specified by the named Index.	None

Each of the following combinations describes a combination of settings and how it is useful in different situations. The following tables describe the forward and backward TourCam settings:

Table 9–5 describes the forward TourCam settings.

Table 9–5 Forward TourCam Settings

Settings	Behavior
ADVANCE index=ON record=ON	This combination permits you to return to the site without specifying it as a destination and storing the state of the cargo. Use this combination if you are entering data and making decisions. The UI provides a method for backing up to the previous step.
tape=ADVANCE index=OFF record=ON	This combination allows you to track visited sites, and allows you to attach undo behavior. However, you cannot back up to this site. A common scenario for use would be for performing external lookups and the user must backup to the site that started the lookup. This combination is used, rather than the following combination, when changes made to the cargo that must be reversible.
tape=ADVANCE index=OFF record=OFF	This combination is useful for sites that require external setup from another site, but do not result in a significant change in cargo. You cannot back up to a site that uses these settings and you cannot restore cargo at this site. As with the previous combination, these settings are used for sites that perform external lookups.
tape=ADVANCE index=ON record=OFF	This combination is used when a site does not do anything of significance to cargo. You would use this setting if a site prompts to choose an option from a list and there is a default, or to respond to a yes/no dialog and you want to ensure the data collected at the site is reset.
tape=ADVANCE namedIndex=LOGIN	This combination is used when you want the application to be able to return to a specific index, even if the backup begins in a child tour.
tape=DISCARD	This combination is used when you want the application flow only to go forward from this site. For example, after a user tenders a credit card for a sale, the user cannot backup to enter, delete or modify items. This setting does not permit you to backup or restore cargo to a previously recorded site.

Table 9–6 describes the backup TourCam settings.

Table 9–6 Backup Tour Cam Settings

Settings	Behavior
destination=BACKUP tape=REWIND	This combination returns the application to the previously marked site and makes the snapshot available for undo. This is the preferred method of performing a full backup with restore.
destination=site tape=REWIND	This combination backs up the application until it reaches the specified site. It is only used if the site to which you want to backup does not directly precede the current site or you know that you always want to backup to the specified site. These settings could produce unpredictable results if new sites are later inserted in the map between the current site and the target backup site.

Table 9–6 Backup Tour Cam Settings

Settings	Behavior
destination=LastIndexed tape=SPLICE	This combination returns the application to the previously marked site without restoring the cargo. These settings are used in scenarios when the cargo is inconsequential.
destination=site tape=SPLICE	This combination backs up the application to the specified site without restoring the cargo. It is used when the cargo is inconsequential, or when you want to loop back to a base site in a tour without permitting backup or undoing cargo after returning to the base site. For example, the application starts from a menu and permits the user to back up until a series of steps are complete, but not afterward. In this case, the final road from the last site returns to the menu. The need to use this combination might indicate a design flaw in the tour. The developer should question whether the series of sites that branch from the menu should be a separate tour. If the answer is no, this combination is the solution.
destination=NamedIndex namedIndex=LOGIN	This combination backs up the application to the origin of the road with the specified named index. This is used to back up to a specific index, even if it was set in a parent tour.

Letter Processing

In the absence of TourCam, processing of letters is straightforward. If the letter triggers a lane, the bus simply traverses the lane. With TourCam enabled, the processing of letters must consider the actions required to retrace the path of the bus. If the letter triggers an aisle, the bus traverses the aisle. There is no backup over an aisle. If the letter triggers a road, tape=advance or tape=discard indicate a forward direction, and tape=rewind or tape=splice indicate a backward direction. The destination of the road element is used to indicate the backup destination when tape=rewind or tape=splice. It can be one of the following values: “LastIndexed”, “NamedIndex”, or <sitename>.

Cargo Restoration

One of the primary strengths of TourCam is the ability to restore the bus’ cargo to a previous state. TourCamIfc provides a mechanism for the bus driver to make and subsequently restore a copy of the cargo when specified by road attributes. Classes that implement TourCamIfc must implement the makeSnapshot() and restoreSnapshot() methods. An example of this is src\com\extendyourstore\pos\services\inquiry\giftreceipt\GiftReceiptCargo.java.

Example 9–25 GiftReceiptCargo.java: TourCamIfc Implementation

```
public class GiftReceiptCargo implements CargoIfc, TourCamIfc
{
...body of GiftReceiptCargo class...
public SnapshotIfc makeSnapshot()
    {
        return new TourCamSnapshot(this);
    }
public void restoreSnapshot(SnapshotIfc snapshot) throws ObjectRestoreException
{
GiftReceiptCargo savedCargo = (GiftReceiptCargo) snapshot.restoreObject();
this.setPriceCode(savedCargo.getPriceCode());
this.setPrice(savedCargo.getPrice());
    }
}
```

SnapshotIfc provides a mechanism to create a copy of the cargo. The class that implements SnapshotIfc is responsible for storing information about the cargo and restoring it later, by calling restoreObject().

A shuttle allows the optional transfer of cargo from the calling tour to the nested tour during backups. If defined, this shuttle is used during rewind and splice backup procedures. The classname for the shuttle is specified in the tour script via the backupshuttle attribute of the station element.

Example 9–26 Sample Backupshuttle Definition

```
<STATION servicename="foo.xml"
         launchshuttle="MyLaunchShuttle"
         backupshuttle="MyBackupShuttle"\/>
```

Tender Tour Reference

The files in the Tender package can be found in src\com\extendyourstore\pos\services\tender.

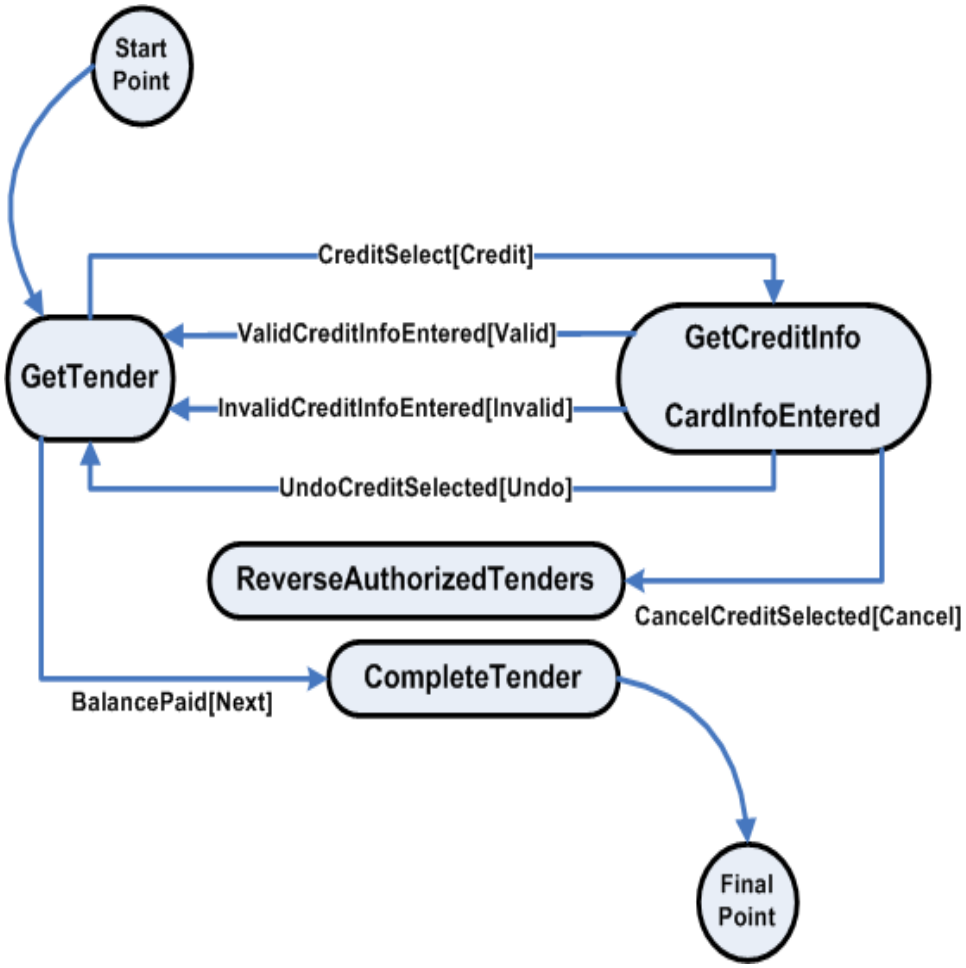
Table 9–7 describes resources in the Tender package that are common to all tours.

Table 9–7 Tender Package Components

Resource	Filename	Description
Tour script	tender.xml	This file defines the components (sites, letters, roads, etc.) of the Tender tour and the map of the Tender tour.
Tour screens	tenderuicfg.xml	This configuration file contains bean specifications and overlay screen specifications for the Tender tour.
Starting site	GetTenderSite.java	Tender types are displayed from this site. If the selected tender requires input, it is entered via another site, which then returns control to this site. When the balance due is paid, control is returned to the calling service.
Cargo	TenderCargo.java	This class represents the cargo for the Tender tour.
Stations	Names (stations do not have classes): AuthorizationStation PINPadStation AddCustomer AddBusinessCustomer FindCustomer SecurityOverrideStation LinkCustomerStation	These stations provide access to other tours. Each of these stations define one or more shuttle classes which are part of the Tender package. The workflows are defined in other packages, but can be called from the Tender tour. For example, AuthFailedRoad is defined in the Tender tour because it handles the exit letter from the Authorization tour. However, Authorization.xml, the workflow for the Authorization tour, is located in src\com\extendyourstore\pos\services\tender\authorization.

The Tender package is unique in that the workflow is generally similar for all the tender type options available from the main site. For example, if the user chooses to pay by check or credit card, the workflow is similar. When the user cancels the form of payment, the Oracle Retail Platform engine is directed to the ReverseAuthorizedTenders site. When the user decides to undo the operation, the engine is directed back to the GetTender site. The workflow for the credit card tender option is shown in the following figure.

Figure 9–1 Workflow Example: Tender with Credit Card Option



10

UI Framework

This chapter describes the User Interface (UI) Framework that is part of the Oracle Retail Platform architecture. The UI Framework encompasses all classes and interfaces included in Oracle Retail Platform to support rapid development of UI screens. It enables the building of custom screens using existing components. Overview

For ease of development, the UI Framework hides many of the implementation details of Java UI classes and containment hierarchies by moving some of the UI specification from Java code into XML. This eases screen manipulation and layout changes affecting the look and feel of the entire screen, subsets of screens, and portions of a screen.

Table 10–1 provides a general description of features of the UI Framework.

Table 10–1 UI Framework Features

Feature	Description
Common Design	All UI implementations share code and extend or implement base UI classes that are provided as part of Oracle Retail Platform. The UI Framework provides basic functionality that does not need to be duplicated within each application.
Reuse	The UI Framework allows bean classes to be independent, thereby supporting their reuse. A UI Technician can be used with multiple applications and UI Framework components can be used across multiple features in an application.
Externally Configurable Screens	The UI Framework enables you to configure screens outside the code to accommodate applications that change frequently. The external screen configurations can be updated to use new Oracle Retail Platform or application-specific components as they are developed.
Support for Internationalization	The UI Framework provides hooks for implementing internationalization, including language and locale independence.
Extensibility and Flexibility	Additional formats for specifications can be defined without affecting the internal UI Framework classes. Portability is achieved through the use of the Java language and flexible layout managers.

The UI Framework is the set of classes and interfaces that define the elements and behavior of a window-based UI Subsystem. It defines a structure for defining user interfaces.

Table 10–2 briefly describes the components of the framework. This chapter discusses these components in more detail.

Table 10–2 UI Framework Components

Name	Description
Display	A display is the root container for the UI application window. Displays are any subclass of java.awt.Container that implement EYSRootPaneContainer.
Screen	A screen is a user-level snapshot of a UI window as it relates to an application. The screen is composed of displays, template areas, assignment beans, and listeners. Each of these parts can be individually configured and reassembled to compose the screen.
Template	A template divides the display into areas that contain the layout information used to place the information on the display. Templates can be interchanged to define screen layouts within an application. Each screen specifies the template that is associated with the screen.
Area	An area is a layout placeholder for UI components that operate together to perform a function. Each area contains a layout constraint that dictates how the area is placed on the display.
Bean	A bean is a user interface component or group of components that operate together to provide some useful functionality. For example, a bean could be an input form or group of navigation buttons.
Connection	A connection captures relationships between beans, or between devices and beans. When a bean or device generates an event, another bean responds with a change in behavior or visual display.
Listener	A listener provides a mechanism for reacting to user interface events.

Screens

Generally, for each package in an application, one UI script in the form of an XML file is created to define the screens for the given package. However, because many screens share basic components, certain components are defined in a default UI script. These basic screen components, including displays, templates, and default screens, are defined in src\com\extendyourstore\pos\config\defaults\defaultuicfg.xml. Overlay screens are then defined in the UI script for the given package. This section describes the components that are used to build Point-of-Service screens, except for beans which are described in the next section.

Displays define window properties. They are basic containers with dimensions and a title defined. In Point-of-Service, only two types of windows can be displayed at the same time—the main application window and a window displaying the Help browser.

Table 10–3 describes the two types of displays.

Table 10–3 Display Types

Name	Description
EYSPOSDisplaySpec	A 600x800 container for all application screens
HelpDialogDisplaySpec	A 600x800 container for Point-of-Service Help screens

Templates divide displays into geographical areas. The GridBagLayout is used to define the attributes of each area.

Table 10–4 describes the typical use of each template.

Table 10–4 Template Types

Name	Typical Use
BrowserTemplateSpec	Back Office screens within Point-of-Service application
EYSPOSTemplateSpec	Point-of-Service screens without required fields
HelpBrowserTemplateSpec	Point-of-Service help screens
ValidatingTemplateSpec	Point-of-Service screens with required fields that display an information panel below the work area

Default screens are partially-defined screens that represent elements common to multiple screens. Default screens are based on one display and one template. Default screens map beans to the commonly used areas of the template and define listeners for the bean. These screens are used by overlay specifications that define more specific screen components. For example, almost all screens in the Point-of-Service application display a status area region. The text displayed in the status region changes, but the StatusPanelSpec bean is the same from screen to screen, so a default screen would assign this bean to the StatusPanel area defined by a template.

Table 10–5 lists the areas of the template to which beans are assigned, and the display and template used by each of the six types of default screens.

Table 10–5 Default Screen Types

Name	Typical Use	Display	Template
BrowserDefaultSpec	Back Office screens within Point-of-Service application	EYSPOSDisplaySpec	BrowserTemplateSpec
DefaultHelpSpec	Point-of-Service help screens	HelpDialogDisplaySpec	HelpBrowserTemplateSpec
DefaultValidatingSpec	Point-of-Service screens with required fields that display an information panel below the work area	EYSPOSDisplaySpec	ValidatingTemplateSpec
EYSPOSDefaultSpec	Point-of-Service screens without required fields	EYSPOSDisplaySpec	EYSPOSTemplateSpec
ResponseEntryScreenSpec	Point-of-Service screens with information captured in the response area at the top of the screen	EYSPOSDisplaySpec	EYSPOSTemplateSpec

Each screen in Point-of-Service has an overlay screen defined in a UI script in the package to which it belongs or in a package higher in the hierarchy. For example, the Authorization tour script is found in src\com\extendyourstore\pos\services\tender\authorization but the UI script is located in src\com\extendyourstore\pos\services\tender. This overlay screen is based on a default screen and defines additional properties for the beans on the areas of the screen. The overlay screen may also specify connections, which are described in "Connections" in next chapter (XREF). The following code sample shows the definition of the ALTERATION_TYPE screen defined in `src\com\extendyourstore\pos\services\alterations\alterationsuicfg.xml`.

Example 10–1 alterationsuicfg.xml: Overlay Screen Definition

```
<OVERLAYSCREEN
 defaultScreenSpecName="EYSPOSDefaultSpec"
 resourceBundleFilename="alterationsText"
 specName="ALTERATION_TYPE">

        <ASSIGNMENT
            areaName="StatusPanel"
            beanSpecName="StatusPanelSpec">
            <BEANPROPERTY
                propName="screenNameTag" propValue="AlterationTypeScreenName"/>
        </ASSIGNMENT>

        <ASSIGNMENT
            areaName="PromptAndResponsePanel"
            beanSpecName="PromptAndResponsePanelSpec">
            <BEANPROPERTY
                propName="promptTextTag" propValue="AlterationTypePrompt"/>
        </ASSIGNMENT>

        <ASSIGNMENT
            areaName="LocalNavigationPanel"
            beanSpecName="AlterationsOptionsButtonSpec">
        </ASSIGNMENT>

</OVERLAYSCREEN>
```

Beans

A screen is composed of beans mapped to specific areas on the screen. All beans are defined in `src/com/extendyourstore/pos/ui/beans`. The beans described in this section are commonly used in screen definitions. Each description provides bean properties that can be defined in assignments of beans to areas. By the Java reflection utility, properties defined in XML files invoke set() or create() methods in the bean class that accept a single string parameter or multiple string parameters.

The following section covers the PromptAndResponseBean, DataInputBean, NavigationButtonBean, and DialogBean.

PromptAndResponseBean

The PromptAndResponseBean configures and displays the text in the top areas of a Point-of-Service screen called the prompt region and the response region. This bean is implemented by src\com\extendyourstore\pos\ui\beans\PromptAndResponseBean.java and its corresponding model PromptAndResponseModel.java.

Bean Properties and Text Bundle

PromptAndResponsePanelSpec is the name of a bean specification that defines the implementation of the PromptAndResponseBean class. The following code sample shows the bean specification available to all screens, defined in src\com\extendyourstore\pos\config\defaults\defaultuicfg.xml.

Example 10–2 defaultuicfg.xml: Bean Specification Using PromptAndResponseBean

```
<BEAN
specName="PromptAndResponsePanelSpec"
beanClassName="PromptAndResponseBean"
beanPackage="com.extendyourstore.pos.ui.beans"
configuratorPackage="com.extendyourstore.pos.ui"
configuratorClassName="POSBeanConfigurator"
cachingScheme="ONE">
</BEAN>
```

Table 10–6 lists property names and values that can be defined in overlay specifications when specifying attributes of a PromptAndResponseBean.

Table 10–6 PromptAndResponseBean Property Names and Values

Item	Description	Example
enterData	Indicates whether data can be entered in the response area	true
promptTextTag	The label tag that corresponds to the text bundle	GiftCardPrompt
responseField	The type of field expected in the response area (see Field Type section for available types)	com.extendyourstore.pos.ui.beans.AlphaNumericTextField
maxLength	Maximum length of response area input	15
minLength	Minimum length of response area input	2
zeroAllowed	Indicates whether a zero value is allowed in the response area	true
negativeAllowed	Indicates whether a negative value is allowed in the response area	false
grabFocus	Indicates whether focus should be grabbed when the screen is first displayed	true

These properties can be defined in UI scripts. The following code sample defines an overlay specification that assigns the PromptAndResponsePanelSpec defined above to the PromptAndResponsePanel. This example from src\com\extendyourstore\pos\services\tender\tenderuicfg.xml defines the COUPON_AMOUNT overlay screen for the Tender service. The property that retrieves text from a text bundle is highlighted.

Example 10–3 tenderuicfg.xml: PromptAndResponseBean Property Definition

```
<OVERLAYSCREEN>
        defaultScreenSpecName="ResponseEntryScreenSpec"
        resourceBundleFilename="tenderText"
        specName="COUPON_AMOUNT">
<ASSIGNMENT
            areaName="PromptAndResponsePanel"
            beanSpecName="PromptAndResponsePanelSpec">
            <BEANPROPERTY
                propName="promptTextTag" propValue="CouponAmountPrompt"/>
            <BEANPROPERTY
 propName="responseField"
 propValue="com.extendyourstore.pos.ui.beans.CurrencyTextField"/>
            <BEANPROPERTY
 propName="maxLength" propValue="9"/>
</ASSIGNMENT>
...
</OVERLAYSCREEN>
```

The string that should be displayed as the prompt text is defined in a resource bundle. In the resource bundle for the Tender service, which for the en_US locale is defined in locales\en_US\config\ui\bundles\tenderText_en_US.properties, the following includes a line that defines the CouponAmountPrompt.

Example 10–4 tenderText_en_US.properties: PromptAndResponseBean Text Bundle Example

```
PromptAndResponsePanelSpec.CouponAmountPrompt=Enter coupon amount and press Next.
```

Tour Code

In the Tour code, bean models are created to hold the data on the bean components.

Table 10–7 lists some of the important methods in the PromptAndResponseModel class.

Table 10–7 PromptAndResponseModel Important Methods

Method	Description
boolean isSwiped()	Returns the flag indicating whether a card is swiped
void setsScanned(boolean)	Sets the flag indicating whether a code is scanned
boolean isResponseEditable()	Returns the flag indicating whether the response area is editable
void setGrabFocus(boolean)	Sets the flag indicating whether focus should stay on the response field

The following sample from src\com\extendyourstore\pos\services\tender\GetPurchaseOrderAmountSite.java shows creation of a PromptAndResponseModel, prefilling of data in the model, and display of the model on which the PromptAndResponseModel is set.

Example 10–5 GetPurchaseOrderAmountSite.java: Creating and Displaying PromptAndResponseModel

```
PromptAndResponseModel responseModel = new PromptAndResponseModel();
Locale locale = LocaleMap.getLocale(LocaleConstantsIfc.USER_INTERFACE);
responseModel.setResponseText(balance.toFormattedString(locale));
POSBaseBeanModel baseModel = new POSBaseBeanModel();
baseModel.setPromptAndResponseModel(responseModel);
ui.showScreen(POSUIManagerIfc.PURCHASE_ORDER_AMOUNT, baseModel);
```

For internationalization, Point-of-Service can use multiple locales at any given time at a register. There is one default locale, one UI locale based on employee-specific locale, and one customer display and customer receipt locale based on customer-specific locale.

The screen constant, PURCHASE_ORDER_AMOUNT, is mapped to an overlay screen name found in the UI script for the package. The screen constants are defined in src\com\extendyourstore\pos\ui\POSUIManagerIfc.java.

The following sample from PurchaseOrderNumberEnteredRoad.java in the same directory shows how to retrieve data from the PromptAndResponseModel in a previous screen. To arrive at this code, a purchase order number is entered and the user presses Next. This line of code gets the purchase order number from the previous screen.

Example 10–6 PurchaseOrderNumberEnteredRoad.java: Retrieving Data From PromptAndResponseModel

```
POSUIManagerIfc ui = (POSUIManagerIfc) bus.getManager(UIManagerIfc.TYPE);
String poNumber = ui.getInput();
```

DataInputBean

The DataInputBean is a standard bean that displays a form layout containing data input components and labels. This bean is implemented by src\com\extendyourstore\pos\ui\beans\DataInputBean.java and its corresponding model DataInputBeanModel.java. Field components are commonly defined with the FIELD element when defining a bean with the DataInputBean, as shown in the code sample below.

Bean Properties and Text Bundle

The DataInputBean has two properties that can be defined in UI scripts, which override the settings in the field specifications.

Table 10–8 lists DataInputBean property names and values.

Table 10–8 DataInputBean Property Names and Values

Item	Description	Example
labelTags	Sets the property bundle tags for the component labels	NameLabel,AddressLabel,StateLabel
labelTexts	Sets the text on the component labels	Name,Address,State

The label tag is used for internationalization purposes, so the application can look for the correct text bundle in each language. The label tag overrides the value of the labelText field. The following code from manageruicfg.xml shows a field specification defined in a DataInputBean bean specification.

Example 10–7 manageruicfg.xml: Bean Specification Using DataInputBean

```
<BEAN
        specName="RegisterStatusPanelSpec"
        configuratorPackage="com.extendyourstore.pos.ui"
        configuratorClassName="POSBeanConfigurator"
        beanPackage="com.extendyourstore.pos.ui.beans"
        beanClassName="DataInputBean">

        <FIELD fieldName="storeID"
               fieldType="displayField"
               labelText="Store ID:"
               labelTag="StoreIDLabel"
               paramList="storeNumberField"/>
 ...
</BEAN>
```

The strings that should be displayed as labels on the screen are defined in a resource bundle. In the resource bundle for the Manager service, which for the en_US locale is defined in locales\en_US\config\ui\bundles\managerText_en_US.properties, the following line of code defines the StoreIDLabel.

Example 10–8 managerText_en_US.properties: DataInputBean Text Bundle Example

```
RegisterStatusPanelSpec.StoreIDLabel=Store ID:
```

Fields do not have to be defined in the UI script. They can be defined in the beans and models instead. In the overlay screen specification, two bean properties that can be set are OptionalValidatingFields and RequiredValidatingFields. If the fields are optional and the user enters information in them, then they are validated. If the user does not enter any information, the fields are not validated. On the other hand, required fields are always validated.

Tour Code

Bean models are created to hold the data managed by the bean. This protects the bean from being changed. A bean can only be accessed by a model in the Tour code.

Table 10–9 lists some of the important methods in the DataInputBeanModel class.

Table 10–9 DataInputBeanModel Important Methods

Method	Description
String getValueAsString(String)	Returns the value of the specified field as a string
int getValueAsInt(String)	Returns the value of the specified field as an integer
void setSelectionValue(String, Object)	Sets the value of the specified field in a vector to the specified value
void setSelectionChoices(String, Vector)	Sets the value of the specified field to the specified vector of choices
void clearAllValues()	Clears the values of all the fields

The following sample from src\com\extendyourstore\pos\services\admin\parametermanager\SelectParamStoreSite.java shows creation of a DataInputBeanModel and prefilling of data in the model.

Example 10–9 SelectParamStoreSite.java: Creating and Displaying DataInputBeanModel

```
DataInputBeanModel beanModel = new DataInputBeanModel();
beanModel.setSelectionChoices("choiceList", vChoices);
beanModel.setSelectionValue("choiceList", (String)vChoices.firstElement());
```

The following sample from Tour code shows how to retrieve data from the DataInputBeanModel. In this example from src\com\extendyourstore\pos\services\admin\parametermanager\StoreParamGroupAisle.java, after the model is created and displayed by the code from the previous code sample, the model is retrieved from the UI Manager, and data is retrieved from the model.

Example 10–10 StoreParamGroupAisle.java: Retrieving Data from DataInputBeanModel

```
DataInputBeanModel model =
(DataInputBeanModel)ui.getModel(POSUIManagerIfc.PARAM_SELECT_GROUP);
ParameterCargo cargo = (ParameterCargo)bus.getCargo();
String val = (String)model.getSelectionValue("choiceList");
cargo.setParameterGroup(val);
```

NavigationButtonBean

The NavigationButtonBean represents a collection of push buttons and associated key stroke equivalents. This bean is implemented by src\com\extendyourstore\pos\ui\beans\NavigationButtonBean.java and its corresponding model NavigationButtonBeanModel.java. The global navigation area and the local navigation area both use the NavigationButtonBean.

Bean Properties and Text Bundle

The LocalNavigationPanel and GlobalNavigationPanel bean specifications both use the NavigationButtonBean. Bean properties are described only for the GlobalNavigationPanelSpec because the LocalNavigationPanelSpec typically sets its properties in the bean specification and not the overlay specification.

LocalNavigationPanel The only property available to the NavigationButtonBean in XML is used to enable and disable buttons. When setting the states of buttons on a LocalNavigationPanel, the buttons are usually defined with the BUTTON element in the bean specification as in the following code sample. In fact, any bean that extends NavigationButtonBean, such as ValidateNavigationButtonBean, can define its buttons in the bean specification.

This example from src\com\extendyourstore\pos\services\customer\customeruicfg.xml, defining the CustomerOptionsButtonSpec bean specification for the Customer service, shows how button text on a NavigationButtonBean is defined in a UI script.

Example 10–11 customeruicfg.xml: Bean Specification Using NavigationButtonBean

```
<BEAN
        specName="CustomerOptionsButtonSpec"
        configuratorPackage="com.extendyourstore.pos.ui"
        configuratorClassName="POSBeanConfigurator"
        beanPackage="com.extendyourstore.pos.ui.beans"
        beanClassName="NavigationButtonBean">

<BUTTON
            actionName="AddBusiness"
            enabled="true"
            keyName="F4"
            labelTag="AddBusiness"/>
...
</BEAN>
```

The string that should be displayed on the buttons on the GlobalNavigationPanel is defined in a resource bundle. In the resource bundle customerText_en_US.properties, the following entry defines the label for the AddBusiness button.

Example 10–12 customerText_en_US.properties: NavigationButtonBean Text Bundle Example

```
CustomerOptionsButtonSpec.AddBusiness= Add Business
```

GlobalNavigationPanel The GlobalNavigationButtonBean extends the NavigationButtonBean. The following code sample shows the GlobalNavigationPanel bean specification defined in src\com\extendyourstore\pos\config\defaults\defaultuicfg.xml. The bean class is a subclass of NavigationButtonBean.

Example 10–13 defaultuicfg.xml: Bean Specification Using GlobalNavigationButtonBean

```
<BEAN
 specName="GlobalNavigationPanelSpec"
 configuratorPackage="com.extendyourstore.pos.ui"
 configuratorClassName="POSBeanConfigurator"
 beanPackage="com.extendyourstore.pos.ui.beans"
 beanClassName="GlobalNavigationButtonBean"
 cachingScheme="ONE">
...
</BEAN>
```

Table 10–10 lists property names and valuesthat can be defined in UI scripts when specifying attributes of a GlobalNavigationButtonBean.

Table 10–10 GlobalNavigationButtonBean Property Names and Values

Item	Description	Example
manageNextButton	Indicates whether the bean should manage the enable property of the Next button	true
buttonStates	Sets the buttons with the action names listed to the specified state	Help[true],Clear[false],Cancel[false],Undo[true],Next[false]

These properties can be defined in overlay specifications, as in the following code sample from tenderuicfg.xml.

Example 10–14 tenderuicfg.xml: GlobalNavigationButtonBean Property Definitions

```
<OVERLAYSCREEN>

defaultScreenSpecName="EYSPOSDefaultSpec"
        resourceBundleFilename="tenderText"
specName="TENDER_OPTIONS">
 <ASSIGNMENT
            areaName="GlobalNavigationPanel"
            beanSpecName="GlobalNavigationPanelSpec">
            <BEANPROPERTY
                propName="manageNextButton"
                propValue="false"/>
            <BEANPROPERTY
                propName="buttonStates"

propValue="Help[true],Clear[false],Cancel[false],Undo[true],Next[false]"/>
        </ASSIGNMENT>
...
</OVERLAYSCREEN>
```

Tour Code

In the Tour code, bean models are created to hold the data on the bean components.

Table 10–11 lists some of the important methods in the NavigationButtonBeanModel class.

Table 10–11 NavigationButtonBeanModel Important Methods

Method	Description
ButtonSpec[] getNewButtons()	Returns an array of new buttons
void setButtonEnabled(String, boolean)	Sets the state of the specified action name of the button (the name of the letter the button mails)
void setButtonLabel(String, String)	Sets the label of the button using the specified action name of the button (the name of the letter the button mails)

The following sample from src\com\extendyourstore\pos\services\tender\PricingOptionsSite.java shows creation of a NavigationButtonBeanModel, prefilling of data in the model, and display of the model on which the NavigationButtonBeanModel is set.

Example 10–15 PricingOptionsSite.java: Creating and Displaying NavigationButtonBeanModel

```
NavigationButtonBeanModel navModel = new NavigationButtonBeanModel();
navModel.setButtonEnabled("TransDiscAmt",true);
navModel.setButtonEnabled("TransDiscPer",true);
model.setLocalButtonBeanModel(navModel);
ui.showScreen(POSUIManagerIfc.PRICING_OPTIONS, model);
```

The screen constant, PRICING_OPTIONS, is mapped to an overlay screen name found in the UI script for the package. The screen constants are defined in src\com\extendyourstore\pos\ui\POSUIManagerIfc.java.

DialogBean

The DialogBean provides dynamic creation of dialog screens. This bean is implemented by src\com\extendyourstore\pos\ui\bundles\DialogBean.java and its corresponding model DialogBeanModel.java.

Bean Properties and Text Bundle

DialogSpec is the name of a bean specification that defines an implementation of the DialogBean class. The following code sample shows the bean specification defined in src\com\extendyourstore\pos\services\common\commonuicfg.xml.

Example 10–16 commonuicfg.xml: Bean Specification Using DialogBean

```
<BEAN
specName="DialogSpec"
configuratorPackage="com.extendyourstore.pos.ui"
configuratorClassName="POSBeanConfigurator"
beanPackage="com.extendyourstore.pos.ui.beans"
beanClassName="DialogBean">
<BEANPROPERTY propName="cachingScheme" propValue="none"/>
</BEAN>
```

The DialogBean does not have any properties that can be defined in UI scripts. Therefore, all its properties are defined in Tour code discussed in the next section. The following code sample defines the message displayed in the dialog. This example from src\com\extendyourstore\pos\services\inquiry\giftcardinquiry\InquirySlipPrintAisle.java shows how text on a DialogBean is defined in Java code.

Example 10–17 InquirySlipPrintAisle.java: DialogBean Label Definition

```
DialogBeanModel model = new DialogBeanModel();
model.setResourceID("Retry");
```

The resourceID corresponds to the name of the text bundle. For all dialog screens in the en_US locale, dialogText_en_US.properties contains the bundles that define the text on the screen, as shown in the following code.

Example 10–18 dialogText_en_US.properties: DialogBean Text Bundle Example

```
DialogSpec.Retry.title=Device is offline
DialogSpec.Retry.description=Device offline
DialogSpec.Retry.line2=<ARG>
DialogSpec.Retry.line5=Press the Retry button to attempt to use the device again.
```

Tour Code

In the Tour code, bean models are created to hold the data on the bean components.

Table 10–12 lists some of the important methods in the DialogBeanModel class.

Table 10–12 DialogBeanModel Important Methods

Method	Description
setResourceID(String)	Used to locate screen text in the text bundle
setArgs(String [])	Sets a string of arguments to replace <ARG> tags in the text bundle
setButtonLetter(int, String)	Sets the specified letter to be sent when the specified button is pressed
setType(int)	Sets the flag indicating whether focus should stay on the response field

The following sample from src\com\extendyourstore\pos\services\tender\LookupStoreCreditSite.java shows creation of a DialogBeanModel, prefilling of data in the model, and display of the model on which the DialogBeanModel is set.

Example 10–19 LookupStoreCreditSite.java: Creating and Displaying DialogBeanModel

```
DialogBeanModel dialogModel = new DialogBeanModel();
DialogModel.setResourceID("InvalidCashAmount");
dialogModel.setArgs(new String[] ={cashAmt});
dialogModel.setType(DialogScreensIfc.ACKNOWLEDGEMENT);
dialogModel.setButtonLetter(BUTTON_OK, "Failure");
ui.showScreen(POSUIManagerIfc.DIALOG_TEMPLATE, dialogModel);
```

The screen constant, DIALOG_TEMPLATE, is mapped to an overlay screen name found in the UI script for the package. The screen constants are defined in src\com\extendyourstore\pos\ui\POSUIManagerIfc.java.

When setting the dialog type, refer to the following table. For each dialog type, the buttons on the dialog are specified. In most cases, the letter sent by the button has the same name as the button, except for the two types noted.

Table 10–13 lists the available dialog types as defined by constants in src\com\extendyourstore\pos\ui\DialogScreensIfc.java.

Table 10–13 Dialog Types

Dialog Type	Button(s)	Details
ACKNOWLEDGEMENT	Enter	Button sends OK letter
CONFIRMATION	Yes, No	
CONTINUE_CANCEL	Continue, Cancel	
ERROR	Enter	Button sends OK letter, Screen displays red in the title bar
RETRY	Retry	
RETRY_CANCEL	Retry, Cancel	
RETRY_CONTINUE	Retry, Continue	
SIGNATURE		Places a signature panel to capture the customer's signature

When setting a letter to a button, refer to the following table that lists the available button types also defined in DialogScreensIfc.java. These constants are used as arguments to DialogBean methods that modify button behavior.

Table 10–14 lists the available button types also defined in DialogScreensIfc.java.

Table 10–14 Button Types

Button	ButtonID
Enter, OK	BUTTON_OK
Yes	BUTTON_YES
No	BUTTON_NO
Continue	BUTTON_CONTINUE
Retry	BUTTON_RETRY
Cancel	BUTTON_CANCEL

Field Types

This section defines field types available to all beans. The following field types may be used by all the beans, but DataInputBean is the only bean that understands the FIELD element. In other words, DataInputBean is the only bean that defines fields in bean specifications.

These field types correspond to create() methods in UIFactory.java, such as createCurrencyField() and createDisplayField(). The application framework uses reflection to create the fields. Therefore, the field names in the following table can be set as the fieldType attribute in an XML bean specification using the DataInputBean class. The corresponding parameter list is a list of strings that can be set as the paramList attribute.

Table 10–15 lists field types and their descriptions.

Table 10–15 Field Types and Descriptions

Name	Description	Parameter List Strings (no spaces allowed)
alphaNumericField	Allows letters and/or numbers, no spaces or characters	name,minLength,maxLength
constrainedPasswordField	Text where the view indicates something was typed, but does not show the original characters	name,minLength,maxLength
constrainedTextAreaField	Multi-line area that allows plain text, with restrictions on length	name,minLength,maxLength,columns,wrapStyle,lineWrap
constrainedField	Allows letters, numbers, special characters, and punctuation, with restrictions on length	name,minLength,maxLength
currencyField	Allows decimal numbers only, representing currency, with two spaces to the right of the decimal	name,zeroAllowed,negativeAllowed,emptyAllowed
decimalField	Allows decimal numbers only	name,maxLength,negativeAllowed,emptyAllowed
displayField	Display area that allows a short text string or an image, or both	name
driversLicenseField	Allows alphanumeric text that can contain '*' or ' '	name
EYSDateField	Allows only whole numbers and the special character/ —the format is MM/DD/YYYY	name
EYSTimeField	Allows only whole numbers and the special character:—the format is HH:MM	name
nonZeroDecimalField	Allows non-zero decimal numbers only	name,maxLength
numericField	Allows integers only, no special characters or letters	name,maxLength,minLength
nonZeroNumericField	Allows non-zero integers only	name,maxLength,minLength
textField	Allows letters, numbers, special characters, and punctuation	name
validatingTextField	Line of text that can be validated by length requirements	name

Connections

Connections configure the handling of an event in the UI Framework. They are used to define inter-bean dependencies and behavior and to tie the bean event responses back to the business logic. When one bean generates an event, another bean can be notified of the event. Connections have a source bean, a Listener Type for the target, and a target bean.

Connections attach a source bean to a target bean, which receives event notifications from the source bean. The Listener Type specifies which type of events can be received. The XML in the following sections are found in com\extendyourstore\pos\services\tender\tenderuicfg.xml. Other listeners used in Point-of-Service include ConfirmCancelAction, HelpAction, and CloseDialogAction.

ClearActionListener

ClearActionListener is an interface that extends ActionListener in Swing to make it unique for its use in Point-of-Service. The following code shows how this listener is used in an overlay specification. Adding the ClearActionListener allows the Clear button to erase the text in the selected field in the work area when the Clear button on the GlobalNavigationPanelSpec is clicked.

Example 10–20 tender.xml: ClearActionListener XML tag

```
<CONNECTION
       listenerInterfaceName="ClearActionListener"
       listenerPackage="com.extendyourstore.pos.ui.behavior"
       sourceBeanSpecName="GlobalNavigationPanelSpec"
       targetBeanSpecName="CreditCardSpec"/>
```

DocumentListener

DocumentListener is an interface defined in Swing. The following code shows how this listener is used in an overlay specification. Adding the DocumentListener allows the Clear button on the GlobalNavigationPanelSpec to be disabled until input is entered in the selected field on the work area.

Example 10–21 tender.xml: DocumentListener XML tag

```
<CONNECTION
listenerInterfaceName="DocumentListener"
listenerPackage="javax.swing.event"
sourceBeanSpecName="CreditCardSpec"
targetBeanSpecName="GlobalNavigationPanelSpec"/>
```

ValidateActionListener

ValidateActionListener is an interface that extends ActionListener in Swing to make it unique for its use in Point-of-Service. The following code shows how this listener is defined in an overlay specification. Adding the ValidateActionListener allows the CreditCardSpec to recognize when the Next button on the GlobalNavigationPanelSpec is clicked, resulting in the validation of the required fields on the work area. If the required fields are empty, an error dialog appears stating that the required field(s) must have data.

Example 10–22 tender.xml: ValidateActionListener XML tag

```
<CONNECTION
listenerInterfaceName="ValidateActionListener"
listenerPackage="com.extendyourstore.pos.ui.behavior"
sourceBeanSpecName="GlobalNavigationPanelSpec"
targetBeanSpecName="CreditCardSpec"/>
```

The fields that are required must be specified for this listener in the overlay specification for the target bean, as in the following XML from tenderuicfg.xml.

Example 10–23 tenderuicfg.xml: ValidateActionListener Required Fields

```
<ASSIGNMENT
   areaName="WorkPanel"
   beanSpecName="CreditCardSpec">
   <BEANPROPERTY
      propName="RequiredValidatingFields"
propValue="CreditCardField,ExpirationDateField"/>
   </ASSIGNMENT>
```

Text Bundles

Currently, over forty text bundles exist for the Point-of-Service application. Many of these bundles are service-specific. A properties file with the same name exists for every language, located in locales\<locale name>\config\ui\bundles with the locale name appended to the filename. For example, the Customer service would have its text defined in the customerText_en_US.properties file in English.

A similarly named properties file would exist for each locale. Because they are discussed earlier in the chapter, service-specific bundles and the dialogText bundle are not described in this section.

receiptText

From src\com\extendyourstore\pos\config\bundles\BundleConstantsIfc.java, the following code sets a string constant for the receiptText bundle.

Example 10–24 BundleConstantsIfc.java: String Constant for receiptText

```
public static String RECEIPT_BUNDLE_NAME = "receiptText";
```

In Tour Code, methods to print the receipt exist which call methods on the Utility Manager to get specified text. The following code is from the printDocument() method in src\com\extendyourstore\pos\receipt\GiftCardInquirySlip.java.

Example 10–25 GiftCardInquirySlip.java: Tour Code to Print Receipt

```
UtilityManager utility = (UtilityManager)
Gateway.getDispatcher().getManager(UtilityManagerIfc.TYPE);
Properties slipProps = utility.getBundleProperties(BundleConstantsIfc.RECEIPT_
BUNDLE_NAME,
                                        UtilityManagerIfc.RECEIPT_BUNDLES,

LocaleMap.getLocale(LocaleConstantsIfc.RECEIPT));
String title = slipProps.getProperty("GiftCardTitle", "Gift Card
Inquiry").toString();
String giftCardNumber = slipProps.getProperty("
GiftCardAccount", "Gift Card #").toString();
...define additional properties...
printLineCentered(title);
printLine("");
printLine(blockLine(new StringBuffer(" " + giftCardNumber), new
StringBuffer(cardNumber)));
```

In the receiptText_<locale>.properties file, the corresponding text is defined.

Example 10–26 receiptText_en_US.properties: Text Bundle

```
Receipt.GiftCardTitle=BALANCE INQUIRY
Receipt.GiftCardAccount=Account #
```

parameterText

In overlay specifications, the parameterText bundle is specified to define the text for particular screens. For example, the following code from src\com\extendyourstore\pos\services\admin\parametermanager\parameteruicfg.xml defines text for the PARAM_SELECT_PARAMETER overlay screen. On this screen, the names of the parameters found in the parameterText properties file are displayed.

Example 10–27 parameteruicfg.xml: Overlay Specification Using parameterText

```
<OVERLAYSCREEN
        defaultScreenSpecName="EYSPOSDefaultSpec"
        resourceBundleFilename="parameterText"
        specName="PARAM_SELECT_PARAMETER">
```

In the utility package, the ParameterManager is used to retrieve parameter values. The following code from src\com\extendyourstore\pos\utility\GiftCardUtility.java shows how a parameter is retrieved from the ParameterManager. The handle to the ParameterManager, pm, is passed into the method but originally retrieved by the code ParameterManagerIfc pm = (ParameterManagerIfc)bus.getManager(ParameterManagerIfc.TYPE);

Example 10–28 GiftCardUtility.java: Tour Code to Retrieve Parameter

```
public static final String DAYS_TO_EXPIRATION_PARAMETER =
"GiftCardDaysToExpiration";
daysToExpiration = pm.getIntegerValue(DAYS_TO_EXPIRATION_PARAMETER);
```

In the parameterText_<locale>.properties file, the corresponding text is defined. This text is displayed on the Parameter List screen when viewing Security options and choosing the Tender parameter group.

Example 10–29 parameterText_en_US.properties: Text Bundle

```
Common.GiftCardDaysToExpiration=Days To Giftcard Expiration
```

The value of the parameter is defined in config\parameter\application\application.xml by the code sample below. Each parameters belongs to a group, a collection of related parameters.

Example 10–30 application.xml: Definition of Parameter

```
<PARAMETER name="GiftCardDaysToExpiration"
         type="INTEGER"
         final="N"
         hidden="N">
         <VALIDATOR class="IntegerRangeValidator"
            package="com.extendyourstore.foundation.manager.parameter">
            <PROPERTY propname="minimum" propvalue="1" />
            <PROPERTY propname="maximum" propvalue="9999" />
         </VALIDATOR>
         <VALUE value="365"/>
</PARAMETER>
```

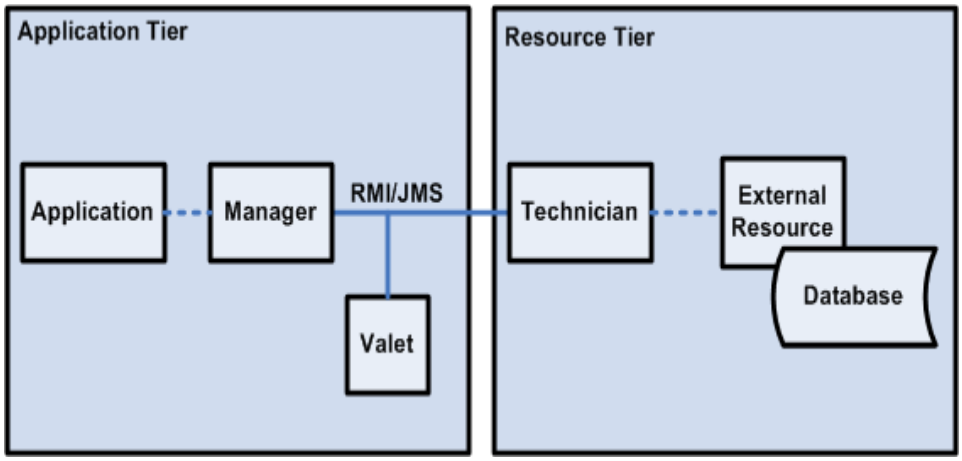
11

Manager/Technician Framework

This chapter describes the Manager/Technician pair relationship and how it is used to provide business and system services to the application. It also describes how to build a Manager and Technician and provides sample implementation and sample code.

Oracle Retail Platform provides the technology for distributing business and system processes across the enterprise through plug-in modules called Managers and Technicians. Manager and Technician classes come in pairs. A Manager is responsible for communicating with its paired Technician on the same or different tiers. The Technician is responsible for performing the work on its tier. By design, Managers know how to communicate with Technicians through a pass-through remote interface called a valet. The valet is the component that handles data transfer. The valet can travel across networks. It receives the instructions from the Manager and delivers them to the Technician. A valet follows the Command design pattern, described in the Architecture chapter.

Figure 11–1 Manager, Technician and Valet



There is a M:N relationship between instances of Managers and Technicians. Multiple Managers may communicate with a Technician, or one Manager may communicate with multiple Technicians. While most Managers have a corresponding Technician, there are cases such as the Utility Manager where no corresponding Technician exists.

There are three Manager/Technician categories. These types have different usages and are started differently. The three types are:

- Global—These Managers and Technicians are shared by all tours. They provide global services to applications.
- Session—These Managers and Technicians perform services for a single tour. They are started by each tour and exist for the length of the tour.
- Embedded—Thread Manager is embedded inside the Oracle Retail Platform engine. It is essential to the operation of the engine. This is currently the only embedded Manager.

Table 11–1 lists each of the three Manager/Technician categories, along with examples.

Table 11–1 Manager/Technician Type Examples

Manager/Technician Type	Examples
Global	Data
	Journal
	Log
	Resource
	Tax
	Timer
	Tier
	Trace
	XML
Session	Device
	Parameter
	Session
	UI
	Web
	DomainInterface
	TenderAuth
Embedded	Thread

Session Managers are started up by the tour bus when a tour is invoked and can only be accessed by the bus in the tour code. Global Managers, on the other hand, can be used at any time and are not specific to any tour. Each type of Manager has a specific responsibility. This table lists the functions of some of the Managers.

Table 11–2 lists the functions of some of the Managers.

Table 11–2 Manager Names and Descriptions

Manager Name	Description
Data	The Data Manager is the system-wide resource through which the application can obtain access to persistent resources. The Data Manager tracks all data stores for the system, and is the mechanism by which application threads obtain logical connections to those resources for persistence operations.
Device	The Device Manager defines the Java interfaces that are available to an application or class for accessing hardware devices, like printers and scanners.
Journal	The Journal Manager is the interface that is used to write audit trail information, such as start transaction, end transaction, and other interesting register events.
Log	The Log Manager is the interface that places diagnostic output in a common location on one tier for an application, regardless of where the actual tours run.
Parameter	The Parameter Manager is the interface that provides access to parameters used for customization and runtime configuration of applications.
Thread	The Thread Manager is a subsystem that provides system threads as a pooled resource to the system.
Tier	The Tier Manager interface starts a tour session and mails letters to existing tour sessions. The Tier Manager enables the engine to start a tour on any tier specified in a transfer station, regardless of where that tier runs. In addition, the Tier Manager enables a bus to mail a letter to any other existing Bus in the system on any tier.
Timer	The Timer Manager provides timer resources to applications that require them. It does not have a Technician because all timers are local on the tier where they are used.
User Interface	The UI Manager is a mechanism for accessing and manipulating user interface components. The user interface subsystem within a state machine application must also maintain a parallel state of screens, so the appropriate screens can be matched with the application state at all times. The user interface subsystem within a distributed environment must enable application logic to be completely isolated from the user interface components.
XML	The XML Manager locates a specified XML file, parses the file, and returns an XML parse tree.

New Manager/Technician

When creating a new Manager and Technician pair, you must create a Manager and Technician class, a Valet class, and interfaces for each class. Managers are the application client to a Technician service, Technicians do the work, and the valet tells the Technicians what work to do. Managers can be considered proxies for the services provided by the Technicians. Technicians can serve as the interfaces to resources. Managers communicate with Technicians indirectly using valets. Valets can be thought of as commands to be executed remotely by the Technician. Samples for the new classes that need to be created are organized together in the next section.

Requesting services from the Managers only requires familiarity with the interface provided by Managers. However, building a new Manager/Technician pair requires implementing the interfaces for both the new Manager and Technician, as well as creating a Valet class.

Manager Class

A Manager merely provides an API to tour code. It behaves like any other method except that the work it performs may be completed remotely. The input to a Manager is usually passed on to the valet that in turn, passes it on to the Technician, which actually performs the work.

The Manager class provides methods for sending valets to the Technician. The sendValet() method makes a single attempt to send a valet to the Manager's Technician. The sendValetWithRetry() method attempts to send the valet to the Manager's Technician, and if there is an error, reset the connection to the Technician and then try again.

Managers must implement the ManagerIfc, which requires the methods in the follwing table.

Table 11–3 lists ManagerIfc methods.

Table 11–3 ManagerIfc Methods

Method	Description
MailboxAddress getAddress()	Gets address of Manager
Boolean getExport()	Returns if this Manager is exportable
String getName()	Gets name of Manager
void setExport(Boolean)	Sets whether the Manager is exportable
void setName(String)	Sets name of Manager
void shutdown()	Shuts this Manager down
void startUp()	Starts this Manager

Often, a subclass of Manager can use these methods exactly as written. Unlike the Technicians, Managers seldom require special startup and shutdown methods, because most Managers have no special resources associated with them.

Manager Configuration

You can provide runtime configuration settings for each Manager using a conduit script. The Dispatcher that loads Back Office configures the Managers by reading properties from the conduit script and calling the corresponding set() method using the Java reflection utility. All properties are set by the Dispatcher before the Dispatcher calls startUp() on the Manager.

Every Manager should have the following:

- Name—Tour code typically locates a Manager using its name. Often this name is the same as the name of the class and may be defined as a constant within the Manager. This is what the getName() method returns.
- Class—This is the name of the class, minus its package.
- Package—This is the Java package where the class resides.

Managers may have an additional property file defined that specifies additional information such as the definition of transaction mappings. If a separate configuration script is defined, the startup() method must read and interpret the configuration script. The following sample from config\conduit\CollapsedConduitFF.xml shows this.

Example 11–1 CollapsedConduitFF.xml: Data Manager Configuration

```
<MANAGER name="DataManager" class="DataManager"
             package="com.extendyourstore.foundation.manager.data">
          <PROPERTY propname="configScript"
                    propvalue="classpath://config/manager/PosDataManager.xml" />
</MANAGER>
```

Technician Class

Technicians implement functions needed by Back Office to communicate with external or internal resources, such as the UI or the store database. Technicians must implement the TechnicianIfc, which requires the following methods:

Table 11–4 lists TechnicianIfc methods.

Table 11–4 TechnicianIfc Methods

Method	Description
MailboxAddress getAddress()	Gets address of Technician
Boolean getExport()	Checks if this Technician is exportable
String getName()	Gets name of Technician
void shutdown()	Shuts this Technician down
void startUp()	Starts up Technician process

Often, a subclass of Technician can use these methods exactly as written. The most likely methods to require additional implementation are startUp() and shutdown(), which needs to handle connections with external systems.

Technician Configuration

The Technician is configured within the conduit script. Each Technician should have the following:

Name

A Manager typically locates its Technician using its name. Often this name is the same as the name of the class and may be defined as a constant within the Technician. This is what Technician.getName() returns.

Class

The name of the class, minus its package.

Package

The Java package where the class resides.

Export

This should be Y if the Technician may be accessed by an external Java process; N otherwise. The value returned by Technician.getExport() is based on this. In Technicians, it indicates whether the Technician can be remotely accessed from another tier.

commScheme (optional)

Specifies the communication scheme used to communicate with the Technician. The default is RMI.

encryptValets (optional)
Specifies whether the valets should be encrypted during network transmission. The default is N.

compressValets (optional)
Specifies whether the valets should be compressed during network transmission. The default is N.

Some Technicians may require complex configuration. In cases like this, it may be preferable to define an XML configuration script specific to the Technician, rather than to rely on the generic property mechanism. Therefore, Technicians may have an additional property defined that specifies additional information such as log formats or parameter validators. If a separate configuration script is defined, the startup() method must read and interpret the configuration script. The following sample from config\conduit\CollapsedConduitFF.xml shows an additional script defined in the configuration of the Tax Technician.

Example 11–2 CollapsedConduitFF.xml: Tax Technician Configuration

```
<TECHNICIAN name="TaxTechnician" class = "TaxTechnician"
package = "com.extendyourstore.domain.manager.tax"
export = "Y" >
        <PROPERTY
            propname="taxSpecScript"
            propvalue="classpath://config/tax/TaxTechnicianRates.xml"
        />
</TECHNICIAN>
```

Valet Class

The valet is the intermediary between the Manager and Technician. Valets act as commands and transport information back and forth between the Manager and Technician. Valets must implement ValetIfc, which contains a single method.

Table 11–5 lists the ValetIfc method.

Table 11–5 ValetIfc Method

Method	Description
Serializable execute(Object)	Executes the valet-specific processing on the object

The execute method is called by the Technician after the valet arrives at its destination as a result of the Manager's sendValet() or sendValetWithRetry() methods, as in the following example from src\com\extendyourstore\foundation\manager\parameter\ParameterManager.java.

Example 11–3 ParameterManager.java: Valet Passed By Manager

```
MailboxAddress techAddress = getParameterTechnicianAddress();
retVal = sendValetWithRetry(valet, techAddress);
```

Sample Code

The examples below illustrate the primary changes that need to be made to create a Manager/Technician pair. Note that interfaces also need to be created for the new Manager, Technician, and Valet classes.

Configuration

The conduit script needs to define the location of the Manager and Technician. This code would be found in a conduit script such as config\conduit\ClientConduit.xml. These code samples would typically be in different files on separate machines. It would include snippets like the following.

Example 11–4 Sample Manager and Technician Configuration

```
    <MANAGER name="MyNewManager"
             class="MyNewManager"
             package="com.extendyourstore.foundation.manager.mynew">
    </MANAGER>

    <TECHNICIAN name="MyNewTechnician"
             class="MyNewTechnician"
             package="com.extendyourstore.foundation.manager.mynew"
             export="Y" >
            <PROPERTY propname="techField" propvalue="importantVal"/>
            <PROPERTY propname="configScript"

propvalue="classpath://com/extendyourstore/pos/config/myconfigscript.xml"/>
    </TECHNICIAN>
```

Tour Code

Tour code might include a snippet like the following, which might be located in src\com\extendyourstore\pos\services.

Example 11–5 Sample Manager in Tour Code

```
        try
        {
            MyNewManagerIfc myManager =
(MyNewManagerIfc)bus.getManager("MyNewManager");
            myManager.doSomeClientWork("From site code ");
        catch (Exception e)
        {
            logger.info(bus.getServiceName(), e.toString());
        }
```

Manager

This is a minimal Manager class to illustrate how to create a new Manager. A new Manager interface also needs to be created for this class. Note that this class references the sample MyNewTechnician class shown in a later code sample.

Example 11–6 Sample Manager Class

```
package com.extendyourstore.foundation.manager.mynew;

import com.extendyourstore.foundation.manager.log.LogMessageConstants;
import com.extendyourstore.foundation.tour.manager.Manager;
import com.extendyourstore.foundation.tour.manager.ValetIfc;

public class MyNewManager extends Manager implements MyNewManagerIfc
{
    //--------------------------------------------------------------------------
    /**
       Constructs MyNewManager object, establishes the manager's address, and
       identifies the associated technician.
    */
    //--------------------------------------------------------------------------

    public MyNewManager()
    {
        getAddressDispatcherOptional();
        setTechnicianName("MyNewTechnician");
    }

    //--------------------------------------------------------------------------
    /**
        This method processes the input argument (via its technician).
        @param  input a String to illustrate argument passing.
        @return  a transformed String
    **/
    //--------------------------------------------------------------------------

    public String doSomeClientWork(String input)
    {
        String result = null;
        ValetIfc valet = new MyNewValet(input);
        try
        {
            result = (String)sendValetWithRetry(valet);
        }
        catch (Exception e) // usually ValetException or CommException
        {
            logger.error(LogMessageConstants.SCOPE_SYSTEM,
                         "MyNewManager.doSomeClientWork, " +
                         "could not sendValetWithRetry: Exception = {0}", e);
        }
        logger.debug(LogMessageConstants.SCOPE_SYSTEM,
                     "MyNewManager.doSomeClientWork, returns {0}", result);
        return result;
    }
}
```

Valet

The following code defines a valet to send input to MyNewTechnician.

Example 11–7 Sample Valet Class

```
package com.extendyourstore.foundation.manager.mynew;

import com.extendyourstore.foundation.tour.manager.ValetIfc;
import java.io.Serializable;

public class MyNewValet implements ValetIfc
{
    /** An input used by the Technician.  **/
    protected String input = null;
    //--------------------------------------------------------------------------
    /**
        The constructor stores the input for later use by the Technician.
        @param input the input to be stored.
    **/
    //--------------------------------------------------------------------------

    public MyNewValet(String input)
    {
        this.input = input;
    }

    //--------------------------------------------------------------------------
    /**
        This method causes the MyNewTechnician to "doSomething" with the input
            and returns the results.
        @param  techIn the technician that will do the work
        @return the results of "MyNewTechnician.doSomething"
    **/
    //--------------------------------------------------------------------------

    public Serializable execute(Object techIn) throws Exception
    {
        if (!(techIn instanceof MyNewTechnician))
        {
            throw new Exception("MyNewTechnician must passed into execute.");
        }
        MyNewTechnician tech = (MyNewTechnician)techIn;
        String result = tech.doSomething(input);
        return result;
    }
}
```

Technician

The following code provides an example of a minimal Technician class. A new Technician interface also needs to be created for this class.

Example 11–8 Sample Technician Class

```
package com.extendyourstore.foundation.manager.mynew;

import com.extendyourstore.foundation.manager.log.LogMessageConstants;
import com.extendyourstore.foundation.tour.manager.Technician;
import com.extendyourstore.foundation.tour.manager.ValetIfc;

public class MyNewTechnician extends Technician implements MyNewTechnicianIfc
{
    /** A value obtained from the config script.  **/
    protected String techField = null;

    public void setTechField(String value)
    {
        techField = value;
    }

    public void setConfigScript(String value)
    {
        // Complicated configuration could go here
    }

    //--------------------------------------------------------------------------
    /**
        This method processes the input argument (via its Technician).
        @param  input a String to illustrate argument passing.
        @return  a transformed String
    **/
    //--------------------------------------------------------------------------

    public String doSomething(String input)
    {
        String result = null;
        result = "MyNewTechnician processed " + input + " using " + techField;
        logger.debug(LogMessageConstants.SCOPE_SYSTEM,
                     "MyNewTechnician.doSomething, returns {0}", result);
        return result;
    }
}
```

Manager/Technician Reference

The following sections describe a Manager/Technician pair, important methods on the Manager, and an example of using the Manager in the application code.

Parameter Manager/Technician

The Parameter Manager is the interface that allows parameters to be used for customization and runtime configuration of applications. The following code from config\conduit\ClientConduit.xml specifies the location and properties of the Parameter Manager and Technician. Note that the Parameter Manager is a Session Manager because it is defined with a PROPERTY element inside the APPLICATION tag. This means it can only be accessed via a tour bus.

Example 11–9 ClientConduit.xml: Code to Configure Parameter Manager

```
<APPLICATION name="APPLICATION"
                class="TierTechnician"
                package="com.extendyourstore.foundation.manager.tier"

startservice="classpath://com/extendyourstore/pos/services/main/main.xml">
<PROPERTY propname="managerData"
propvalue="name=ParameterManager,managerpropname=className,managerpropvalue=com.ex
tendyourstore.foundation.manager.parameter.ParameterManager"/>
<PROPERTY propname="managerData"

propvalue="name=ParameterManager,managerpropname=useDefaults,managerpropvalue=Y"/>
...
</APPLICATION>
```

Example 11–10 ClientConduit.xml: Code to Configure Parameter Technician

```
<TECHNICIAN name="ParameterTechnician" class = "ParameterTechnician"
              package = "com.extendyourstore.foundation.manager.parameter"
              export = "Y" >
       <PROPERTY propname="paramScript"

propvalue="classpath://config/manager/PosParameterTechnician.xml"/>
</TECHNICIAN>
```

The Parameter Manager classes contain methods to retrieve parameter values. The Customization chapter describes details about where and how parameters are defined. A list of parameters can be found in the Parameter Names and Values Addendum.

Table 11–6 lists the important ParameterManagerIfc methods, implemented in src\com\extendyourstore\foundation\manager\parameter\ParameterManager.java.

Table 11–6 Important ParameterManagerIfc Methods

Method	Description
Serializable[] getParameterValues(String paramName)	Returns the values of the specified parameter
String[] getStringValues(String parameterName)	Returns as an array of Strings the values of the specified parameter
String getStringValue(String parameterName)	Returns as a String the value of the specified parameter
Integer getIntegerValue(String parameterName)	Returns as an Integer the value of the specified parameter
Double getDoubleValue(String parameterName)	Returns as a Double the value of the specified parameter

The following code sample from src\com\extendyourstore\pos\services\browser\BrowserControlSite.java illustrates the use of the Parameter Manager to retrieve parameter values.

Example 11–11 BrowserControlSite.java: Tour Code Using ParameterManagerIfc

```
ParameterManagerIfc pm =
(ParameterManagerIfc)bus.getManager(ParameterManagerIfc.TYPE);
Serializable homeUrl[] = pm.getParameterValues("BrowserHomeUrl");
String cookieString = pm.getStringValue("CookiesEnabled");
```

UI Manager/Technician

The UI Manager/Technician is used to abstract the UI implementation. User events captured by the screen are sent to the UI Manager. The UI Manager communicates with a UI Technician, which updates the screen for a client running the UI. The UI Technician provides access to the application UI Subsystem. There is one UITechnician per application.

The model is an object that is used to transport information between the screen and the UI Manager via the UI Technician. Models and screens have a one-to-one relationship. The UI Manager allows you to set the model for a screen and retrieve a model for a screen; it knows which screen to show and which model is associated with the screen. The model has data members that map to the entry fields on the given screen. It can also contain data that dictates screen behavior, such as the field that has the starting focus or the state of a specific field.

The following code samples from config\conduit\ClientConduit.xml specify the UI Manager and Technician properties. Like the Parameter Manager, the UI Manager can only be accessed via a tour bus.

Example 11–12 ClientConduit.xml: Code to Configure UI Manager

```
<APPLICATION name="APPLICATION"
                class="TierTechnician"
                package="com.extendyourstore.foundation.manager.tier"

startservice="classpath://com/extendyourstore/pos/services/main/main.xml">
<PROPERTY propname="managerData"
propvalue="name=UIManager,managerpropname=className,managerpropvalue=com.extendyou
rstore.pos.ui.POSUIManager"/>
...configuration of other Managers...
</APPLICATION>
```

Example 11–13 ClientConduit.xml: Code to Configure UI Technician

```
<TECHNICIAN
        name="UITechnician"
        class="UITechnician"
        package="com.extendyourstore.foundation.manager.gui" export="Y">

        <CLASS
            name="UISubsystem"
            package="com.extendyourstore.pos.ui"
            class="POSJFCUISubsystem">

            <CLASSPROPERTY
                    propname="configFilename"

propvalue="classpath://com/extendyourstore/pos/config/defaults/defaultuicfg.xml"
                    proptype="STRING"/>
...
</TECHNICIAN>
```

The UI is configured in XML scripts. Each tour has its own uicfg file in which screen specifications are defined. The screen constants that bind to screen specification names are defined in src\com\extendyourstore\pos\ui\POSUIManagerIfc.java. The UI Framework chapter discusses screen configuration in more detail.

POSUIManager is the UI Manager for the Back Office application. One is started for each tour that is created.

Table 11–7 lists important POSUIManagerIfc methods, implemented in src\com\extendyourstore\pos\ui\POSUIManager.java.

Table 11–7 Important POSUIManagerIfc Methods

Method	Description
void showScreen(String screenId, UIModelIfc beanModel)	Displays the specified screen using the specified model
UIModelIfc getModel(String screenId)	Gets the model from the specified screen
String getInput()	Gets the contents of the most recent Response area as a string
void setModel(String screenId, UIModelIfc beanModel)	Sets the model for the specified screen

These methods are used in tour code to display a screen, as in the following code from src\com\extendyourstore\pos\services\GetCheckInfoSite.java.

Example 11–14 GetCheckInfoSite.java: Tour Code Using POSUIManagerIfc

```
POSUIManagerIfc ui = (POSUIManagerIfc) bus.getManager(UIManagerIfc.TYPE);
CheckEntryBeanModel model = new CheckEntryBeanModel();
model.setCountryIndex(countryIndex);
...set additional attributes...
ui.showScreen(POSUIManagerIfc.CHECK_ENTRY, model);
```

Journal Manager/Technician

The Journal Manager provides location abstraction for journal facilities by implementing the JournalManagerIfc interface. By communicating with a JournalTechnicianIfc, the Journal Manager removes your need to know the location of resources. The Journal Technician is responsible for providing journal facilities to other tiers. The Journal Manager must be started on each tier that uses it. There must be a LocalJournalTechnician running on the local tier or an exported JournalTechnician running on a remote tier, or both. Transactions should be written to E-journal only when completed.

The following code samples from config\conduit\CollapsedConduitFF.xml specify the Journal Manager and Technician properties. Note that this Manager is a Session Manager; it is defined outside of the APPLICATION element in which the UI Manager and Parameter Manager were defined. This allows the Journal Manager to be accessed outside of the bus, meaning it is more accessible and flexible.

Example 11–15 CollapsedConduitFF.xml: Code to Configure Journal Manager

```
<MANAGER name="JournalManager"
             class="JournalManager"
             package="com.extendyourstore.foundation.manager.journal"
             export="N">
</MANAGER>
```

Example 11–16 CollapsedConduitFF.xml: Code to Configure Journal Technician

```
    <TECHNICIAN name="LocalJournalTechnician"
                class="JournalTechnician"
                package="com.extendyourstore.foundation.manager.journal"
                export="Y">
    </TECHNICIAN>
```

The Journal Manager must be started on each tier that uses it. The Journal Manager sends journal entries in the following order: (1) Console if consolePrintable is set, (2) LocalJournalTechnician if defined, (3) JournalTechnician if defined.

Table 11–8 lists important JournalManagerIfc methods, implemented in src\com\extendyourstore\foundation\manager\journal\JournalManager.java.

Table 11–8 Important JournalManagerIfc Methods

Method	Description
void journal(String user, String transaction, String text)	Adds a new entry to the journal
void setConsolePrintable(String printable)	Sets whether journal entries are sent to the console
void index(String transaction, String key)	Adds a new entry to the index to provide search capabilities to the transaction
void setRegisterID(String registerID)	Sets a register ID associated with the journal entry

These methods are used in tour code to configure the E-journal. This code is from src\com\extendyourstore\pos\services\GetCheckInfoSite.java.

Example 11–17 GetCheckInfoSite.java: Tour Code Using JournalManagerIfc

```
JournalManagerIfc journal =
(JournalManagerIfc) Gateway.getDispatcher().getManager(JournalManagerIfc.TYPE);
journal.journal(trans.getCashier().getLoginID(),
                                trans.getTransactionID(),
                                purchaseOrder.toJournalString());
```

12

Retail Domain

This chapter contains an overview of the Oracle Retail business objects, including steps to create, extend, and use them. The Retail Domain is the set of classes that represent the business objects used by Point-of-Service, which are contained in the Commerce Services layer of the architecture. Typical domain classes are Customer, Transaction, and Tender.

The Retail Domain is a set of business logic components that implement retail-oriented business functionality in Point-of-Service. The Retail Domain is the part of the Commerce Services layer of the Oracle Retail architecture that is retail-specific. The Retail Domain provides a common vocabulary that enables the expression of retail functionality as processes that can be executed by the Oracle Retail Platform engine.

The Retail Domain is a set of retail-oriented objects that have a set of attributes. They do not implement work flow or a user interface. The Tour scripts executed by Oracle Retail Platform provide the work flow, and the UI subsystem provides the user interface. The Retail Domain objects simply define the attributes and logic for application data.

A significant advantage of Retail Domain objects is that they can be easily used as-is or can be extended to include attributes and logic that are specific to a retailer's business requirements. The Domain objects could be used as a basis for many different types of retail applications. The objects serve as containers for the transient data used by the applications. Domain objects do not persist themselves, but they are persisted via the OracleRetailStore Data Manager interface.

Retail Domain is packaged as domain.jar and domainconfig.jar, which are installed with the Point-of-Service application. The Data Managers and Technicians, along with the related Data Transactions and Data Operations classes that they require, are also packaged within the Retail Domain jars.

All Retail Domain classes extend EYSDomainIfc. This interface ensures the following interfaces are implemented:

Serializable

This communicates Java's ability to flatten an object to a data stream and, conversely, reconstruct the object from a data stream, when using RMI.

Cloneable

This communicates that it is legal to make a field-for-field copy of instances of this class.

The EYSDomainIfc interface also requires that the following methods be implemented:

equals()
This method accepts an object as a parameter. If the object passed has data attributes equal to this object, the method returns true, otherwise it returns false.

clone()
This method creates a new instance of the class of this object and initializes all its fields with exactly the contents of the corresponding fields of this object.

toString()
This method returns a String version of the object contents for debugging and logging purposes.

New Domain Object

When an existing Retail Domain object contains attributes and methods that are a subset of those required, a new Retail Domain object can extend the existing object. For example, if a new Domain object is necessary for the Tender service, the AbstractTenderLineItem class can be extended. This class implements TenderLineItemIfc, which extends the generic EYSDomainIfc interface. If no similar Domain object exists in the application, create a new Domain object. The usual coding standards apply; reference the Development Standards document.

1. Create a new interface extending EYSDomainIfc.

   All Retail Domain objects extend EYSDomainIfc, but existing Services have an interface available for Domain objects related to that Service. For example, TenderLineItemIfc, which extends EYSDomainIfc, is the interface implemented by each Retail Domain object interface in the Tender service. The following code sample shows the header of TenderPurchaseOrderIfc, found in src\com\extendyourstore\domain\tender\TenderPurchaseOrderIfc.java.

Example 12–1 TenderPurchaseOrderIfc.java: Class Header

```
public interface TenderPurchaseOrderIfc extends TenderLineItemIfc
{
public static final String revisionNumber = "$Revision:   1.0  $";
// begin TenderPurchaseOrderIfc
}
```

2. Create a new Java class that implements the interface created in the previous step. The class of a brand new object that does not fit an existing pattern should extend AbstractRoutable, which defines a “luggage tag” for EYS domain classes; otherwise, the class should extend the existing class that represents a similar type of object.

   The following code sample shows the header for the TenderPurchaseOrder Domain object from src\com\extendyourstore\domain\tender\TenderPurchaseOrder.java.

Example 12–2 TenderPurchaseOrder.java: Class Header

```
public class TenderPurchaseOrder extends AbstractTenderLineItem implements
TenderPurchaseOrderIfc
{
public static final String revisionNumber = "$Revision:   1.0  $";
//begin TenderPurchaseOrder
}
```

In the implementation of the class, make sure to do the following:

- Define attributes for the class.

  Check the superclass to see if an attribute has already been defined. For example, the AbstractTenderLineItem class defines the amountTender attribute, so amountTender should not be redefined in a new Tender Domain object.

  If the new domain object has numerous constants, you might consider defining ObjectNameConstantsIfc.java

- Define get and set methods for the attributes as necessary.
- Implement methods required by EYSDomainIfc: equals(), clone(), toString(), and getRevisionNumber(). Reference the superclass as appropriate. toString() should indicate the class name and revision number.

3. To return a new instance of the Domain object, add a method to src\com\extendyourstore\domain\factory\DomainObjectFactoryIfc.java called getObjectNameInstance().

   Domain objects should always be instantiated by the factory. The following code sample shows the method interface to return an instance of the TenderPurchaseOrder object.

Example 12–3 DomainObjectFactoryIfc.java: Method For Instantiating TenderPurchaseOrder

```
public TenderPurchaseOrderIfc getTenderPurchaseOrderInstance();
```

4. To return a new instance of the Domain object, implement the method src\com\extendyourstore\domain\factory\DomainObjectFactory.java called getObjectNameInstance().

   The following code sample shows the method definition to return an instance of the TenderPurchaseOrder object.

Example 12–4 DomainObjectFactory.java: Method For Instantiating TenderPurchaseOrder

```
public TenderPurchaseOrderIfc getTenderPurchaseOrderInstance()
{
return(new TenderPurchaseOrder());
}
```

Domain Object in Tour Code

Once a Retail Domain class is identified for use, the Java code needs to be written to instantiate the object and call the object's methods. This code is typically located in site, road and aisle classes of application tours. There are two very important things to keep in mind when using Domain objects in Tour code:

- Retail Domain objects cannot be instantiated directly. They must be generated by the factory.
- All interaction with Domain objects take place through the object's interface, even interaction between objects.

The steps to use the object involve the following:

1. Get an instance of the DomainObjectFactory and request the instance of the object from the factory.

   The factory class is instantiated once for the application and returns instances of Retail Domain objects. Since different implementations use different classes to implement the objects, the factory keeps track of which class implements the requested object.

   The following line of code from src\com\extendyourstore\services\tender\GetCheckInfoSite.java gets an instance of a Check object.

Example 12–5 GetCheckInfoSite.java: Instantiating Check from DomainObjectFactory

```
check = DomainGateway.getFactory().getTenderCheckInstance();
```

2. Call methods on the object.

   Now that an instance of the object exists, methods of the class can be called. The following lines of code from GetCheckInfoSite.java sets attributes on the Check object.

Example 12–6 GetCheckInfoSite.java: Setting Attributes of Check

```
check.setTenderLimits(cargo.getTenderLimits());
check.setAmountTender(amount);
```

Domain Object Reference

The Domain Objects discussed below include a description of the purpose of the object, classes and interfaces involved in its construction, a class diagram, and examples in Tour code.

CodeListMap

To implement Point-of-Service metadata such as reasons for return, shipping methods, and departments, the CodeList objects are used. This data is referred to as "reason codes" from the UI. Codes are read in from the database at application startup. They are available from the Utility Manager.

Table 12–1 lists files are involved in the formation of CodeLists. All are found in src\com\extendyourstore\domain\utility.

Table 12–1 CodeListMap Object Classes and Interfaces

Class or Interface	Description	Important Methods

CodeEntry	**This class handles the functions associated with an entry in a list of codes.**	`void setText(String)`
		`void setCode(int)`
		`void setEnabled(boolean)`
		`String getCodeString()`

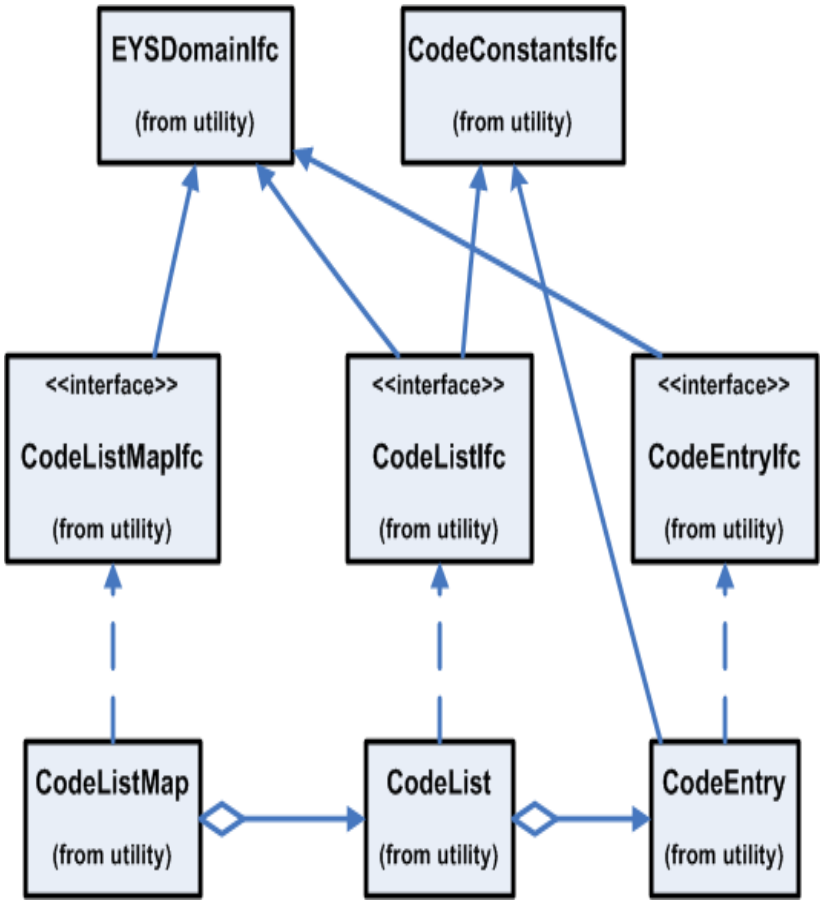
CodeList	This class is used for handling lists of codes which map to strings, such as reason codes.	`CodeEntryIfc[] getEntries()`
		`void setEntries(CodeEntryIfc[])`
		`void addEntry(CodeEntryIfc)`
		`CodeEntryIfc findListEntry(String)`

CodeListMap	This class is used for the collection of code lists used in applications.	`CodeListIfc[] getLists()`
		`CodeListIfc getCodeListInstance(String)`
		`CodeListIfc add(CodeListIfc)`

CodeConstantsIfc	This class defines constants used for the implementation of CodeList and CodeEntry. It includes the constants for the lists currently defined, such as TimekeepingManagerEditReasonCodes and TillPayOutReasonCodes.	This class does not contain methods.

The following class diagram illustrates the relationship between these classes.

Figure 12–1 CodeListMap Class Diagrams



To use the CodeListMap, the Utility Manager provides two methods:

- CodeListMapIfc getCodeListMap()
- void setCodeListMap(CodeListMapIfc)

Tour code that requires a code entry would retrieve it as in the following code from src\com\extendyourstore\pos\services\common\ItemInfoEnteredAisle.java.

Example 12–7 ItemInfoEnteredAisle.java: CodeListIfc in Tour Code

```
CodeListIfc list  = utility.getCodeListMap().get(CodeConstantsIfc.CODE_LIST_UNIT_
OF_MEASURE);
CodeEntryIfc uomCodeEntry = list.findListEntry(uomString);
String uomCode = uomCodeEntry.getCodeString();
```

Currency

All currency representation and behavior is abstracted, so any currency can be implemented. Currency is a Domain Object that handles the behaviors and attributes of money used as a medium of exchange. It is important to use Currency objects and methods to compare and manipulate numbers instead of primitive types. Currency is implemented by the following classes. They can be found in src\com\extendyourstore\domain\currency.

Table 12–2 lists Currency Object Classes and Interfaces.

Table 12–2 Currency Object Classes and Interfaces

Class or Interface	Description	Important Methods

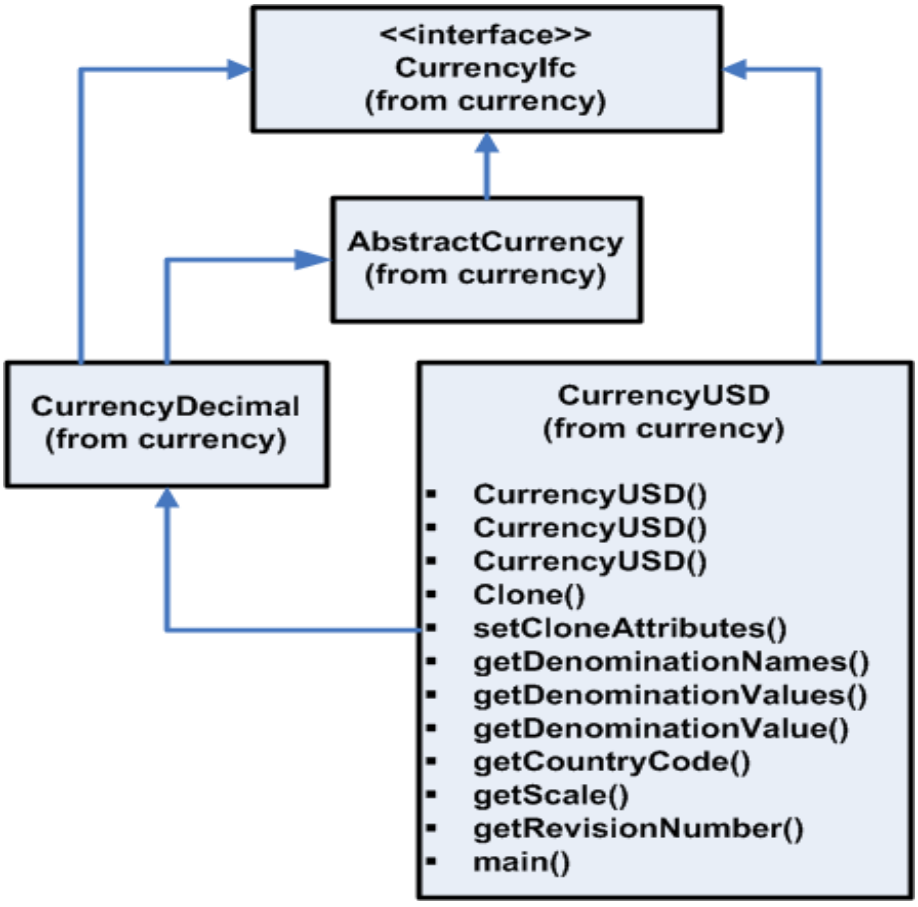
CurrencyIfc	This interface defines a common interface for currency objects.	`CurrencyIfc add(CurrencyIfc)`
		`CurrencyIfc negate()`
		`String getCountryCode()`

AbstractCurrency	This abstract class contains the behaviors and attributes common to all currency.	`BigDecimal getBaseConversionRate()`
		`void setNationality(String)`
		`String getNationality()`

CurrencyDecimal	This class contains the behaviors and attributes common to all decimal-based currency.	`CurrencyIfc add(CurrencyIfc)`
		`CurrencyIfc negate()`
		`String getCountryCode()`

All Currency types extend AbstractCurrency and implement CurrencyIfc. For example, if creating a class to support Canadian currency, the class should extend CurrencyDecimal and implement CurrencyIfc.

Figure 12–2 Currency Class Diagram



The following code is an example of the Currency object used in src\com\extendryourstore\pos\services\tender\PurchaseOrderAmountEnteredAisle.java.

Example 12–8 PurchaseOrderAmountEnteredAisle.java: CurrencyIfc in Tour Code

```
CurrencyIfc balanceDue = totals.getBalanceDue();
CurrencyIfc amount = DomainGateway.getBaseCurrencyInstance(poAmount);
if (!(amount.compareTo(balanceDue) == CurrencyIfc.EQUALS)) {
...display invalid PO Amount message...
}
```

Transaction

A Transaction is a record of business activity that involves a financial and/or merchandise unit exchange or the granting of access to conduct business with an external device. There are various types of Transactions found in `src\com\extendyourstore\domain\transaction` such as LayawayTransaction, StoreOpenCloseTransaction, and BankDepositTransaction. SaleReturnTransaction is a commonly used Domain Object that extends AbstractTenderableTransaction. The classes involved in the implementation of a SaleReturnTransaction and its behaviors are described in the following table.

Table 12–3 lists classes involved in the implementation of a SaleReturnTransaction and its behaviors.

Table 12–3 Transaction Object Classes and Interfaces

Class or Interface	Description	Important Methods

SaleReturnTransaction	This class is a sale or return transaction.	`void addTender(TenderLineItemIfc)`
		`CustomerIfc getCustomer()`
		`TransactionTotalsIfc getTenderTransactionTotals()`

AbstractTenderableTransaction	This class contains the behavior associated with a transaction that involves the tendering of money.	`void addLineItem(SaleReturnLineItemIfc)`
		`void linkCustomer(CustomerIfc)`
		`void addLineItem(AbstractTransactionLineItemIfc)`

Transaction	This class represents a record of business activity that involves a financial and/or merchandise unit exchange or the granting of access to conduct business at a specific device, at a specific point in time for a specific employee.	`CustomerInfoIfc getCustomerInfo()`
		`String getTillID()`
		`void setCashier(EmployeeIfc)`

Table 12–3 Transaction Object Classes and Interfaces

Class or Interface	Description	Important Methods

TenderableTransactionIfc	This is the interface for all transactions that involve the tendering of money.	`void addTender(TenderLineItemIfc)`
		`TenderLineItemIfc[] getTenderLineItems()`
		`void setTransactionTotals(TransactionTotalsIfc)`

SaleReturnTransactionIfc	This is the interface for all sale/return transactions.	`void addTender(TenderLineItemIfc)`
		`CustomerIfc getCustomer()`
		`TransactionTotalsIfc getTenderTransactionTotals()`

RetailTransactionIfc	This is the interface for all retail transactions.	`EmployeeIfc getSalesAssociate()`
		`AbstractTransactionLineItemIfc[] getLineItems()`
		`String getOrderID()`

The following code sample from src\com\extendyourstore\domain\arts\JdbcSaveTenderLineItems.java shows how SaleReturnTransaction is used in Tour code.

Example 12–9 JdbcSaveTenderLineItems.java: SaleReturnTransactionIfc in Tour Code

```
public void saveTenderLineItems(JdbcDataConnection dataConnection,
                                TenderableTransactionIfc transaction) throws
DataException
{
        if (transaction instanceof SaleReturnTransactionIfc)
        {
                SaleReturnTransactionIfc srt = (SaleReturnTransactionIfc)
transaction;
                int numDiscounts = 0;
                if (srt.getTransactionDiscounts() != null)
                {
                       numDiscounts = srt.getTransactionDiscounts().length;
                }
                lineItemSequenceNumber = srt.getLineItems().length + 1 +
numDiscounts;
        }
...code to handle different transaction types...
}
```

13

Store Database

This chapter describes the database used with Point-of-Service and how to interface with it, including:

- Updating tables
- Rebuilding the database
- Creating new tables
- Updating flat file configurations

The chapter includes an example of writing code to store new data in the database using the Tender function.

ARTS Compliance

The Oracle Retail Point-of-Service system uses an Association of Retail Technology Standards (ARTS)-compliant database to store transactions and settings. The ARTS standard (see http://www.nrf-arts.org/) is a key element in maintaining compatibility with other hardware and software systems.

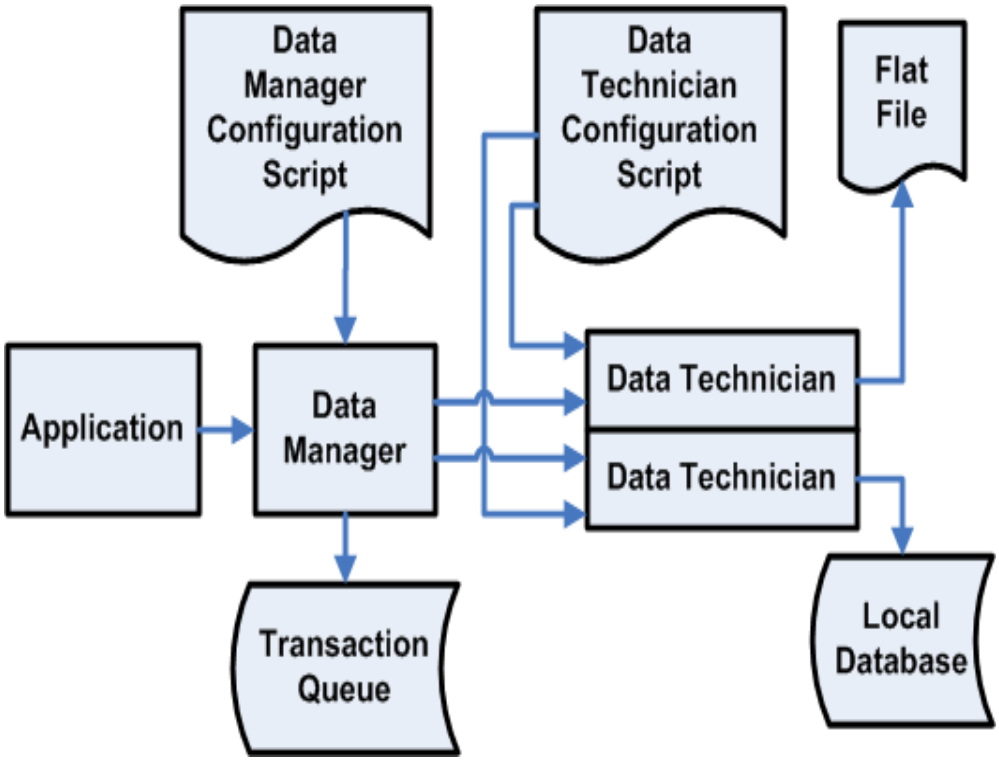
Although the Point-of-Service system complies with the ARTS guidelines, it does not implement the entire standard, and contains some tables which are not specified by ARTS. For example, ARTS tables for store equipment and recipe are not included, while tables for tender types and reporting have been added.

The ARTSDatabaseIfc.java file defines the mapping of ARTS names to constants in application code.

Understanding Data Managers and Technicians

The following diagram shows how Data Managers and Data Technicians handle communication with the database in the Point-of-Service application.

Figure 13–1 Data Managers and Data Technicians



The Point-of-Service system uses the following components to write to the database:

- The Data Manager's primary responsibilities are to provide an API to the application code and to contact the Data Technician and pass it data store requests. Typically, there are multiple Data Manager instances (one per register).
- The Data Manager Configuration Script is an XML file that specifies the properties of the Data Manager.
- The Data Technician handles the database connection. Configure the Data Technician with an XML script. The Data Transaction class is the valet from the manager to the technician. The Data Transaction class has the add, find, and update methods to the database. Typically, there is one Data Technician that communicates with the local database and one that communicates with flat files.

> **Note:** Most managers create valets when they need talk to technicians. Data Manager works a little differently: the Data Transaction class calls the Data Manager and passes itself as a valet. The valet finds the data operation class, then the valet knows which technician it is associated with and calls its execute method.

- The Data Technician configuration script is an XML file that specifies the properties of the Data Technician.
- The Transaction Queue collects data transactions and guarantees delivery.
- Flat Files are local register files that are used when the register is offline.
- The Local Database is the store database.

How Data Transactions Work

This section gives an overview of how Oracle Retail Platform, Data Manager, and Data Technician components work together to store data in the database.

> **Note:** The notation TXN refers to a data transaction, which can be any guaranteed transmission of data, not necessarily a sales transaction in the retail sense.

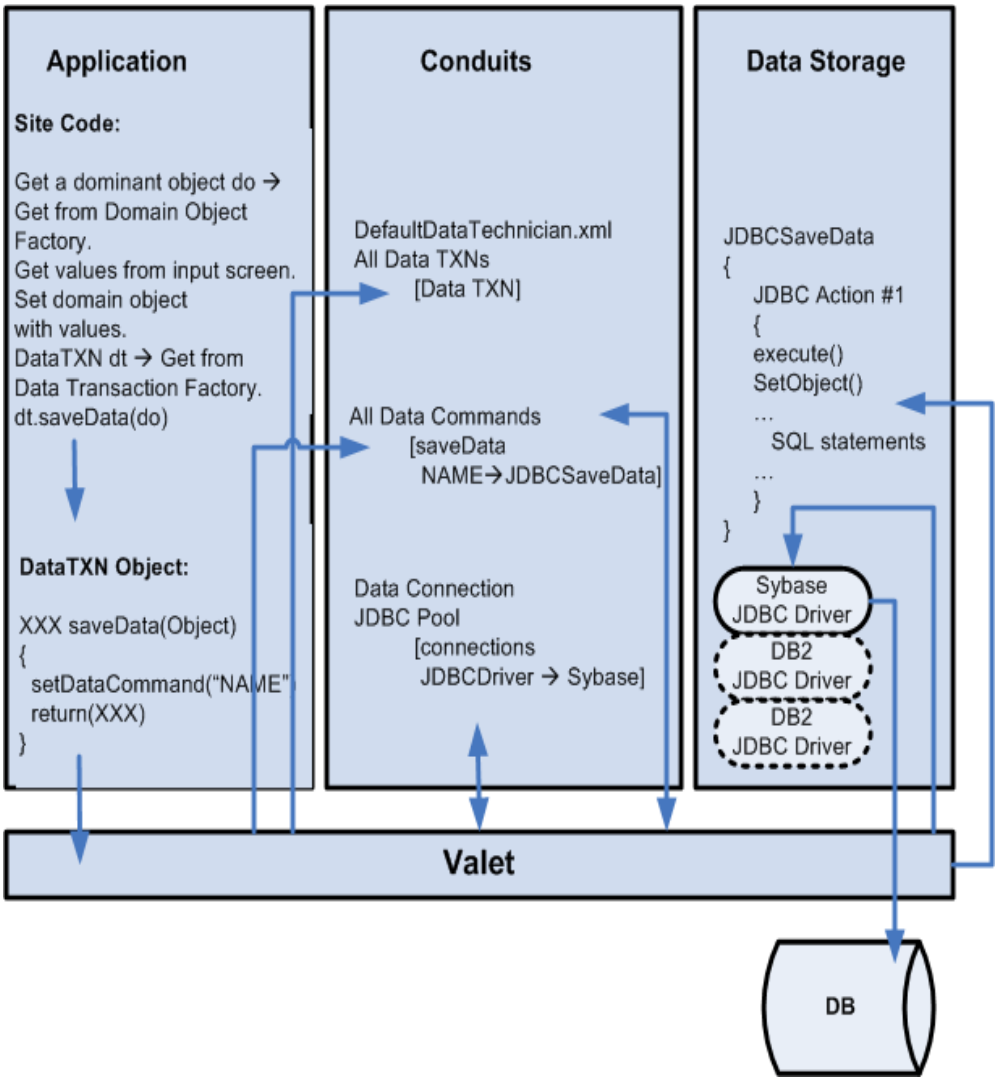
Oracle Retail Platform is responsible for configuring the system so that the Data Manager, Data Technician, configuration scripts, and conduit scripts work together to provide the mechanism to update, store, and retrieve data from a database.

1. The client conduit script defines the name and package for the Data Manager and Data Manager configuration script, POSDataManager.xml.
2. The server conduit script defines the name and package for the Data Technician and Data Technician configuration script, DefaultDataTechnician.xml.
3. At runtime, the tour code requests a data transaction object from the Data Transaction Factory.
4. The Data Transaction Factory verifies that the transaction is defined in POSDataManager.xml and the transaction object is returned to the tour code.
5. The tour code calls a method on the transaction object that creates a vector of data actions. A data action corresponds to a set of SQL commands that are executed as a unit. (Data actions are reused by different transactions.)
6. The method in the transaction object gets a handle to the Data Manager and calls execute(), sending itself as a parameter. This instructs the Data Manager to send the Transaction object (a valet) across the network to the Data Technician.

   > **Note:** Most Manager/Technician pairs work differently. The standard pattern is for the tour code to get a handle to the Manager, then call a method on the manager that will create the valet object and send it to the technician. For the Data Manager/Technician pair, the transaction object (the valet class), gets the handle to the Data Manager. The tour code is only responsible for getting a transaction object from the factory and calling the appropriate method.

7. On the server side, the Data Technician configuration script, DefaultDataTechnician.xml, lists all available transactions. It also defines an operation class for each data action. Each data action is then processed by the appropriate data operation class.

Figure 13–2 Updating the Database: Simplified Runtime View



Creating or Updating Database Tables

Use this procedure when creating a new database table or updating an existing one. Refer to the ARTS standards when designing tables.

> **Note:** When you add or change a table, you need to rebuild the database for your local copy of Point-of-Service before you can test your changes. The Point-of-Service system includes scripts for building the database; the main script, dbbuild.bat, runs multiple subordinate scripts to create all the necessary tables and populate them with initial data. The script automatically includes all files in the sql directory, so the build scripts do not have to be modified in order to build your files. However, you may have to edit a build script in order to test foreign key constraints; see step 6.

1. Edit the appropriate database script, or write a new one.

   Database scripts can be found in the source directory commerceservices\trunk\db\sql. In a Point-of-Service installation, see `C:\OracleRetailStore\360common\db\sql`.

   Start a new file (or edit the appropriate existing file) in the db/sql source directory file to store SQL commands for creating the new table. Example 13–1 shows the SQL commands for creating the table that stores the credit card data.

Example 13–1 CreateTableCreditDebitCardTenderLineItem.sql

```
DROP TABLE TR_LTM_CRDB_CRD_TN;

CREATE TABLE TR_LTM_CRDB_CRD_TN
(
    ID_STR_RT           char(5) NOT NULL,
    ID_WS               char(3) NOT NULL,
    DC_DY_BSN           char(10) NOT NULL,
    AI_TRN              integer NOT NULL,
    AI_LN_ITM           smallint NOT NULL,
    TY_TND              varchar(20),
    ID_ISSR_TND_MD      varchar(20),
    TY_CRD              VARCHAR(40),
    ...additional column lines omitted here...
);

ALTER TABLE TR_LTM_CRDB_CRD_TN ADD PRIMARY KEY (ID_STR_RT, ID_WS, DC_DY_BSN, AI_
TRN,
AI_LN_ITM);

COMMENT ON TABLE TR_LTM_CRDB_CRD_TN IS 'Credit/Debit Card Tender Line Item';

COMMENT ON COLUMN TR_LTM_CRDB_CRD_TN.ID_STR_RT IS           'Retail Store ID';
COMMENT ON COLUMN TR_LTM_CRDB_CRD_TN.ID_WS IS               'Workstation ID';
COMMENT ON COLUMN TR_LTM_CRDB_CRD_TN.DC_DY_BSN IS           'Business Day Date';
COMMENT ON COLUMN TR_LTM_CRDB_CRD_TN.AI_TRN IS              'Transaction Sequence
Number';
COMMENT ON COLUMN TR_LTM_CRDB_CRD_TN.AI_LN_ITM IS           'Retail Transaction
Line Item
Sequence Number';
COMMENT ON COLUMN TR_LTM_CRDB_CRD_TN.ID_ISSR_TND_MD IS      'Tender Media Issuer
ID';
```

```
COMMENT ON COLUMN TR_LTM_CRDB_CRD_TN.TY_TND IS TenderTypeCode';
COMMENT ON COLUMN TR_LTM_CRDB_CRD_TN.TY_CRD IS              'Card Type';
...additional comment lines omitted...
```

2. Create or edit the insert files (also in the db/sql source directory) for inserting initial data into the new database table.

   This step is used only to insert data into the database table for purposes of initially logging on, testing, and so on. Example 13–2 contains three inserts from the `db/sql/InsertTableTenderLineItem.sql` file.

Example 13–2 InsertTableTenderLineItem.sql

```
INSERT INTO TR_LTM_TND
(ID_STR_RT, ID_WS, AI_TRN, AI_LN_ITM, DC_DY_BSN, TY_TND, MO_ITM_LN_TND,
 TS_CRT_RCRD, TS_MDF_RCRD)
VALUES ('04241', '149', 1000, 2, '1999-09-23', 'CASH', 54.11,
        TIMESTAMP('1999-09-05 12:53:06.536'), TIMESTAMP('1999-09-05
12:53:06.536'));

INSERT INTO TR_LTM_TND
(ID_STR_RT, ID_WS, AI_TRN, AI_LN_ITM, DC_DY_BSN, TY_TND, MO_ITM_LN_TND,
 TS_CRT_RCRD, TS_MDF_RCRD)
VALUES ('04241', '149', 1000, 2, '1999-09-30', 'CASH', 4.32,
        TIMESTAMP('1999-09-05 12:53:06.536'), TIMESTAMP('1999-09-05
12:53:06.536'));

INSERT INTO TR_LTM_TND
(ID_STR_RT, ID_WS, AI_TRN, AI_LN_ITM, DC_DY_BSN, TY_TND, MO_ITM_LN_TND,
 TS_CRT_RCRD, TS_MDF_RCRD)
VALUES ('04241', '129', 1, 2, '1999-09-05', 'CASH', 54.11,
        TIMESTAMP('1999-09-05 12:53:06.536'), TIMESTAMP('1999-09-05
12:53:06.536'));
```

3. Make updates to foreign keys in CreateForeignKeys.sql.
4. If you are creating a new table, add a string constant to the `src/com/_360commerce/domain/arts/ARTSDatabaseIfc.java` file. Use a string constant with a meaningful name to store the official ARTS name of the database table.

   Example 13–3 shows two examples of meaningful String constants found in ARTSDatabaseIfc.java.

Example 13–3 String Constant in ARTSDatabaseIfc.java

```
public static final String TABLE_TENDER_LINE_ITEM = "tr_ltm_tnd";
public static final String TABLE_CREDIT_DEBIT_CARD_TENDER_LINE_ITEM = "tr_ltm_
crdb_crd_tn";
```

5. Update the flat file configuration XML files, if needed.

   If you are creating a new table, consult functional specifications to determine whether the table needs to be represented in the flat files.

   For existing tables, you can inspect the file `pos/config/manager/FFTableDefs.xml` to determine whether the table is represented in the flat files.

   See “Updating Flat File Configurations” on page 13-15 for information on updating the configuration files.

6. Check foreign key constraints.

   For performance reasons, the database build scripts do not turn on foreign key constraints until late. If you make inserts which break foreign key constraints, you will not be notified. To check this, test all inserts with foreign key constraints in place, by editing the appropriate database build script. In the following example, the locations of the CreateK.sql and InsertD.sql scripts have been swapped:

Example 13–4 mysql_builddb.bat: Changes to Implement Foreign Key Checking

```
COPY /B %_360COMMON_MYSQL_PATH%\mysql_prologue.sql + %_360COMMON_LOGS_
PATH%\CreateS.sql + %_360COMMON_LOGS_PATH%\
CreateK.sql
 + %_360COMMON_LOGS_PATH%\
InsertD.sql
 + %_360COMMON_DB2_PATH%\mysql_epilogue.sql %_360COMMON_LOGS_PATH%\FinalSQL.sq
```

7. Run `c:\OracleRetailStore\pos\bin\dbbuild.bat` to rebuild the database.

   ```
   dbbuild.bat [data level]
   ```
   [data level] can be base_data, seed_data, test_data, demo_data.

   - base_data contains just enough to get the build running
   - seed_data should contain enough to build and run unit/functional tests.
   - test_data will contain the rest of the data that you expect from previous builds

   The dbbuild.bat script performs the following operations:

   - Executes CreateTable*.sql scripts
   - Performs inserts and adds keys
   - Creates flat files in `C:\OracleRetailStore\pos\bin\*.dat`

8. After you verify that the table builds successfully and the code referencing the table works, check your updates into source control.

Example of Saving Data: Storing Tender Information

This section describes how to save data to the database, using credit card tender information as an example.

When completing a retail transaction, a customer can offer multiple forms of payment for a purchase. Each form of payment is a different tender, and the system stores each one as a tender line item. For example, the customer may pay for a $100 purchase with a $50 gift card payment, a $20 store credit payment, and a $30 credit card payment. There are three forms of payment and three tender line items, each potentially requiring different types of data. The following subsections describe how to store the credit card tender data.

Research Table Requirements and Standards

To plan your database code, refer to functional requirements documents to determine what data must be stored. For example, the Credit Functional Requirements specify that the credit card number and expiration date be stored.

Next, review the ARTS database standards for tables and columns. Determine whether you need to create a new table. If you need to create a table defined by ARTS but not

currently used in the Store database, follow the ARTS standard. For instructions on creating a new table, see "Creating or Updating Database Tables".

For the credit card tender transaction, there are two tables that need to be addressed: the tender line item table and the credit/debit card transaction table.

Table 13–1 lists database tables used in a credit card tender option.

Table 13–1 Database Tables Used in Credit Card Tender Option

ARTS Table Name	Description
tr_ltm_tnd	Tender line item
tr_ltm_crdb_crd_tn	Credit/debit card transactions

Saving Data from Site Code

To save data to the database from a site:

1. Create and populate the domain object to be saved.
2. Save the data to the cargo's transaction.

   For the credit card tender option, the TenderCargo contains a retail transaction object that keeps track of all the data for each tender line item, as well as other pertinent data. TenderCargo is the cargo for the Tender Tour.

   In Example 13–5, credit is a domain object that stores the credit card data such as number, expiration date, type of card, and so on. Credit was already stored in the cargo as a pending line item in GetCreditInfoSite.java. In the following code, credit is retrieved from the cargo and added to the cargo's retail transaction as a tender line item.

Example 13–5 ValidCreditInfoEnteredRoad.java: Transaction Object

```
public void traverse(BusIfc bus)
{
  // Get the pending line item
  TenderCargo cargo = (TenderCargo) bus.getCargo();
  TenderChargeIfc credit = (TenderChargeIfc) cargo.getPendingLineItem();
  TenderableTransactionIfc trans = cargo.getTransaction();
  ...
  // Add the credit line item to the transaction
  trans.addTender(credit);
  ...
}
```

3. Call a method to save the transaction object.

   After the credit object is added to the Tender Cargo transaction, the collected data is saved to the database. In Example 13–6, the `com/extendyourstore/pos/services/common/SaveRetailTransactionAisle.java` file uses the Utility Manager to call the saveTransaction() method.

Example 13–6 SaveRetailTransactionAisle.java: Save Transaction

```
public void traverse(BusIfc bus)
{
  ...
  UtilityManagerIfc utility =(UtilityManagerIfc)
bus.getManager(UtilityManagerIfc.TYPE);
  ...
```

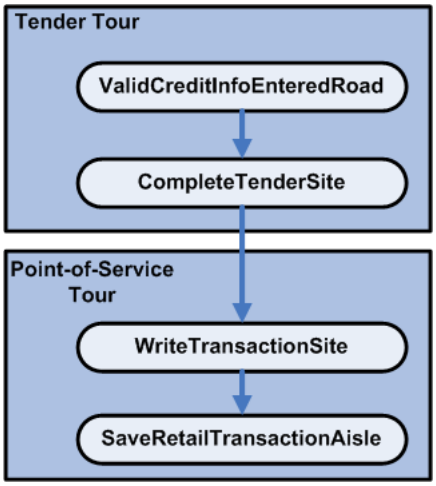
```
  utility.saveTransaction(trans, totals, till, register);
  ...
}
```

Locate Data Operation

The Data Manager and Data Technician work together to provide access to the database from the application. The developer rarely modifies these. Typically, the site code and the JDBC code are updated. To identify which JDBC class should be used, trace through the site code until the DataAction sets the operation name.

As an example, the following figure shows the tour workflow that occurs when a tender is complete and the data is ready to be saved.

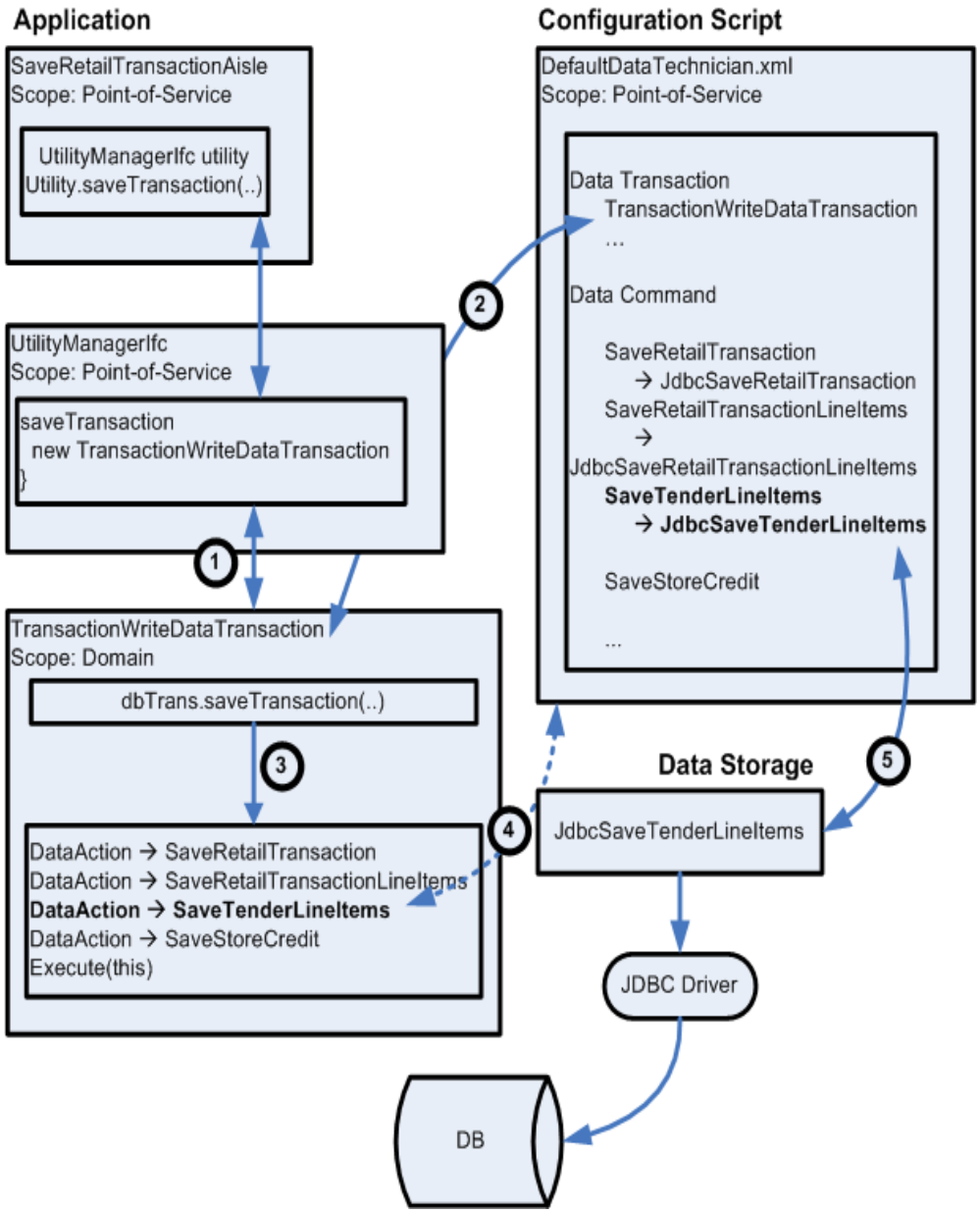
Figure 13–3 Tender Tour to Point-of-Service Tour Workflow



After the Tender Tour has completed, the program returns to Point-of-Service Tour via the WriteTransactionSite to the SaveRetailTransactionAisle. The SaveRetailTransactionAisle initiates the save process.

The conceptual diagram in the following figure illustrates the basic communication path from the SaveRetailTransactionAisle to the database. For more detail, refer to the source code.

Figure 13–4 Diagram: Saving a Transaction



The following descriptions explain the labels in the figure. When creating the credit card tender option, only the site and road classes for the Tender Tour and the JdbcSaveTenderLineItems class were changed.

1. SaveRetailTransactionAisle uses the Utility Manager to call the saveTransaction() method as shown in Example 13–6. The utility.saveTransaction() method uses the data transaction class TransactionWriteDataTransaction to save the retail transaction.

   The following code samples show details for the previous figure.

Example 13–7 UtilityManager.java: Save Data Transaction

```
TransactionWriteDataTransaction dbTrans = new
TransactionWriteDataTransaction(tranName);
dbTrans.saveTransaction(trans, totals, till, register);
```

Example 13–8 TransactionWriteDataTransaction.java: Save Transaction

```
public void saveTransaction(TransactionIfc transaction,
                            FinancialTotalsIfc   totals,
                            TillIfc              till,
                            RegisterIfc          register)
                            throws DataException
{
  ...
  int transactionType = transaction.getTransactionType();
  ...
  switch(transactionType)
  {                         // begin add actions based on type
    case TransactionIfc.TYPE_SALE:
    case TransactionIfc.TYPE_RETURN:
    addSaveSaleReturnTransactionActions((SaleReturnTransactionIfc)
transaction,totals,till,
      register);
    break;
    ...
}
```

2. The `com/extendyourstore/domain/arts/DefaultDataTechnician.xml` file is the configuration file for the Data Technician and is used to configure the links between the application and the JDBC class that performs the work. All Data Transaction classes must be defined in this file, including TransactionWriteDataTransaction.

Example 13–9 DefaultDataTechnician.xml: Define Data Transaction Class

```
<DATATECHNICIAN
  package="com.extendyourstore.domain.arts">
  ...
  <TRANSACTION name="TransactionWriteDataTransaction" command="jdbccommand"/>
  ...
```

3. The TransactionWriteDataTransaction class instantiates the DataAction object and sets the data operation name to SaveTenderLineItems. Other data actions occurred before these tender data actions. Data Actions are added in the specific order in which they should occur.

Example 13–10 TransactionWriteDataTransaction: DataAction

```
protected void addSaveSaleReturnTransactionActions(SaleReturnTransactionIfc
transaction,
                                                   FinancialTotalsIfc totals,
                                                   TillIfc till,
                                                   RegisterIfc register)
{
  artsTransaction = new ARTSTransaction(transaction);

  // Add a DataAction to save the SaleReturnTransactionIfc
  DataAction dataAction = new DataAction();
  dataAction.setDataOperationName("SaveRetailTransaction");
  dataAction.setDataObject(artsTransaction);
  actionVector.addElement(dataAction);

  // Add a DataAction to save all the line items in the Transaction
  dataAction = new DataAction();
  dataAction.setDataOperationName("SaveRetailTransactionLineItems");
  dataAction.setDataObject(artsTransaction);
  actionVector.addElement(dataAction);

  // Add a DataAction to save all the tender line items in the Transaction
  DataActionIfc da = new SaveTenderLineItemsAction(this, artsTransaction);
  actionVector.addElement(da);

  //Add a DataAction to save store credit in the Transaction
  dataAction = createDataAction(artsTransaction, "SaveStoreCredit");
  actionVector.addElement(dataAction);
  ...
}
```

Example 13–11 SaveTenderLineItemsAction: Set Data Operation Name

```
protected static final String OPERATION_NAME = "SaveTenderLineItems";
```

4. The DefaultDataTechnician uses the data command to list several data operation names. The data operation name SaveTenderLineItems points to the name of the JDBC class, which is JdbcSaveTenderLineItems.

Example 13–12 DefaultDataTechnician.xml: Define Data Operation Class

```
<DATATECHNICIAN
  package="com.extendyourstore.domain.arts">
  ...
  <TRANSACTION name="TransactionWriteDataTransaction" command="jdbccommand"/>
  ...
  <COMMAND name="jdbccommand"
           class="DataCommand"
           package="com.extendyourstore.foundation.manager.data"

  <COMMENT>
    This command contains all operations supported on a JDBC
    database connection.
  </COMMENT>
  <POOLREF pool="jdbcpool"/>
  ...
  <OPERATION class="JdbcSaveTenderLineItems"
    package="com.extendyourstore.domain.arts"
    name="SaveTenderLineItems">
    <COMMENT>
      This operation saves all tender line items associated with the transaction.
    </COMMENT>
  </OPERATION>
...
</DATATECHNICIAN>
```

5. The JdbcSaveTenderLineItems class is used to write the credit card data to the database table. See the next section.

Modify Data Operation

Use this procedure to modify the data operation class to access the database.

1. Add a save method to the data operation class.

   The `com/extendyourstore/domain/arts/JdbcSaveTenderLineItems.java` file creates the JDBC code that saves the tender line items to the database via the saveTenderLineItem() method, shown in Example 13–13. This code checks the type of a line item. If the tender line item is an instance of the TenderChargeIfc, then it calls the insertCreditDebitCardTenderLineItem() method.

Example 13–13 JdbcSaveTenderLineItems: Saving Tender Line Item

```
public void saveTenderLineItem(JdbcDataConnection dataConnection,
                               TenderableTransactionIfc transaction,
                               int lineItemSequenceNumber,
                               TenderLineItemIfc lineItem) throws
DataException
{

  if (lineItem instanceof TenderCashIfc)
  {
    insertTenderLineItem(dataConnection,
                         transaction,
                         lineItemSequenceNumber,
                         lineItem);
  }
  else if (lineItem instanceof TenderGiftCardIfc)
  {
```

```
    insertGiftCardTenderLineItem(dataConnection,
                         transaction,
                         lineItemSequenceNumber,
                         (TenderGiftCardIfc) lineItem);
  }
  else if (lineItem instanceof TenderChargeIfc)
  {
    /*
     * Charge tender updates the Credit/Debit Card Tender Line Item,
     * Tender Line Item, and Retail Transaction Line Item tables.
    */
    insertCreditDebitCardTenderLineItem(dataConnection,
                                        transaction,
                                        lineItemSequenceNumber,
                                        (TenderChargeIfc)lineItem);
  }
  ...
}
```

2. Write an implementation for methods written for the data operation class.

   Example 13–14 lists the source code for the insertCreditDebitCardTenderLineItem(), called in Example 13–13. First, the tender line item must be saved to the tender table using the insertTenderLineItem() method. This code already existed for the other tender options.

   Second, the credit data must be saved to the new database table using SQL factory methods.

Example 13–14 JdbcSaveTenderLineItems.java: SQL Factory Methods

```
public class JdbcSaveTenderLineItems extends JdbcSaveRetailTransactionLineItems
                                     implements ARTSDatabaseIfc
{
  public void insertCreditDebitCardTenderLineItem(JdbcDataConnection
dataConnection,
                                                  TenderableTransactionIfc
transaction,
                                                  int lineItemSequenceNumber,
                                                  TenderChargeIfc lineItem)
  throws DataException
  {
    /*
     * Update the Tender Line Item table first.
     */
    insertTenderLineItem(dataConnection,
                         transaction,
                         lineItemSequenceNumber,
                         lineItem);

       SQLInsertStatement sql = new SQLInsertStatement();

    // Table
    sql.setTable(TABLE_CREDIT_DEBIT_CARD_TENDER_LINE_ITEM);
    // Fields
    sql.addColumn(FIELD_RETAIL_STORE_ID, getStoreID(transaction));
    sql.addColumn(FIELD_WORKSTATION_ID, getWorkstationID(transaction));
    sql.addColumn(FIELD_BUSINESS_DAY_DATE, getBusinessDayString(transaction));
    sql.addColumn(FIELD_TENDER_AUTHORIZATION_DEBIT_CREDIT_CARD_ACCOUNT_NUMBER,
      getCardNumber(lineItem));
    sql.addColumn(FIELD_TENDER_AUTHORIZATION_CARD_NUMBER_SWIPED_OR_KEYED_CODE,
```

```
      getEntryMethod(lineItem));
    sql.addColumn(FIELD_TENDER_AUTHORIZATION_DEBIT_CREDIT_CARD_EXPIRATION_DATE,
      getExpirationDate(lineItem));
  }
  ...
}
```

Test Code

To test the new code:

1. Run Point-of-Service.
2. Select the path to the screen.
3. Enter the data.
4. Complete the retail transaction.

Verify Data

To verify that the correct data exists in the database table, use a database access program to view the table that should contain the new information. Verify that the data in the database table matches the data entered. The following example shows a sample SQL statement you can use to retrieve the data.

```
select * from tr_ltm_crdb_crd_tn
```

Updating Flat File Configurations

A Point-of-Service flat file is a simple database system in which each table is contained in one file. The Point-of-Service system uses flat files created by the Store Server to provide access to minimal data when the network or server is down. With the help of the flat files, the Point-of-Service system can continue to process transactions without access to the network.

The information provided in flat files includes:

- Item data, such as price, tax group, SKU
- Tax rules for the local store
- User logon and role information
- Reason codes

When a register is opened at the start of a new business day, the system updates the flat files on the register. The files can also be updated periodically during the business day if an optional parameter is set.

The Oracle Retail Platform FlatFileEngine provides access to flat file tables. The FlatFileEngine integrates with the Data Technician using the DataConnectionIfc and DataOperationIfc interfaces. A wrapper class, FlatFileDataConnection, implements the DataConnectionIfc interface. The application developer must provide the classes implementing the DataOperationIfc interface for the application-specific operations. Two configuration scripts are required, the Data Technician configuration script and the FlatFileEngine configuration script.

Data Technician Script

The Data Technician script specifies the data connection class and the data operation mappings. Two sections of the XML script are highlighted, the first containing the OPERATION tags and the second containing the CONNECTION and CONNECTIONPROPERTY tags.

- The first section specifies the mapping of the data actions to data operations. For the FlatFileEngine, the FlatFilePLUOperation and FlatFileEmployeeLookupOperation are classes that implement the DataOperationIfc interface.
- The second section declares the use of the FlatFileConnection class for the data connection and specifies the configSource property for the connection. Specification of the configSource provides the location of the FlatFileEngine configuration script and is required for the FlatFileEngine to operate.

Example 13–15 PosLFFDataTechnician.xml: Sample Data Technician Script for Flat Files

```
<!DOCTYPE DATATECHNICIAN SYSTEM
"classpath://com/extendyourstore/foundation/toru/dtd/datascript.dtd">

<DATATECHNICIAN
    package="com.extendyourstore.domain.arts">

    <TRANSACTION name="PLU" command="flatfilecommand"/>
    <TRANSACTION name="employee" command="flatfilecommand"/>

    <COMMAND name="flatfilecommand"
             class="DataCommand"
             package="com.extendyourstore.foundation.manager.data" >
        <COMMENT>
            This command contains all operations supported
            on a flat file database connection.
        </COMMENT>
        <POOLREF pool="flatfilepool"/>

        <OPERATION class="FlatFilePLUOperation" package="flatfileops"
            name="PLULookup">
            <COMMENT>
                This operation retrieves a priced item from a
                flat file database, given a string lookup key.
            </COMMENT>
        </OPERATION>
...operation omitted here...
    </COMMAND>
    <POOL name="flatfilepool"
            class="DataConnectionPool"
            package="com.extendyourstore.foundation.manager.data" >
          <COMMENT>
            This pool defines a FlatFile connection to the gift registry database.
          </COMMENT>
    <POOLPROPERTY propname="numConnections"
                  propvalue="1" proptype="INTEGER"/>
        <CONNECTION class="FlatFileDataConnection"
                    package="com.extendyourstore.foundation.manager.data.flatfile">
            <CONNECTIONPROPERTY propname="configSource"
                       propvalue="classpath://datafiles/TableDefs.xml" />
        </CONNECTION>
    </POOL>
</DATATECHNICIAN>
```

Flat File Engine Configuration Script

The FlatFileEngine configuration script is required for Oracle Retail applications to access the FlatFileEngine. This script specifies the files where the information is stored, the physical schema of the file, and the supported indexes on the files. Example 13–16 is a sample FlatFileEngine configuration script that specifies two tables with associated fields and indexes.

The XML blocks beginning with the tag FWTABLE declare two fixed-width tables with table names Item and Employees. The example configuration in FWFIELDS provides the definitions of the fields within the tables. The field definitions use one base indexing for the starting positions.

After the fields are declared, the following script defines two indexes for the table (indexes are optional). The index names are ItemID_Index and ItemName_Index. The files to store the index information are specified along with the index. Within the individual index specifications, the fields used to generate the index are specified by field name. During configuration, the FlatFileEngine validates the index files and rebuilds the index files if necessary.

Example 13–16 FFTableDefs.xml: Sample FlatFileEngine Configuration File

```
<?xml version='1.0' ?>
<!DOCTYPE FFENGINE SYSTEM
"classpath://com/extendyourstore/foundation/tour/dtd/flatfile.dtd">


<!—Configuration Script for FlatFileEngine   -->

<FFENGINE>
    <FWTABLE>
        <TABLE  tablename="Items"
                datasource="datafiles/Items.txt"
        />

        <FWFIELDS>
            <FWFIELD fieldname="ItemID"
                     startpos="1"   width="10" />
<FWFIELD fieldname="Name"
                     startpos="11"  width="80" />
      <FWFIELD fieldname="SupplierID"
                     startpos="91"  width="10" />
<FWFIELD fieldname="CategoryID"
                     startpos="101" width="10" />
     ...additional fields omitted...
        </FWFIELDS>

        <INDEXES>
            <INDEX indexname="ItemID_Index"
                   indexfile="datafiles/item_id.idx" >
                <INDEXFIELD fieldname="ItemID"/>
            </INDEX>
            <INDEX indexname="ItemName_Index"
                   indexfile="datafiles/item_name.idx" >
                <INDEXFIELD fieldname="Name"/>
            </INDEX>
        </INDEXES>
</FWTABLE>

<FWTABLE>
```

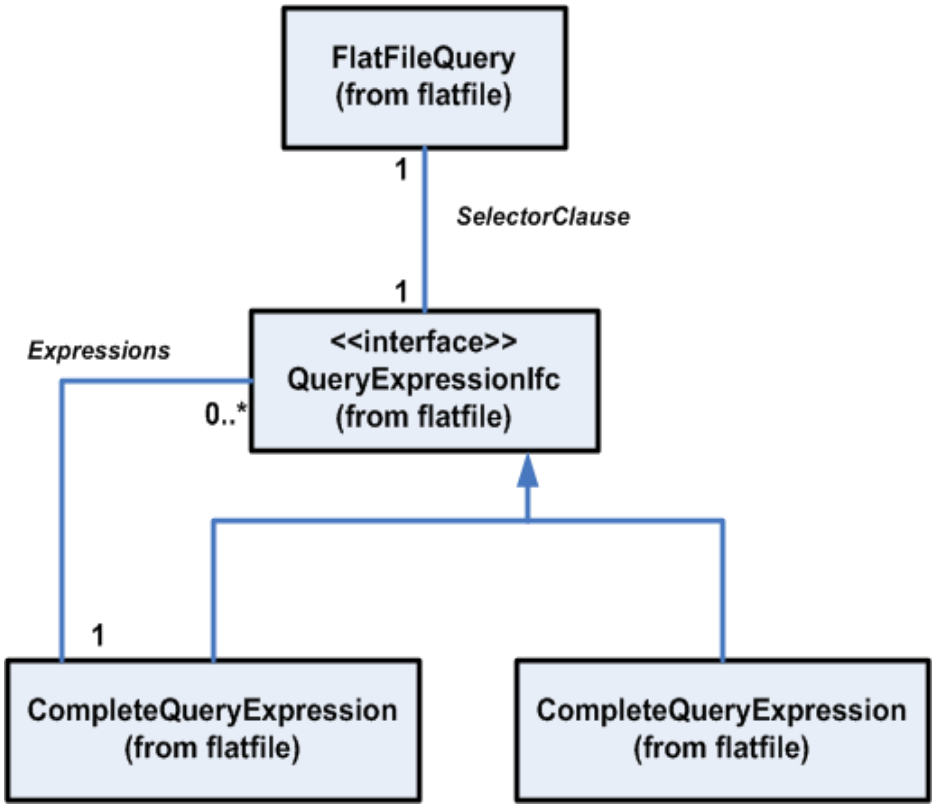
```
    <TABLE tablename="Employees" datasource="datafiles/Employees.txt"/>
<FWFIELDS>
  <FWFIELD fieldname="EmployeeID"
                       startpos="1"  width="10" />
        <FWFIELD fieldname="LastName"
                       startpos="11" width="20" />
        <FWFIELD fieldname="FirstName"
                       startpos="31" width="10" />
        <FWFIELD fieldname="Title"
                       startpos="61"  width="10" />
...additional fields omitted...
</FWFIELDS>

<INDEXES>
    <INDEX indexname="Employee_Name"
                       indexfile="datafiles/emp_name.idx" >
        <INDEXFIELD fieldname="LastName"/>
        <INDEXFIELD fieldname="FirstName"/>
    </INDEX>
    <INDEX indexname="Employee_HireDate"
                       indexfile="datafiles/emp_hire.idx">
        <INDEXFIELD fieldname="HireDate"/>
    </INDEX>
</INDEXES>
</FWTABLE>
</FFENGINE>
```

Implementing FlatFileDataOperations

To create a FlatFileDataOperation, you create a class that extends the FlatFileDataOperation class and implements the execute method. You must create a FlatFileQuery to communicate with the FlatFileEngine via the FlatFileDataConnection.execute() method.

The following diagram shows the class relationships.

Figure 13–5 FlatFileQuery Classes



The types of FlatFileQueries are:

- Insert
- Update
- Delete
- Retrieve
- Clear table
- Rebuild indexes

The query type and the target table are specified in the constructor for the FlatFileQuery. Some of the query types (update, delete, and retrieve) require the creation of a selection clause to identify the set of records on which the operation is to be performed. The sample code shown below creates a retrieve query, the most common of the queries that you implement. Differences for other query types are shown following the sample code (see "Other Query Types").

The sample code shown below is an implementation for an item retrieve operation:

1. The first lines of the method simply cast the connection and get the relevant selection criteria from the dataTransaction object.

2. The major work of the method occurs within the try-catch block. Refer to the comments within the sample code. The input to the FlatFileEngine is a FlatFileQuery. The FlatFileQuery(Instance) is created in the statements immediately following the try. First, a new FlatFileQuery instance is created, and then the target data table is specified. Lastly, the selection clause is set to create a new SimpleQueryExpression using the target data fields and the item number supplied in the Data Transaction.
3. Calling the connection.execute() method with the FlatFileQuery as a parameter returns a FlatFileResultSet or throws a FlatFileException. If an exception is thrown, it is translated to a DataException by the parent class. If a result set is returned, the set is iterated record by record and the field values within the records are translated to appropriate domain objects.

Example 13–17 Item Retrieve Sample Code

```
    public void execute(DataTransactionIfc dataTransaction,
                        DataConnectionIfc dataConnection,
                        DataActionIfc action)
                        throws DataException
    {
        FlatFileDataConnection connection =
                 (FlatFileDataConnection)dataConnection;

        String prodId = (String)action.getDataObject();
        PLUItems[] pluItems = null;

        try
        {
// Create a new query of type retrieve for table Items
            FlatFileQuery query =
                  new FlatFileQuery(FlatFileQuery.QUERY_RETRIEVE,
                                    "Items");
            query.setSelectionClause(
                        new SimpleQueryExpression("ItemID",
                        QueryExpressionIfc.EQ, itemId));

            connection.execute(query);

            FlatFileResultSet rs =
                    (FlatFileResultSet)connection.getResult();

            int recCount = rs.getRecordCount();

            if (recCount == 0)
            {
                throw new DataException(DataException.NO_DATA,
                    "No PLU was found proccessing the result "
                    + set in FlatFilePLUOperation.");
            }

            items = new PLUItem[recCount];

            FlatFileRecord record = rs.getFirstRecord();
            for (int i = 0; i < recCount; i++)
            {
                /*
                 * Grab the fields selected from the database
                 */
                // Sting fldValue = record.getFieldValue("FIELDNAME");
```

```
                // TRANSFER ATTRIBUTES HERE

                record = rs.getNextRecord();
            }
        }

        catch (FlatFileException eff)
        {
            throw translateToDataException(eff);
        }

        dataTransaction.setResult((Serializable)items);
    }
```

Other Query Types

Table 13–2 provides additional information for creating the query types supported by the FlatFileEngine.

Table 13–2 FlatFileEngine Query Types

Query Type	Definition
Update	The update query allows the application to update field values within a table. The table name is specified and a selection clause is created to identify the record(s) to apply the updated field values. The field values are placed in a hash table, keyed by field name that contains the new field values. The FlatFileQuery.setValues() method is called and passes the values hashtable as a parameter. The query is passed as a parameter to the execute method of the collection. The number of records updated is returned via the getUpdated() method.
Insert	The insert query inserts a new record into the flat file table. The table name and the values are specified in the query. Values are transmitted using a hashtable keyed by field name. Not all fields require values. A confirmation of the insertion is accessed using the getInserted() method.
Delete	The delete query marks the records matching the selection clause for deletion. The table name and a selection clause must be specified in this query. After executing the query, the number of records deleted is available using the getDeleted() method. Deleting records invalidates the indexes. To rebuild the indexes, a rebuild query must be executed.
Clear Table	A clear table query removes all the records in a specified table. Only the table name is required. Completion status is available from the FlatFileResultSet.getCleared() method.
Rebuild	The rebuild query type removes records marked for deletion from the table and rebuilds the associated indexes. Only the table name is required.

Complex Query Expressions

Complex Query Expressions allow the creation of selection clauses with multiple criteria. To select an employee based on last name and first name, create a ComplexQueryExpression. The logical operation joining the associated expressions is set using the constants AND and OR from the QueryExpressionIfc class as the parameter in the setJoinCondition() method. Two SimpleQueryExpression objects are created, one for the last name criteria and one for the first name criteria. These two SimpleQueryExpressions are added to the expressions vector in the ComplexQueryEpression. The selection clause association of the FlatFileQuery is set to the ComplexQueryExpression. The ComplexQueryExpression can contain both Simple and Complex expressions, and supports nested conditions.

A

Appendix: Intra Store Data Distribution Infrastructure

Oracle Retail Point-of-Service client needs Employee, Item, Advanced pricing, Tax and Currency datasets to support offline functionality. Intra Store Data Distribution Infrastructure (IDDI) automates the following:

- dataset file generation at the Oracle Retail Point-of-Service server
- dataset file transfer from Oracle Retail Point-of-Service Server to Oracle Retail Point-of-Service Client
- importing dataset files to Oracle Retail Point-of-Service client database

Spring Configuration

The system has been designed to support a pluggable model. The following are all designed to be configurable at deployment time:

- DataSetProducerJob
- ClientDataSetController
- DataSetService
- ClientDataSetService
- DataSetProducers
  - EmployeeDataSetProducer
  - CurrencyDataSetProducer
  - TaxDataSetProducer
  - ItemDataSetProducer
  - AdvancedPricingDataSetProducer
- DataSetConsumers
  - EmployeeDataSetConsumer
  - CurrencyDataSetConsumer
  - ItemDataSetConsumer
  - AdvancedPricingDataSetConsumer
  - TaxDataSetConsumer
- DerbyDataFormatter

This configuration is accomplished through the use of the Spring Framework as a configuration framework.

Table A–1 includes the set of Spring bean IDs used for each of the pluggable components.

Table A–1 **Spring Framework Configuration Options**

Spring bean ID	Purpose	Provided implementation	Configurable Options
service_DataSetService	Configuration for DataSetService. Contains the list of all the DataSetKeys.	com.extendyourstore. foundation.iddi.DataSetService	None To add a new DataSet type, add one more service_config_<<DataSetType>>_KEY
service_ ClientDataSetService	Configuration for ClientDataSetService. Contains the list of all the DataSetKeys.	com.extendyourstore. foundation.iddi.ClientDataSetService	None To add a new DataSet type, add one more service_config_<<DataSetType>>_KEY dataImportFilePath(service_config_DataImportFilePath)
service_ FrequentProducerJob	Producer Job that runs frequently. Configured to run once every 15 minutes by default.	org.springframework.scheduling.quartz.JobDetailBeanservice_DataSetService	To add a new DataSet type, add one more service_config_<<DataSetType>>_KEY
service_ InfrequentProducerJob	Producer Job configured to run once a day by default.	org.springframework.scheduling.quartz.JobDetailBeanservice_DataSetService	To add a new DataSet type, add one more service_config_<<DataSetType>>_KEY
service_ TriggerFrequentProducer	Cron Job Trigger class that runs service_FrequentProducerJob configuration. Cron Expression value can be modified to configure the job frequency.Cron Expression format.value="0 0,15,30,45 * * * ?" Value parameters from left to right separated by spaceSecondsMinutes HoursDaysWeeksYears To configure more than one value to any of the value parameter, configure values separated by commas (,) * Indicates any value	org.springframework.scheduling.quartz.CronTriggerBean	service_FrequentProducerJob Cron Expression Value
service_ TriggerInfrequentProducer	Trigger class that runs service_InfrequentProducerJob configuration	org.springframework.scheduling.quartz.CronTriggerBean	service_ InfrequentProducerJobCron Expression Value

Table A–1 **Spring Framework Configuration Options**

Spring bean ID	Purpose	Provided implementation	Configurable Options
			service_ ProducerSchedulerFactory Registers the services, service_ TriggerFrequentProducerservice_ TriggerInfrequentProducer with the Quartz SchedulerFactoryBean org.springframework. scheduling.quartz.SchedulerFactoryBeanservice_ TriggerFrequentProducerservice_ TriggerInfrequentProducer
service_CurrencyProducer	DataSet Key definition for Currency DataSetProducer	com.extendyourstore.domain.iddi.CurrencyDataSetProducer	dataSetKey (service_config_ CUR_ KEY)dataExportFilePath (service_config_ DataExportFilePath)dataExportZipFilePath (service_config_ DataExportZipFilePath)fileWriter(service_FileWriter)
service_TaxProducer	DataSet Key definition for Tax DataSetProducer	com.extendyourstore.domain.iddi.TaxDataSetProducer	dataSetKey(service_config_ TAX_ KEY)dataExportFilePath (service_config_ DataExportFilePath)dataExportZipFilePath (service_config_ DataExportZipFilePath)fileWriter(service_FileWriter)
service_ EmployeeProducer	DataSet Key definition for Employee Producer	com.extendyourstore.domain.iddi.EmployeeDataSetProducer	dataSetKey(service_config_ EMP_ KEY)dataExportFilePath (service_config_ DataExportFilePath)dataExportZipFilePath (service_config_ DataExportZipFilePath)fileWriter(service_FileWriter)
service_ AdvancedPricingProducer	DataSet Key definition for Advanced Pricing DataSetProducer	com.extendyourstore.domain.iddi.PricingDataSetProducer	dataSetKey(service_config_ PRC_ KEY)dataExportFilePath (service_config_ DataExportFilePath)dataExportZipFilePath (service_config_ DataExportZipFilePath)fileWriter(service_FileWriter)
service_ItemProducer	DataSet Key definition for Item DataSetProducer	com.extendyourstore.domain.iddi.ItemDataSetProducer	dataSetKey(service_config_ ITM_KEY)dataExportFilePath (service_config_ DataExportFilePath)dataExportZipFilePath (service_config_ DataExportZipFilePath)fileWriter(service_FileWriter)

Table A–1 **Spring Framework Configuration Options**

Spring bean ID	Purpose	Provided implementation	Configurable Options
service_ CurrencyConsumer	DataSet Key definition for Currency DataSetConsumer	com.extendyourstore. domain.iddi.CurrencyDataSet Consumer	dataSetKey(service_config_ CUR_ KEY)dataImportFilePath(serv ice_config_ DataImportFilePath)importH elper(service_ OfflineDBHelper)
service_TaxConsumer	DataSet Key definition for Tax DataSetConsumer	com.extendyourstore. domain.iddi.TaxDataSetCons umer	dataSetKey(service_config_ TAX_ KEY)dataImportFilePath(serv ice_config_ DataImportFilePath)importH elper(service_ OfflineDBHelper)
service_ EmployeeConsumer	DataSet Key definition for Employee DataSetConsumer	com.extendyourstore. domain.iddi.EmployeeDataSe tConsumer	dataSetKey(service_config_ EMP_ KEY)dataImportFilePath(serv ice_config_ DataImportFilePath)importH elper(service_ OfflineDBHelper)
service_ AdvancedPricingConsume r	DataSet Key definition for Advanced Pricing DataSetConsumer	com.extendyourstore. domain.iddi.AdvancedPricin gDataSetConsumer	dataSetKey(service_config_ PRC_ KEY)dataImportFilePath(serv ice_config_ DataImportFilePath)importH elper(service_ OfflineDBHelper)
service_ItemConsumer	DataSet Key definition for Item DataSetConsumer	com.extendyourstore. domain.iddi.ItemDataSetCon sumer	dataSetKey(service_config_ ITM_ KEY)dataImportFilePath(serv ice_config_ DataImportFilePath)importH elper(service_ OfflineDBHelper)
service_ FrequentConsumerJob	Consumer Job that runs frequently. Configured to run every 15mins by default	org.springframework.schedul ing.quartz.JobDetailBean	dataSets To add a new DataSet type, add one more service_config_ <<DataSetType>_KEY
service_ InfrequentConsumerJob	Consumer Job configured to run once a day by default.	org.springframework.schedul ing.quartz.JobDetailBean	dataSets To add a new DataSet type, add one more service_config_ <<DataSetType>_KEY
service_ TriggerFrequentConsumer	Cron Job Trigger class that runs service_ FrequentConsumer configuration.	org.springframework. scheduling.quartz.CronTrigge rBean	service_ FrequentConsumerJobcronEx pression Value
service_ TriggerInfrequentConsum er	Cron Job Trigger class that runs service_ InfrequentConsumer configuration.	org.springframework.schedul ing.quartz.CronTriggerBean	service_ InfrequentConsumerJobcronE xpression Value

Table A–1 **Spring Framework Configuration Options**

Spring bean ID	Purpose	Provided implementation	Configurable Options
service_ clientSchedulerFactory	Registers the services, service_ TriggerFrequentCons umerservice_ TriggerInfrequentCon sumer with the Quartz SchedulerFactoryBean	org.springframework.schedul ing.quartz.SchedulerFactoryB ean	service_ TriggerFrequentConsumerser vice_ TriggerInfrequentConsumer
service_config_ DataExportFilePath	Configuration for Data Export File Path. This is the relative path. Application takes the application running path and appends the path given in this configuration.	java.lang.String	value
service_config_ DataExportZipFilePath	Configuration for Data Export Zip File Path. This is the relative path. Application takes the application running path and appends the path given in this configuration.Note: The service_config_ DataExportFilePath should not contain DataSetKey names (eg: EMPLOYEE, ITEM, CURRENCY, ADVANCED_ PRICING,TAX)	java.lang.String	value
service_config_ DataImportFilePath	Configuration for Data Import File Path where the dataset files will be downloaded from Oracle Retail Point-of-Service Server and cached.	java.lang.String	value
service_config_ OfflineSchemaSQLFilePat h	Folder configuration where the Offline database schema SQL File.	java.lang.String	value
service_config_ OfflineSchemaLogFilePath	Folder configuration for storing the Offline database schema SQL File import log file.	java.lang.String	value
service_ OfflineRepositoryDataSou rce	Oracle Retail Point-of-Service Client Database user credentials configuration.	org.apache.commons.dbcp.Ba sicDataSource	url username password

Table A–1 **Spring Framework Configuration Options**

Spring bean ID	Purpose	Provided implementation	Configurable Options
service_OfflineDBHelper	Oracle Retail Point-of-Service Client offline Database Helper Class configuration	com.extendyourstore.foundation.iddi.OfflineDerbyHelper	SchemaName offlineDataSource dataImportFilePath
service_ ApplicationVersion	Application Version retreival class configuration.	com.extendyourstore.pos.PosVersion	None
service_DataFormatter	Data Formatter Helper to format Oracle Retail Point-of-Service Server data to Derby data import format specifications.	com.extendyourstore.foundation.iddi.DerbyDataFormatter	None
service_config_EMP_KEY	DataSet key Configuration	java.lang.String	None
service_config_CUR_KEY	DataSet key Configuration	java.lang.String	None
service_config_TAX_KEY	DataSet key Configuration	java.lang.String	None
service_config_ITM_KEY	DataSet key Configuration	java.lang.String	None
service_config_PRC_KEY	DataSet key Configuration	java.lang.String	None

For POS, the ServiceContext.xml is under `<install dir>/pos/config/context`.

Application Configuration

The Timeout interval to start data consumption is configured in the Application.xml file. The IDDITimeoutInterval parameter value is set to 15 minutes by default and is configurable.

The IDDIOfflineSupport parameter has been renamed to IDDIOfflineSupportRequired, and the values are reversed. Basically, this parameter allows the end-user to decide if the client should come up without offline data. If IDDIOfflineSupportRequired is **Y**, then the client does not start if no offline data is available (offline data is required for the client to start). If IDDIOfflineSupportRequired is **N**, then the client starts without offline data (offline data is not required for the client to start).

The batch size of the records to write data to flat file is set in domain.properties with the property IDDIBatchSize.

Integration Considerations

IDDI integrates with both the Oracle Retail Point-of-Service server and the Oracle Retail Point-of-Service Client application. IDDI integration with Oracle Retail Point-of-Service server produces dataset files on a scheduled basis. IDDI integration with Oracle Retail Point-of-Service client downloads the dataset files from Oracle Retail Point-of-Service server on a scheduled basis, and the client can then comsume those files. IDDI server and client integration is pluggable and configurable.

Oracle Retail Point-of-Service client should be online when it is run the first time to download the data from Oracle Retail Point-of-Service server. If there is no offline data available, Oracle Retail Point-of-Service client doesn't function in offline mode.

The client-side database schema must be in synch with server-side database schema.

Table A–2 has been used in Derby Database at the Oracle Retail Point-of-Service client. The database schema for the following tables must mach the Oracle Retail Point-of-Service server database schema.

Table A–2 **Point-of-Service Dataset Table**

ID	Dataset Name	Dataset Tables
1.	Items	AS_ITM
		ID_IDN_PS
		AS_ITM_I8
		PA_MF
		AS_POG
		AS_ITM_ASCTN_POG
		AS_ITM_STK
		AS_ITM_RTL_STR
		CO_UOM
		ID_DPT_PS
		CO_ASC_RLTD_ITM
		CO_CLN_ITM
2.	Employees	PA_EM
		CO_GP_WRK
		CO_ACS_GP_RS
		PA_RS

Table A–2 **Point-of-Service Dataset Table**

ID	Dataset Name	Dataset Tables
3.	Advanced Pricing	RU_PRDV
		CO_PRDV_ITM
		RU_PRDVC_MXMH
		TR_ITM_MXMH_PRDV
		CO_EL_PRDV_ITM
		CO_EL_PRDV_ITM_SC
		CO_EL_PRDV_DPT
		CO_EL_CTAF_PRDV
		CO_EL_MRST_PRDV
		CO_EL_TM_PRDV
4.	Tax	RU_TX_GP
		RU_TX_RT
		PA_ATHY_TX
		PA_TY_TX
		GEO_TX_JUR
		CD_GEO
		CO_GP_TX_ITM
		PA_STR_RTL
		CO_TX_JUR_ATHY_LNK
5.	Currency	CO_CNY
		CO_RT_EXC
		CO_CNY_DNM

DataSet Compressed File Structure

The dataset compressed file contains all the dataset flat files of the tables associated with the dataset and metadata information (for example, the Manifest file).

Here is the structure of the dataset compressed file:

```
<DataSet Flat file>
<DataSet Flat file>
<DataSet Flat file>
META-INF\MANIFEST.MF
```

DataSet Compressed File Example

Contents of a Currency Dataset compressed file (CURRENCY_<<BATCHID>>.ZIP)

```
META-INF\MANIFEST.MF
CO_ACS_GP_RS.TXT
CO_GP_WRK.TXT
PA_RS.TXT
```

Manifest File Structure

The Manifest file compressed in the DataSet compressed files contains dataset metadata information in the following format:

```
DataSetName: <<DataSetName>>
DataSetID: <<DataSetID>>
ApplicationVersion: <<Oracle Retail Point-of-Service Version>>
StoreID: <<StoreID>>
BatchID: <<DataSetBatchID>>

#Add all the Tables Names as shown in the format below
DataFile-<<TableName>>: <<Table File Name>>
TableSequence: <<Table Names separated by comma in the order of tables to be
imported to Derby>>
```

Manifest File Example

The following is the Manifest file example for Currency Dataset:

```
DataSetName: CURRENCY
DataSetID: 5
ApplicationVersion: pos
StoreID: 04241
BatchID: 20070606084600
DataFile-CO_CNY: CO_CNY.TXT
DataFile-CO_RT_EXC: CO_RT_EXC.TXT
DataFile-CO_CNY_DNM: CO_CNY_DNM.TXT
TableSequence: CO_CNY,CO_RT_EXC,CO_CNY_DNM
```

DataSet Flat File Structure

The following is the format of the DataSet flat file:

```
<<Table Row Data with the column information separated by comma (,) and enclosed
within double quotes (") if the information is not of numeric data type. The table
row data is followed by New line character>>
```

DataSet Flat File Example

The following is the DataSet flat file example for CO_CNY table:

```
1,"US","USD","USD","US","1",2,0
2,"CA","CAD","CAD","CA","0",2,1
3,"MX","MXN","MXN","MX","0",2,3
4,"GB","GBP","GBP","GB","0",2,4
5,"EU","EUR","EUR","EU","0",2,5
6,"JP","JPY","JPY","JP","0",0,6
```

Note: All the data type values except number type must be within double quotes.

Extensibility

Extensibility is supported through the interface-based design and the use of the Spring Framework. From an extensibility stand point, an alternate implementation of any of the exposed interfaces could inherit from one of the out-of-the-box implementation classes and be injected into the system through Spring.

Additionally, the schema has been designed to enable the addition of datasets and dataset tables.

Adding New Table To Existing Dataset

Adding a new dataset table to the data model is as simple as adding a new row to the table CO_DT_ST_TB_IDDI and creating table script in CreateSchema.sql.

Adding More Tables To Existing Dataset Types

The following example walks through the process of adding more tables to the existing DataSet in IDDI.

1. Insert the tables to be associated with the existing DataSet by adding records to CO_DT_ST_TB_IDDI using SQL.

   Run the following queries to insert the table association to DataSet.

Example A–1 Adding Table Assiociation To Employee Dataset

```
insert into CO_DT_ST_TB_IDDI
(ID_DT_ST, ID_STR_RT, NM_TB, NM_FL,AI_LD_SEQ)
values
(<<Employee DataSet ID>>, <<'Store ID'>>,<<'Table1'>>,<<'Table1.txt'>>,1 );

TableName: CO_DT_ST_TB_IDDI

Column Description
ID_DT_ST : DataSet ID
ID_STR_RT: Store ID
NM_TB    : Table Name
NM_FL    : File Name of the Flat file to be generated
AI_LD_SEQ: Table Order in which the data to be exported and imported

eg: Get the Employee DataSet ID from CO_DT_ST_IDDI table

insert into CO_DT_ST_TB_IDDI
(ID_DT_ST, ID_STR_RT, NM_TB, NM_FL,AI_LD_SEQ)
values
(1,'04241','TABLE1','TABLE1.TXT',1 );

insert into CO_DT_ST_TB_IDDI
(ID_DT_ST, ID_STR_RT, NM_TB, NM_FL,AI_LD_SEQ)
values
(1,'04241','TABLE2','TABLE2.TXT',2 );
```

2. Add CREATE TABLE scripts in CreateSchema.sql.

```
CREATE TABLE "offlinedb"."TABLE1"
    ("COLUMN1" <<TYPE>> <<Constraint>>,
    "COLUMN2, <<TYPE>> <<Constraint>>)
CREATE TABLE "offlinedb"."TABLE2"
    ("COLUMN1" <<TYPE>> <<Constraint>>,
    "COLUMN2, <<TYPE>> <<Constraint>>)
```

Adding a New DataSet

Do the following to add new DataSet:

1. Add DataSet information in CO_DT_ST_IDDI.
2. Add DataSet tables to CO_DT_ST_TB_IDDI.
3. Create `<DataSetKey>Producer` and `<DataSetKey>Consumer` classes extending from AbstractDataSetProducer and AbstractDataSetConsumer respectively.
4. Define `service_config_<<DataSetKey>>` in ServiceContext.xml
5. Define `service_<<DataSetKey>>Producer` with `class=<DataSetKey>Producer` and `service_<<DataSetKey>>Consumer` with `class=<DataSetKey>Consumer` in ServiceContext.xml
6. Add to `service_<<DataSetKey>>Producer` and `service_<<DataSetKey>>Consumer` to service_DataSetService and service_ClientDataSetService respectively in ServiceContext.xml
7. Add DataSet key to `service_FrequentProducerJob/service_InfrequentProducerJob` and `service_FrequentConsumerJob/service_InfrequentConsumerJob` in ServiceContext.xml
8. Add create table scripts and insert script for newly added DataSet in CreateSchema.sql.

Configuring Schedule for DataSet Producer and Consumer

Any existing Dataset Producer and Consumer can be individually configured to run on scheduled basis.

Configure DataSet Producer

Follow the steps below to configure DataSet Producer:

1. Add JobDetailBean bean configuration service_<<DataSet>>ProducerJob.

```
    <bean id="service_<<DataSet>>ProducerJob"
class="org.springframework.scheduling.quartz.JobDetailBean">
        <property name="jobClass">

<value>com.extendyourstore.foundation.iddi.DataSetProducerJob</value>
        </property>
        <property name="jobDataAsMap">
            <map>
                <entry key="producer" value-ref="service_DataSetService"/>
                <entry key="dataSets">
                    <list>
                        <ref local="service_config_<<DataSetKey>>"/>
                    </list>
                </entry>
            </map>
        </property>
    </bean>
```

Note: service_config_<<DataSetKey>> should have been configured with the DataSetKey

2. Add CronTriggerBean bean configuration service_Trigger<<DataSet>>Producer

```
    <bean id="service_Trigger<<DataSet>>Producer" class =
"org.springframework.scheduling.quartz.CronTriggerBean">
        <property name = "jobDetail">
            <ref local="service_<<DataSet>>ProducerJob"/>
        </property>
        <property name="cronExpression" value="0 0,15,30,45 0 * * ?"/>
    </bean>
```

The above DataSet is configured to run once every 15 minutes.

Note: For more information about configuring using Quartz, go to http://www.opensymphony.com/quartz/wikidocs/CronTriggers%20Tutorial.html.

---

3. Add `service_Trigger<<DataSet>>Producer` to the SchedulerFactoryBean bean configuration:

```
    <bean id="service_ProducerSchedulerFactory"
class="org.springframework.scheduling.quartz.SchedulerFactoryBean">
        <property name="triggers">
            <list>
                <ref local="service_TriggerFrequentProducer"/>
                <ref local="service_TriggerInfrequentProducer"/>
                <ref local="service_Trigger<<DataSet>>Producer"/>
            </list>
        </property>
    </bean>
```

Configure DataSet Consumer

Do the following to configure DataSet Consumer:

1. Add JobDetailBean bean configuration `service_<<DataSet>>ConsumerJob:`

```
    <bean id="service_<<DataSet>>ConsumerJob"
class="org.springframework.scheduling.quartz.JobDetailBean">
        <property name="jobClass">

<value>com.extendyourstore.foundation.iddi.ClientDataSetController</value>
        </property>
        <property name="jobDataAsMap">
            <map>
               <entry key="dataSets">
                    <list>
                        <ref local="service_config_<< DataSetKey>>"/>
                    </list>
                </entry>
            </map>
        </property>
    </bean>
```

Note: `service_config_<<DataSetKey>>` should have been configured with the DataSetKey.

---

2. Add CronTriggerBean bean configuration `service_Trigger<<DataSet>>Consumer`:

```
    <bean id="service_Trigger<<DataSet>>Consumer" class =
"org.springframework.scheduling.quartz.CronTriggerBean">
        <property name = "jobDetail">
            <ref local="service_<<DataSet>>ConsumerJob"/>
        </property>
        <property name="cronExpression" value="0 0,15,30,45 0 * * ?"/>
    </bean>
```

   The DataSet is configured to run once every 15 minutes.

3. Add `service_Trigger<<DataSet>>Consumer` to the SchedulerFactoryBean bean configuration:

```
    <bean id=" service_clientSchedulerFactory"
class="org.springframework.scheduling.quartz.SchedulerFactoryBean">
        <property name="triggers">
            <list>
                <ref local="service_TriggerFrequentConsumer"></ref>
                <ref local="service_TriggerInfrequentConsumer"></ref>
                <ref local="service_Trigger<<DataSet>>Consumer"/>
            </list>
        </property>
    </bean>
```

Adding New DataSet Type

The following example walks through the process of adding a new DataSet to the existing IDDI.

- Insert the new DataSet information in into the databaset table CO_DT_ST_IDDI using SQL:
- Insert the tables associated with the DataSet added to CO_DT_ST_TB_IDDI using SQL.

1. Run the following queries to insert new DataSet information and table association to DataSet.

Example A–2 Adding New DataSet

```
insert into CO_DT_ST_IDDI
(ID_DT_ST, ID_STR_RT, NM_DT_ST)
values
(maxid+1,<<'StoreID'>> ,<<'DataSetName'>>);

TableName: CO_DT_ST_IDDI

Column Description
ID_DT_ST : DataSet ID
ID_STR_RT: Store ID
NM_DT_ST : DataSet Name

eg:
insert into CO_DT_ST_IDDI
(ID_DT_ST, ID_STR_RT, NM_DT_ST)
values
(6,'04241','NEW');
```

Example A–3 Adding Table association to New DataSet

```
insert into CO_DT_ST_TB_IDDI
(ID_DT_ST, ID_STR_RT, NM_TB, NM_FL,AI_LD_SEQ)
values
(<<New DataSet ID>>, <<'Store ID'>>,<<'Table1'>>,<<'Table1.txt'>>,1 );

eg:
insert into CO_DT_ST_TB_IDDI
(ID_DT_ST, ID_STR_RT, NM_TB, NM_FL,AI_LD_SEQ)
values
(6,'04241','TABLE1','TABLE1.TXT',1 );

insert into CO_DT_ST_TB_IDDI
(ID_DT_ST, ID_STR_RT, NM_TB, NM_FL,AI_LD_SEQ)
values
(6,'04241','TABLE2','TABLE2.TXT',2 );
```

2. Create `<DataSetKey>Producer` and `<DataSetKey>Consumer` classes extending from AbstractDataSetProducer and AbstractDataSetConsumer respectively.

Example A–4 DataSetProducer Code

```
package com.extendyourstore.domain.iddi;


import com.extendyourstore.foundation.iddi.AbstractDataSetProducer;
import com.extendyourstore.foundation.iddi.DataSetMetaData;
import com.extendyourstore.foundation.iddi.TableQueryInfo;
import com.extendyourstore.foundation.iddi.ifc.DataSetMetaDataIfc;

public class NewDataSetProducer extends AbstractDataSetProducer
{

private final String[] TABLE_FIELDS={"*"};


/**


 * NewDataSetProducer constructor
 */

public NewDataSetProducer ()
{

}
/**
* Get DataSetMetatIfc reference
*
*/
public DataSetMetaDataIfc getDataSetMetaData()
{
// Get the table names for the Key
return dataSetMetaData;
}
/**
* Initialize the MetaData for the DataSetProducer
*/
public void initializeDataSet()
```

```
{
dataSetMetaData = new DataSetMetaData(dataSetKey);
}
/**
* Create TableQueryInfo object with the column names to fetch
* @param TableName
* @return TableQueryInfo Object
*/
public TableQueryInfo getTableQueryInfo(String tableName)
{
TableQueryInfo tableQueryInfo = new TableQueryInfo(tableName);
tableQueryInfo.setTableFields(TABLE_FIELDS);
return tableQueryInfo;
}
/**
 * Finalize DataSet Method
 *
 */
public void finalizeDataSet()
{

}
}
```

Example A–5 DataSetConsumer Code

```
package com.extendyourstore.domain.iddi;

import com.extendyourstore.foundation.iddi.AbstractDataSetConsumer;

//------------------------------------------------------------------------
/**
    The NewDataSetConsumer defines methods that the
    application calls to import Employee dataset files into
    offline database.
     @version $Revision: $
**/
//------------------------------------------------------------------------

public class NewDataSetConsumer extends AbstractDataSetConsumer
{         /**  Dataset key name for currency dataset.

    */    private String dataSetKey = null;



   // ---------------------------------------------------------------------
    /**
        @return Returns the dataSetKey
    **/
    //---------------------------------------------------------------------

    public String getDataSetKey()
    {


return dataSetKey;
    }

    //  ---------------------------------------------------------------------
```

```
    /**
      @param dataSetKey The DataSetKey to set
    **/
    //----------------------------------------------------------------------------

    public void setDataSetKey(String dataSetKey)
    {

this.dataSetKey = dataSetKey;

  }
}
```

3. Define `service_config_<<DataSetKey>>` in ServiceContext.xml:

```
    <bean id="service_config_<<datasetKey>> " class="java.lang.String">
        <constructor-arg type="java.lang.String" value="<<DataSetKey>>"/>
    </bean>eg:    <bean id="service_config_NEW_KEY" class="java.lang.String">
        <constructor-arg type="java.lang.String" value="NEW"/>
    </bean>
```

4. Define `service_<<DataSetKey>>Producer` with `class=<DataSetKey>Producer` and `service_<<DataSetKey>>Consumer` with `class=<DataSetKey>Consumer` in ServiceContext.xml:

```
<bean id="service_NewProducer"
class="com.extendyourstore.domain.iddi.NewDataSetProducer" lazy-init="true"
singleton=”true”>
        <property name="dataSetKey" ref="service_config_NEW_KEY"/>
        <property name="dataExportFilePath" ref="service_config_
DataExportFilePath"/>
        <property name="dataExportZipFilePath" ref="service_config_
DataExportZipFilePath"/>
    </bean>
    <bean id="service_NewConsumer"
 class="com.extendyourstore.domain.iddi.NewDataSetConsumer"
             lazy-init="true"
             singleton="true">
        <property name="dataSetKey" ref="service_config_NEW_KEY"/>
        <property name="dataImportFilePath" ref="service_config_
DataImportFilePath"/>
    </bean>
```

5. Add to `service_<<DataSetKey>>Producer` and `service_<<DataSetKey>>Consumer` to `service_DataSetService` and `service_ClientDataSetService` respectively in ServiceContext.xml

```
   <bean id="service_DataSetService"
class="com.extendyourstore.foundation.iddi.DataSetService" singleton="true">
        <property name="producers">
            <map>
                <entry key-ref="service_config_EMP_KEY" value-ref="service_
EmployeeProducer"/>
                <entry key-ref="service_config_ITM_KEY" value-ref="service_
ItemProducer"/>
                <entry key-ref="service_config_PRC_KEY" value-ref="service_
AdvancedPricingProducer"/>
                <entry key-ref="service_config_TAX_KEY" value-ref="service_
TaxProducer"/>
                <entry key-ref="service_config_CUR_KEY" value-ref="service_
CurrencyProducer"/>
```

```
                <entry key-ref="service_config_NEW_KEY" value-ref="service_
NewProducer"/>
            </map>
        </property>
    </bean>
    <bean id="service_ClientDataSetService"
     class="com.extendyourstore.foundation.iddi.ClientDataSetService"
singleton="true">
        <property name="consumers">
            <map>
                <entry key-ref="service_config_EMP_KEY" value-ref="service_
EmployeeConsumer"/>
                <entry key-ref="service_config_CUR_KEY" value-ref="service_
CurrencyConsumer"/>
                <entry key-ref="service_config_TAX_KEY" value-ref="service_
TaxConsumer"/>
                <entry key-ref="service_config_ITM_KEY" value-ref="service_
ItemConsumer"/>
                <entry key-ref="service_config_PRC_KEY" value-ref="service_
AdvancedPricingConsumer"/>
                <entry key-ref="service_config_NEW_KEY" value-ref="service_
NewConsumer"/>
            </map>
        </property>
        <property name="dataImportFilePath" ref="service_config_
DataImportFilePath"/>
    </bean>
```

6. Add DataSet key to `service_FrequentProducerJob/service_InfrequentProducerJob` and `service_FrequentConsumerJob/service_InfrequentConsumerJob` in ServiceContext.xml

```
    <bean id="service_FrequentProducerJob"
class="org.springframework.scheduling.quartz.JobDetailBean">
        <property name="jobClass">

<value>com.extendyourstore.foundation.iddi.DataSetProducerJob</value>
        </property>
        <property name="jobDataAsMap">
            <map>
                <entry key="producer" value-ref="service_DataSetService"/>
                <entry key="dataSets">
                    <list>
                        <ref local="service_config_EMP_KEY"/>
                        <ref local="service_config_PRC_KEY"/>
                        <ref local="service_config_TAX_KEY"/>
                        <ref local="service_config_NEW_KEY"/>
                    </list>
                </entry>
            </map>
        </property>
    </bean>

<bean id="service_FrequentConsumerJob"
class="org.springframework.scheduling.quartz.JobDetailBean">
        <property name="jobClass">

<value>com.extendyourstore.foundation.iddi.ClientDataSetController</value>
        </property>
        <property name="jobDataAsMap">
```

```
            <map>
               <entry key="dataSets">
                    <list>
                        <ref local="service_config_EMP_KEY"/>
                        <ref local="service_config_PRC_KEY"/>
                        <ref local="service_config_TAX_KEY"/>
                        <ref local="service_config_NEW_KEY"/>
                    </list>
                </entry>
            </map>
        </property>
    </bean>
```

7. Add CREATE TABLE scripts and insert scripts to newly added DataSet in CreateSchema.sql.

```
CREATE TABLE "offlinedb"."TABLE1"
    ("COLUMN1" <<TYPE>> <<Constraint>>,
 "COLUMN2, <<TYPE>> <<Constraint>>)
CREATE TABLE "offlinedb"."TABLE2"
    ("COLUMN1" <<TYPE>> <<Constraint>>,
 "COLUMN2, <<TYPE>> <<Constraint>>)
insert into CO_DT_ST_IDDI(ID_DT_ST, ID_STR_RT, NM_DT_ST)
values(6,'04241','NEW');
```

Changing Oracle Retail Point-of-Service Client Database vendor

Currently the Oracle Retail Point-of-Service client uses Derby Database. However, the modifications to the code are minimal for replacing the Oracle Retail Point-of-Service client database from Derby to another database. Do the following to change the Oracle Retail Point-of-Service client database:

1. Add `Offline<<DBName>>Helper` class which implements `offlineDBHelperIfc`.
2. Change the installer to have new database driver jar file paths.
3. Update the `"<POOL name="jdbcpool class="DataConnectionPool" package="com.extendyourstore.foundation.manager.data">"` section of PosLFFDataTechnician.xml file with the driver, databaseUrl, userid, password.

Plugability

The plug points have been identified as follows:

- DataSetService
- ClientDataSetService
- ClientDataSetController
- DataSetProducers
  - EmployeeDataSetProducer
  - ItemDataSetProducer
  - TaxDataSetProducer
  - CurrencyDataSetProducer
  - PricingDataSetProducer
- DataSetConsumers

  - EmployeeDataSetConsumer
  - ItemDataSetConsumer
  - TaxDataSetConsumer
  - CurrencyDataSetConsumer
  - AdvancedPricingDataSetConsumer
- Data Formatter
- Offline DB Helper
- Offline Data Source

Any and all of these implementations can be replaced with custom implementations by updating the ServiceContext.xml file to point to custom implementations.

B

Appendix: Value-Added Tax

The value-added tax (VAT) is a consumption tax that is levied at each stage of production based on the value added to the product at that stage. VAT is used across the European Union, as well as other locales, but different rates of VAT can be applied in different regions. Point-of-Service currently supports various tax rules, as well as Canadian taxes (GST/PST/HST), a type of VAT, but additional support for VAT is required to support an EU deployment.

One difference between a sales tax and a VAT is that with a sales tax, the tax is added to the retail price of an item; whereas with a VAT the retail price includes the tax amount (there are exceptions in some types of Canadian VAT). This project addresses the price inclusive VAT only. If the associate overrides the default price, the overridden price is assumed to include VAT, so the VAT calculation is based on the price entered by the user.

VAT tax will still need to be considered part of customer localization as VAT can vary from country to country, might need to be configured differently and many customers might want to modify receipt formats, reports, and so forth.

VAT calculation

Inclusive Tax Flag At Tax Group Rule Level

At tax group rule level, a boolean-inclusive tax flag is added to indicate if the tax amount is already included in the item price. For details on this enhancement, see "Adding Tax Inclusive Flag To Tax Group Rule" for class/service API changes, and "Tax Group Rule Table RU_TX_GP" for DB schema enhancement.

Inclusive Tax Rate Calculator

A new inclusive tax rate calculator class is added to support VAT calculation. For details on this new calculator, see "Tax Rate Calculators" for class level APIs.

Enhancing PLU Item Look Up

A tax calculator is instantiated during PLU item look up for a sales transaction. When it comes to instantiate a rate calculator, the logic in member function NewTaxRuleIfc[] retrieveItemTaxRules(ArrayList ffTaxVOs) in JDBC class com.extendyourstore.domain.arts.JdbcReadNewTaxRules must be enhanced to create either an inclusive tax rate calculator or an exclusive tax rate calculator based on the inclusive tax flag at the tax group rule level. Instead of calling the existing domain factory API TaxRateCalculatorIfc getTaxRateCalculatorInstance(), it is changed to invoke the following new API to create the correct tax rate calculator (inclusive versus exclusive).

```
public TaxRateCalculatorIfc getTaxRateCalculatorInstance(boolean inclusiveTax);
```

For details on this API, see "Domain Object Factory Service".

Enhancing Internal Tax Engine

Various tax classes are used by the internal tax engine to hold tax amounts during tax calculation process. These classes must be enhanced to hold inclusive and exclusive (add on) tax separately. For details, see "Enhancing Domain Tax Interfaces/Classes" and "Enhancing Transaction & Line Item Tax Interfaces/Classes".

For the internal tax engine class com.extendyourstore.domain.tax.InternalTaxEngine, it must be enhanced in the post tax calculation phase to roll up inclusive and exclusive tax to line items and transaction totals. The following member functions will be modified for this purpose.

```
public void postTaxCalculation(TaxLineItemInformationIfc item);
public void postTaxCalculation(TransactionTotalsIfc totals);
```

Our internal tax engine today does not support tax on shipping charge. For details on the enhancement to support tax on shipping charges, see "Calculate VAT for Shipping Charges".

VAT Tax Rule Seed Data

To provide out-of-box VAT calculation support, tax rule seed data will be populated into tax tables using the tax import utility. The seed data is created based on UK VAT. A complete xml definition of the tax rule seed data is included in the appendix.

As we can see from the xml definition, the out-of-box VAT rule will take the following attribute values:

- Rounding digits: 4
- Inclusive tax flag: TRUE. This is a new flag introduced for this project. The tax import utility is enhanced to handle this extra boolean flag.
- Compound sequence number: **0** for no compound tax.
- Tax on gross amount flag: false for calculating tax based on price after discount.
- Calculation method code: LineItem for calculating tax by line item, not by transaction.
- Tax rate rule usage code: PercentageOrAmount for simple tax, no tax table lookup or threshold tax.
- Rate tax type: Percentage for calculating tax based on a tax rate.

Calculate VAT For Unknown Items, Invalid Or Blank Tax Groups

For an unknown item, the tax group ID of its Point-of-Service department will be used to calculate VAT. This is consistent with our current approach for sales tax.

For a blank tax group, tax group ID of **0** will be used to calculate VAT. This is consistent with our current approach for sales tax.

For an invalid tax group, use the following mechanism to determine tax:

```
If item's tax group is valid, use it
    else if item's department tax group is valid, use it
    else if a default tax rule (tax group id = -1 & tax authority id = -1) is
configured, use it with the tax rate parameter
    else use the tax rate parameter with hard coded tax rule name.
```

Calculate VAT for Returns Transactions

For a returns transaction with receipt, its VAT will not be recalculated. Instead, reverse item tax rules are created to negate the original sales transaction's VAT. This is consistent with our current approach of handling sales tax for returns with receipt.

The following member function in sale return line item class com.extendyourstore.domain.lineitem.SaleReturnLineItem is responsible for creating and returning an array of reverse item tax rules for returns transactions. The tax rules are created based on the tax information saved in the original transaction's sales return tax line items.

```
protected ReverseItemTaxRuleIfc[] getRetrievedReturnTaxRules();
```

This function must be enhanced to populate a reverse item tax rule's inclusive tax flag from the sales return tax line item of the original transaction.

For a returns transaction without receipt, the transaction VAT will be recalculated. The function goes through the same logic to calculate VAT as a sales transaction. Therefore, no additional work is required in this case.

Calculate VAT for Reverse Transactions Other Than Returns

For a reverse transaction other than returns (such as a Post Void transaction), its VAT will not be recalculated as well. Reverse item tax rules are created to negate the original transaction's VAT. This is consistent with our current approach of handling sales tax for reverse transactions.

The following member function in sale return line item class com.extendyourstore.domain.lineitem.SaleReturnLineItem is responsible of creating and returning an array of reverse item tax rules for reverse transactions other than returns. The tax rules are created based on the tax information saved in the original transaction's sales return tax line items.

```
protected ReverseItemTaxRuleIfc[] getReverseTaxRules ();
```

This function must be enhanced to populate a reverse item tax rule's inclusive tax flag from the sales return tax line item of the original transaction.

For a post void transaction, the following function in class com.extendyourstore.domain.transaction.VoidTransaction must be enhanced to negate the inclusive tax total of the original transaction.

```
protected void setVoidTransactionTotals(TransactionTotalsIfc origTotals);
```

The same function must be enhanced to negate shipping charge tax as well (see "Calculate VAT for Shipping Charges" for details).

Calculate VAT for Shipping Charges

Enhance Shipping Method Table and Domain Interface/Class

Each shipping method will take a boolean-taxable flag and a tax group ID. These two combined define how VAT is calculated for the shipping charges. For details on the db schema enhancements on shipping method table CO_SHP_MTH, see "Shipping Methods Table CO_SHP_MTH". For details on enhancements on the domain shipping method interface/class, see "Shipping Method Interface/Class". The following JDBC class will be enhanced to read the taxable flag and tax group ID from the table and populate the tax rules into domain object instance of interface com.extendyourstore.domain.financial.ShippingMethodIfc:

```
com.extendyourstore.domain.arts.JdbcReadShippingMethod
```

Add/Update Send Packages to/in a Sale Return Transaction

To support VAT for shipping charges, a new send package line item interface and class will be added. The class implements the tax line item interface and therefore provides all the necessary information the internal tax engine needs to calculation tax on shipping charges. For details on the send package line item interface/class, see "Send Package Line Item Interface/Class".

New methods addSendPackageInfo and updateSendPackageInfo are added in sales return transaction interface and class to support adding and updating of send (shipping) packages. See "Enhancing Sale Return Transaction Interface/Class" for more details on the functions added.

The following UI site and road will be updated to call the above new methods to add or update send packages.

```
com.extendyourstore.pos.services.send.displaysendmethod.AssignTransactionLevelInfo
Site
com.extendyourstore.pos.services.send.displaysendmethod.SendMethodSelectedRoad
```

Enhance Internal Tax Engine

The internal tax engine will be enhanced to calculate tax for shipping charges. See "Internal Tax Engine Classes" for details.

Negate VAT for Shipping Charges for a Post Void Transaction

For a post void transaction, the following function in class com.extendyourstore.domain.transaction.VoidTransaction must be enhanced to negate the shipping charges tax of the original transaction.

```
protected void setVoidTransactionTotals(TransactionTotalsIfc origTotals);
```

Enhance Overlay Lane Action Class SendMethodSelectedRoad

The lane action class for road DisplaySendMethodNext in tour script com.extendyourstore.pos.services.send.displaysendmethod.displaysendmethod.xml is com.extendyourstore.pos.services.send.displaysendmethod.SendMethodSelectedRoad . This action class is invoked when a send method is selected. We will overlay this class with the following one for VAT.

```
com.extendyourstore.pos.services.send.displaysendmethod.VatSendMethodSelectedRoad
```

The lane action class com.extendyourstore.pos.service.send.displaysendmethod.SendMethodSelectedRoad is invoked when a send method is selected in Point-of-Service UI.

Since shipping charges can be taxable, it will be enhanced to call the sales return transaction API updateTransactionTotals() to force tax recalculation after the shipping method is added/updated to the transaction.

Calculate VAT for Send Transactions

For a send transaction, its VAT will be calculated based on local tax rules, not the destination tax rules. The tax rules of a send transaction are retrieved in GetTaxRules site in tour script com.extendyourstore.pos.services.send.displaysendmethod.displaysendmethod.xml. Its site class com.extendyourstore.pos.services.send.displaysendmethod.GetTaxRulesSite retrieves the send tax rules based on the postal code of the shipping address. We will overlay this site class with the following one for VAT.

```
com.extendyourstore.pos.services.send.displaysendmethod.GetVatRulesSite
```

This new site class will retrieve local tax rules for the send transaction.

Transaction Persistence for VAT

Persist Inclusive tax

For a retail transaction, inclusive tax information must be saved at transaction and line item level.

- For schema enhancement of a retail transaction, see "Retail Transaction Table TR_RTL".
- For schema enhancement of a transaction tax line item, see "Tax Line Item Table TR_LTM_TX".
- For schema enhancement of a sales return line item, see "Sales Return Line Item Table TR_LTM_SLS_RTN".
- For schema enhancements of a sales return tax line item, see "Sales Return Tax Line Item Table TR_LTM_SLS_RTN_TX".

The following is a list of domain persistence classes that need to be enhanced to load or save the additional inclusive tax information of a retail transaction.

- com.extendyourstore.domain.arts.JdbcReadTransaction
- com.extendyourstore.domain.arts.JdbcReadTransactionHistory
- com.extendyourstore.domain.arts.JdbcSaveRetailTransaction
- com.extendyourstore.domain.arts.JdbcSaveRetailTransactionLineItems
- com.extendyourstore.domain.arts.JdbcUpdatePriceAdjustedLineItems

For an order transaction, inclusive tax amount must be saved at order item level.

For schema enhancement of an order item, see "Order Item Table OR_LTM".

The following is a list of domain persistence classes that need to be enhanced to load or save the additional inclusive tax amount of an order item.

- com.extendyourstore.domain.arts.JdbcCreateOrder
- com.extendyourstore.domain.arts.JdbcRetrieveOrder
- com.extendyourstore.domain.arts.JdbcSaveOrderLineItems
- com.extendyourstore.domain.arts.JdbcUpdateOrder

Persist Shipping Charge Tax

For a send transaction, all its shipping information (including the tax on shipping charges) must be saved to the shipping record table SHP_RDS_SLS_RTN and the new shipping record tax table SHP_RDS_SLS_RTN_TX.

For schema enhancements of the shipping record table, see "Shipping Record Table SHP_RDS_SLS_RTN".

For schema of the new shipping record tax table, see "Shipping Record Tax Table SHP_RDS_SLS_RTN_TX".

The following new functions will be added to class com.extendyourstore.domain.arts.JdbcReadTransaction to read tax information of a send package from the shipping record tax table SHP_RDS_SLS_RTN_TX.

```
protected TaxInformationIfc[]
readTransactionShippingTaxInformation(JdbcDataConnection dataConnection,
SaleReturnTransactionIfc transaction, int sendLabelCount);
```

The existing readTransactionShippings will be enhanced to read all the shipping information from the db and create send packages for the transaction. It will invoke the above new function to read tax information of a send package. It must also set each send package's from transaction flag to true.

The following new functions will be added to class com.extendyourstore.domain.arts.JdbcSaveRetailTransaction to save a send package to the shipping record table SHP_RDS_SLS_RTN and its tax table SHP_RDS_SLS_RTN_TX.

```
protected void saveTransactionShippingInformation(JdbcDataConnection
dataConnection,
        TenderableTransactionIfc transaction, SendPackageLineItemIfc
sendPackage);
protected void saveTransactionShippingTaxInformation(JdbcDataConnection
dataConnection,
        TenderableTransactionIfc transaction, SendPackageLineItemIfc sendPackage,
        TaxInformationIfc taxInformation);
```

The existing function saveTransactionShippings will be enhanced to save all shipping information in the transaction's send packages into db. It will invoke the above new functions to do so.

Tracking VAT Financial Totals

For schema enhancement of Point-of-Service department history table, see "Point-of-Service Department History Table LE_HST_PS_DPT".

For schema enhancement of till history table, see "Till History Table LE_HST_TL".

For schema enhancement of register history table, see "Register History Table LE_HST_WS".

For schema enhancement of store history table, see "Store History Table LE_HST_STR".

For schema enhancement of tax history table, see "Tax History Table HST_TX".

Accumulate Inclusive Tax

For a retail transaction, its inclusive tax amount must be accumulated in financial totals, and added to store, register, till, and Point-of-Service department history tables. A detail break down of its inclusive tax collected for each tax group rule must be accumulated in financial totals, and added to tax history table.

Financial totals classes must be enhanced to hold inclusive tax information. For details, see "Enhancing Financial Totals Interfaces/Classes".

The following existing member function in sales return line item class com.extendyourstore.domain.lineitem.SaleReturnLineItem will be enhanced to populate its financial totals' inclusive tax amounts.

```
public FinancialTotalsIfc getFinancialTotals(boolean isSale);
```

The following existing member function in layaway transaction class com.extendyourstore.domain.transaction.LayawayTransaction will be enhanced to populate its financial totals' inclusive tax amounts.

```
protected FinancialTotalsIfc getLayawayFinancialTotals();
```

The following existing member function in order transaction class com.extendyourstore.domain.transaction.OrderTransaction will be enhanced to populate its financial totals' inclusive tax amounts.

```
protected FinancialTotalsIfc getOrderFinancialTotals();
```

The following existing member function in sales return transaction class com.extendyourstore.domain.transaction.SaleReturnTransaction will be enhanced to populate its financial totals' inclusive tax amounts.

```
protected FinancialTotalsIfc getSaleReturnFinancialTotals();
```

The following existing member functions in post voided transaction class com.extendyourstore.domain.transaction.VoidTransaction will be enhanced to populate its financial totals' inclusive tax amounts.

```
protected void getLayawayFinancialTotals(FinancialTotalsIfc financialTotals,
                        LayawayTransactionIfc layawayTransaction);
protected void getOrderFinancialTotals(FinancialTotalsIfc financialTotals,
                        OrderTransactionIfc orderTransaction);
protected void getSaleReturnFinancialTotals(FinancialTotalsIfc financialTotals);
```

The following is a list of domain persistence classes that need to be enhanced to load or save the additional inclusive tax information of the history tables.

- com.extendyourstore.domain.arts.JdbcReadDepartment
- com.extendyourstore.domain.arts.JdbcSaveDepartment
- com.extendyourstore.domain.arts.JdbcReadTill
- com.extendyourstore.domain.arts.JdbcSaveTill
- com.extendyourstore.domain.arts.JdbcReadRegister
- com.extendyourstore.domain.arts.JdbcReadStoreRegisters

- com.extendyourstore.domain.arts.JdbcSaveRegister
- com.extendyourstore.domain.arts.JdbcReadStoreTotals
- com.extendyourstore.domain.arts.JdbcSaveStore
- com.extendyourstore.domain.arts.JdbcReadTaxHistory
- com.extendyourstore.domain.arts.JdbcSaveTaxHistory

Accumulate Shipping Charge Tax

For a send transaction, its shipping charge tax must be accumulated in financial totals, and added to store, register, and till history tables. A detail break down of the tax collected for each tax group rule must be accumulated in financial totals, and added to tax history table.

Note that shipping charges are not tracked in Point-of-Service department history table, since a shipping method is not associated with a department id.

Financial totals classes must be enhanced to hold shipping charges tax. For details, see "Enhancing Financial Totals Interfaces/Classes".

The following API of a send package line item is responsible of returning a financial totals object populated with shipping charges and its tax information. See "Send Package Line Item Interface/Class" for more details.

```
public FinancialTotalsIfc getFinancialTotals(boolean isNotVoid);
```

The following existing member function in sales return transaction class com.extendyourstore.domain.transaction.SaleReturnTransaction will be modified to collect financial totals of all send packages and add them up. It will retrieve the financial totals of a send package line item by calling its getFinancialTotals function listed above.

```
protected FinancialTotalsIfc getSaleReturnFinancialTotals();
```

The following existing member function in post void transaction class com.extendyourstore.domain.transaction.VoidTransaction will be modified to collect financial totals of all send packages and add them up. It will retrieve the financial totals of a send package line item by calling its getFinancialTotals function listed above.

```
public FinancialTotalsIfc getFinancialTotals()
```

The following is a list of domain persistence classes that need to be enhanced to load or save the additional shipping charge tax information of the history tables.

- com.extendyourstore.domain.arts.JdbcReadTill
- com.extendyourstore.domain.arts.JdbcSaveTill
- com.extendyourstore.domain.arts.JdbcReadRegister
- com.extendyourstore.domain.arts.JdbcReadStoreRegisters
- com.extendyourstore.domain.arts.JdbcSaveRegister
- com.extendyourstore.domain.arts.JdbcReadStoreTotals
- com.extendyourstore.domain.arts.JdbcSaveStore

Transaction Retrieval in CO

Enhancing Transaction Entity Beans

The following is a list of entity beans that will be enhanced to accommodate the columns.

Entity Bean Name:	RetailTransactionBean
Table:	TR_RTL (see "Retail Transaction Table TR_RTL")
Bean/DTO Classes:	com._360commerce.commerceservices.transaction.retail.* com._360commerce.commerceservices.transaction.retail.ejb.*

Entity Bean Name:	SaleReturnLineItemBean
Table:	TR_LTM_SLS_RTN (see "Sales Return Line Item Table TR_LTM_SLS_RTN")
Bean/DTO Classes:	com._360commerce.commerceservices.transaction.salereturn.* com._360commerce.commerceservices.transaction.salereturn.ejb.*

Entity Bean Name:	SaleReturnShippingRecordBean
Table:	SHP_RDS_SLS_RTN (see "Shipping Record Table SHP_RDS_SLS_RTN")
Bean/DTO Classes:	com._360commerce.commerceservices.transaction.shipping.* com._360commerce.commerceservices.transaction.shipping.ejb.*

The following are new entity beans that will be created.

Entity Bean Name:	SaleReturnLineItemTaxBean
Table:	TR_LTM_SLS_RTN_TX (see "Sales Return Tax Line Item Table TR_LTM_SLS_RTN_TX")
Bean/DTO Classes:	com._360commerce.commerceservices.transaction.salereturn.* com._360commerce.commerceservices.transaction.salereturn.ejb.*

Entity Bean Name:	SaleReturnShippingRecordTaxBean
Table:	SHP_RDS_SLS_RTN_TX (see "Shipping Record Tax Table SHP_RDS_SLS_RTN_TX")
Bean/DTO Classes:	com._360commerce.commerceservices.transaction.shipping.* com._360commerce.commerceservices.transaction.shipping.ejb.*

For details of the DTO (data transfer object) class enhancements, see "Commerce Service Transaction DTO Classes".

The toDTO() method in all the above bean classes must be enhanced or created to populate the DTO objects.

Enhancing Transaction Service Bean

The transaction retrieval logic in transaction service bean class com._360commerce.commerceservices.transaction.ejb.TransactionServiceBean must be

enhanced to retrieve the line item and shipping record tax information. The following methods will be enhanced to do so.

```
private List getItemsForTransaction(TransactionKey key);
```

This function retrieves all the sales return line items of a sales return, order, or layaway transaction. It must be enhanced to call entity bean SaleReturnLineItemTaxBean to get a collection of SaleReturnLineItenTaxDTO objects for each sale return line item, and set them to the SaleReturnLineItemDTO object. For details of the DTO classes, see "Commerce Service Transaction DTO Classes".

```
private List getShippingRecordsForTransaction(TransactionKey key);
```

This function retrieves all the shipping records of a sales return transaction. It must be enhanced to call entity bean SaleReturnShippingRecordTaxBean to get a collection of SaleReturnShippingRecordTaxDTO objects for each shipping record, and set them to the SaleReturnShippingRecordDTO object. For details of the DTO classes, see "Commerce Service Transaction DTO Classes".

Enhancing Transaction Manager Bean

The following function in transaction manager bean class com._360commerce.webmodules.transaction.app.ejb.EJournalManagerBean will be enhanced to populate the inclusive summary tax information into the TransactionDetailViewDTO (see "Web Modules Transaction View Bean Classes" for the view DTO) object returned from the api. The enhancement is for sale return transactions only.

```
public TransactionDetailViewDTO retrieveTransactionDetails(String keyString,
String dateString);
```

This function will collect all the group rule level tax information from each sales return line item and shipping record by calling getTaxInformation api on SaleReturnLineItemDTO and SaleReturnShippingRecordDTO (see "Commerce Service Transaction DTO Classes"), and summarize the taxable amount and tax amount for each unique tax group rule. A tax group rule is uniquely identified by tax authority ID, tax group ID, and tax type combined. It will then create an array of class com._360commerce.commerceservices.transaction.tax.GroupRuleTaxDTO (see "Commerce Service Transaction DTO Classes") containing tax summary information of each tax group rule for inclusive tax, and populate them to the TransactionDetailViewDTO object by calling its API setInclusiveTaxSummaryInformation.

Enhancing POSLog

For a retail transaction, all new elements created in the Database Schema such as VAT information, Shipping Tax information must also be included in the POSLog. Listed below are the new elements that need to be sent as part of the generated POSLog xml content.

- TR_RTL
  - MO_TX_INC_TOT

com.extendyourstore.domain.ixretail.transaction.v21.LogRetailTransaction class needs to be enhanced to include the above element in the addBaseElements(TransactionIfc transaction) method. See "Log Retail Transaction Class".

- TR_LTM_TX
  - MO_TX_INC

com.extendyourstore.domain.ixretail.transaction.v21.LogRetailTransaction class needs to be enhanced to include the above element in the makeTaxLineItems(SaleReturnTransactionIfc retailTrans) method

- TR_LTM_SLS_RTN
  - MO_VAT_INC_LN_ITM_RTN

com.extendyourstore.domain.ixretail.lineitem.v21. LogSaleReturnLineItem class needs to be enhanced to include the above element in the createElement(SaleReturnLineItemIfc srli,

TransactionIfc transaction,
Document doc,
Element el,
boolean voidFlag,
int sequenceNumber) method.

- TR_LTM_SLS_RTN_TX
  - MO_TX_INC_RTN_SLS_TOT (ELEMENT_TOTAL_INCLUSIVE_TAX_360)
  - FL_TX_INC (ATTRIBUTE_TAX_INCLUDED_IN_TAXABLE_AMOUNT_ FLAG)

com.extendyourstore.domain.ixretail.lineitem.v21.LogSaleReturnLineItem class needs to be enhanced to include the previous two elements in the createRetailTransactionTaxElements(SaleReturnLineItemIfc srli, RetailTransactionItemIfc el)

JdbcReadTransaction (selectSaleReturnLineItemTaxInformation(JdbcDataConnection dataConnection,

SaleReturnTransactionIfc transaction,
int lineItemSequenceNumber)) method needs to be modified to add two new columns

- OR_LTM
  - MO_TAX_INC_LN_ITM_RTN
- SHP_RDS_SLS_RTN
  - ID_GP_TX(ELEMENT_TAX_GROUP_ID_360)
  - MO_TX(ELEMENT_AMOUNT)
  - MO_TX_INC(ELEMENT_TAX_INCLUSIVE)

com.extendyourstore.domain.ixretail.lineitem.v21. LogSaleReturnLineItem class needs to be enhanced to include the above three elements in the addShippingDetails(SaleReturnLineItemIfc srli) method.

- SHP_RDS_SLS_RTN_TX
  - ID_ATHY_TX (ELEMENT_TAX_AUTHORITY)
  - ID_GP_TX (ELEMENT_TAX_GROUP_ID_360)
  - TY_TX (ELEMENT_TAX_TYPE_360)
  - FLG_TX_HDY (ELEMENT_TAX_HOLIDAY_360)
  - TX_MOD (ELEMENT_TAX_MODE_360)
  - MO_TXBL_RTN_SLS (ELEMENT_TAXABLE_AMOUNT)

  - FL_TX_INC (ATTRIBUTE_TAX_INCLUDED_IN_TAXABLE_AMOUNT_FLAG)
  - MO_TX_RTN_SLS (ELEMENT_AMOUNT)
  - MO_TX_RTN_SLS_TOT (ELEMENT_TOTAL_TAX_360)
  - MO_TX_INC_RTN_SLS_TOT (ELEMENT_TOTAL_INCLUSIVE_TAX_360)
  - NM_RU_TX (ELEMENT_TAX_RULE_ID_360)
  - PE_TX (ELEMENT_TAX_PERCENTAGE_RATE)
- Till/Workstation/Store History Fields
  - MO_RFD_INC_TX_TOT (ELEMENT_AMOUNT_INCLUSIVE_TAX_ITEM_SALES_360)
  - MO_RTN_INC_TX_TOT (ELEMENT_AMOUNT_INCLUSIVE_TAX_ITEM_RETURNS_360)
  - CP_SLS_ITM_INC_TX (ELEMENT_AMOUNT_INCLUSIVE_TAX_TRANSACTION_SALES_360)
  - CP_TRN_SLS_INC_TX (ELEMENT_AMOUNT_INCLUSIVE_TAX_TRANSACTION_SALES_360)
  - MO_SHP_CHR_TX_TOT (ELEMENT_AMOUNT_TAX_SHIPPING_CHARGES_360)
  - MO_SHP_CHR_INC_TX_TOT (ELEMENT_AMOUNT_INCLUSIVE_TAX_SHIPPING_CHARGES_360)
- Tax History Fields
  - FL_TX_INC (ELEMENT_INCLUSIVE_TAX_FLAG_360)

Seed Data Population

We will reuse the existing stores 04241 and 01291. The following seed data will be populated to facilitate VAT dev testing.

The db.properties tax.enableTaxInclusive flag is used to determine which rules are used by 04241 and 01291. When the flag is true, the stores will use the geo codes of the VAT seed data. If the flag is not defined (or false), stores 04241 and 01291 will use the existing tax rules geo codes.

VAT Tax Rule Seed Data

Two vat rules are created. Both of them will be associated with store 04241 and 01291. The following is a brief description of the rules.

Table B–1 describes Rule 1: Tax Authority Id8888600.

Table B–1 **Rule 1: Tax Authority Id8888600**

Tax Group ID	Name	Rate
8888640	S	17.5%
8888650	R	5%
8888660	Z	0%

Table B–2 describes Rule 2: Tax Authority Id8888601.

Table B–2 **Rule 2: Tax Authority Id8888601**

Tax Group ID	Name	Rate
8888670	S+	12.5%
8888680	R+	3%
8888690	Z+	0%

Point-of-Service Department Seed Data

The following Point-of-Service departments will be created. They will be associated with both stores.

Point-of-Service Department ID	Tax Group ID
8888602	8888640
8888603	8888670
8888604	Invalid tax group ID

Item Seed Data

A couple of items must be created for each tax group. The following table defines the item number range for each tax group. Among them, at least one kit header item containing a couple of kit components must be created for each group.

Tax Group ID	Item Number Range
8888640	8888640 - 8888649
8888650	8888650 - 8888659
8888660	8888660 - 8888669
8888670	8888670 - 8888679
8888680	8888680 - 8888689
8888690	8888690 - 8888699
Blank tax group	8888610 - 8888619
Invalid tax group	8888620 - 8888624
Non taxable	8888630 - 8888639

Shipping Method Seed Data

One shipping method must be created for each tax group.

Tax Group ID	Shipping Method ID
8888640	8888605
8888650	8888606
8888660	8888607
8888670	8888608
8888680	8888609
8888690	8888610

Tax Group ID	Shipping Method ID
Blank tax group	8888611
Invalid tax group	8888612
Non taxable	8888613

Sales Return Transaction Seed Data

A few sales return transactions with inclusive tax information must be created. At least one of them must include shipping records and shipping charge tax information. This is to facilitate CO transaction tracker development before CTR is enabled.

New or Changed Classes/Services

Only classes/modules which are either new, or contain modifications to existing classes/modules are described below. In the case where the described class/module exists, only changes to this class/module will be documented.

Adding Tax Inclusive Flag To Tax Group Rule

At tax group rule level, a Boolean flag will be added to indicate if the tax amount is already included in the item price. For DB schema enhancement, see "Tax Group Rule Table RU_TX_GP".

Business Objects

Two new member functions will be added to get/set the tax inclusive flag.

```
public boolean getTaxInclusiveFlag();// By default, it must return false
public void setTaxInclusiveFlag(boolean flag);
```

The following is a list of tax group rule interfaces/objects that will include the above two new methods.

- Domain interface com.extendyourstore.domain.tax.RunTimeTaxRuleIfc
- Domain object com.extendyourstore.domain.tax.AbstractTaxRule
- Domain object com.extendyourstore.domain.arts.FFTaxVO
- CommerceService object com._360commerce.commerceservices.tax.TaxGroupRuleDTO

Persistence Services

The following is a list of persistence classes that must be modified to load/save the tax inclusive flag from/to table RU_TX_GP.

- Member function NewTaxRuleIfc[] retrieveItemTaxRules(JdbcDataConnection dataConnection, int taxGroupID, String geoCode) in domain JDBC class com.extendyourstore.domain.arts.JdbcPLUOperation
- Member function NewTaxRuleIfc[] retrieveItemTaxRules(ArrayList ffTaxVOs) in domain JDBC class com.extendyourstore.domain.arts.JdbcReadNewTaxRules
- Member function buildFlatFile in domain JDBC class com.extendyourstore.domain.arts.JdbcNewTaxRuleBuildFFOperation
- Entity bean com._360commerce.commerceservices.tax.ejb.TaxGroupRuleBean

- Tax group rule DAO object com._ 360commerce.commerceservices.tax.dao.TaxGroupRuleDAO

Import Services

The tax group rule import handler com._ 360commerce.commerceservices.tax.importdata.TaxGroupRuleHandler must be updated to import the new tax inclusive flag.

Internal Tax Engine Classes

The following function will be added to com.extendyourstore.domain.tax.InternalTaxEngine to collect all the taxable line items, including the sales return line items and the send package line items.

```
protected TaxLineItemInformationIfc[]
collectTaxableLineItems(TaxLineItemInformationIfc[] lineitems,
TransactionTotalsIfc totals);
```

The calculateTax function in the internal tax engine class com.extendyourstore.domain.tax.InternalTaxEngine is responsible of calculating tax for all the taxable line items. It will be modified to call the above collectTaxableLineItems() to collect all the taxable line items.

```
public void calculateTax(TaxLineItemInformationIfc[] lineItems,
TransactionTotalsIfc totals
            , TransactionTaxIfc transactionTax)
{
….
lineItems = collectTaxableLineItems(lineItems, totals);
TaxRuleItemContainerIfc[] taxRuleItemContainer =
collectTaxRulesAddItems(lineItems, transactionTax);
…
}
```

Tax Rate Calculators

In addition to the exsiting com.extendyourstore.domain.tax.TaxRateCalculator class, a new com.extendyourstore.domain.tax.InclusiveTaxRateCalculator class will be added to perform rate based tax calculation for price inclusive tax. A new abstract base class com.extendyourstore.domain.tax.AbstractTaxRateCalculator is added to be the parent class.

Business Objects

Both TaxRateCalculator and InclusiveTaxRateCalculator classes will implement the following API:

```
public CurrencyIfc calculateTaxAmount(CurrencyIfc amount);
```

All other API specified by Interface TaxRateCalculatorIfc will be implemented in AbstractTaxRateCalculator class.

Domain Object Factory Service

The following two API will be added to domain object factory interface com.extendyourstore.domain.factory. DomainObjectFactoryIfc. The API will be implemented in com.extendyourstore.domain.factory. DomainObjectFactory class to return an (exclusive) tax or inclusive tax rate calculator based on the boolean flag passed in.

```
public TaxRateCalculatorIfc getTaxRateCalculatorInstance(boolean inclusiveTax);
public TaxRateCalculatorIfc getTaxRateCalculatorInstance(Locale locale, boolean
inclusiveTax);
```

Enhancing Domain Tax Interfaces/Classes

Tax Information Interface/Class

An instance of a domain tax information interface/class is used to hold tax amount for a sales return tax line item. Each instance is meant to represent a row in sales return tax line item table TR_LTM_SLS_RTN_TX. It must be enhanced to include an inclusive tax flag.

The following two new member functions will be added to interface com.extendyourstore.domain.tax.TaxInformationIfc and class com.extendyourstore.domain.tax.TaxInformation

```
public boolean getInclusiveTaxFlag();// by default, it is false
public void setInclusiveTaxFlag(boolean flag);
```

The following member function in abstract tax rule class com.extendyourstore.domain.tax.AbstractTaxRule is invoked by internal tax engine to create an instance of a tax information class. It populates the instance with attribute values from the tax rule. It must be enhanced to populate the tax rule's inclusive tax flag to the tax information instance.

```
public TaxInformationIfc createTaxInformation(int mode);
```

Tax Information Container Interface/Class

An instance of a domain tax information container interface/class is used to hold tax information generated during tax calculation process. It contains multiple instances of the tax information class. Its member function getTaxAmount() returns total tax amount of all the tax information instances added to the container. Since we are introducing inclusive tax, it must be enhanced to return inclusive and exclusive (add on) total tax amount respectively.

The following new member functions will be added to interface com.extendyourstore.domain.tax.TaxInformationContainerIfc and class com.extendyourstore.domain.tax.TaxInformationContainer to return inclusive tax total amount.

```
public CurrencyIfc getInclusiveTaxAmount();
```

The following existing member function will be enhanced to add the given tax information instance's tax amount to inclusive tax total if the instance's inclusive tax flag is true; otherwise it adds the tax amount to the exclusive tax total.

```
public void addTaxInformation(TaxInformationIfc taxInformation);
```

The existing member function getTaxAmount()will return exclusive tax total only.

Enhancing Transaction & Line Item Tax Interfaces/Classes

Transaction Totals Interface/Class

The transaction total interface/class must be enhanced to hold inclusive total tax amount. The following new access member functions will be added to transaction totals interface com.extendyourstore.domain.transaction.TransactionTotalsIfc and class com.extendyourstore.domain.transaction.TransactionTotals.

```
public CurrencyIfc getInclusiveTaxTotal();
public void setInclusiveTaxTotal(CurrencyIfc total);
```

To support VAT for shipping charges, this interface/class must also be enhanced to hold a vector of send package line items (see "Send Package Line Item Interface/Class" for its class definition), in stead of a vector of shipping methods and a different vector of the send customers. A send package line item combines a shipping method and a send customer into one data structure, and adds the additional support for shipping charges tax calculation.

The following methods will be removed.

```
public void addSendPackageInfo(ShippingMethodIfc shippingMethodUsed,
       CustomerIfc shippingToCustomer);
public Vector getShippingMethodAllSends();
public Vector getShippingToCustomerAllSends();
```

The following methods will be added.

```
public void addSendPackage(SendPackageLineItemIfc sendPackage);
public Vector getSendPackages();  //It returns a vector of send package line items
```

Item Tax Interface/Class

An instance of an item tax interface/class holds a transaction line item's tax data. Two enhancements will be made to the interface/class.

First of all, it must be enhanced to hold inclusive item tax amount. The following member functions will be added to the item tax interface com.extendyourstore.domain.lineitem.ItemTaxIfc and class com.extendyourstore.domain.lineitem.ItemTax.

```
public CurrencyIfc getItemInclusiveTaxAmount();
public void setItemInclusiveTaxAmount (CurrencyIfc amount);
```

The implementation of the following member functions in the item tax class must be enhanced to support the new inclusive item tax amount.

```
public ItemTax()// the constructor
public void clearTaxAmounts();
public void setCloneAttributes(ItemTax newClass);
public String toString();
public void translateFromElement(XMLConverterIfc converter);
```

Secondly, the following existing member function must be enhanced to create a default tax rule based on an inclusive tax flag (InclusiveTaxEnabled) in domain.properties.

```
public NewTaxRuleIfc[] getDefaultTaxRules();
```

If the default inclusive tax flag is true, a tax by line item rule is created with its inclusive tax flag set to true, and is associated with an inclusive tax rate calculator (see "Inclusive Tax Rate Calculator" for details on the inclusive tax rate calculator); Otherwise, a tax by line item rule is create with its inclusive tax flag set to false, and is associated with an (exclusive) tax rate calculator. The following new domain factory api will be used to create the correct tax rate calculator.

```
public TaxRateCalculatorIfc getTaxRateCalculatorInstance(boolean inclusiveTax);
```

For details on this API, see "Domain Object Factory Service".

Item Price Interface/Class

An instance of an item price interface/class holds a transaction line item's price data (including tax data). It contains an instance of the item tax interface. It must be enhanced to get/set inclusive item tax amount.

The following member functions will be added the item price interface com.extendyourstore.domain.lineitem.ItemPriceIfc and class com.extendyourstore.domain.lineitem.ItemPrice.The implementation of these functions must be delegated to the item tax object contained.

```
public CurrencyIfc getItemInclusiveTaxAmount();
public void setItemInclusiveTaxAmount (CurrencyIfc amount);
// This must call the recalculateItemTotal() to recalculate the item totals.
```

The implementation of the following member function in the item price class must be enhanced to support the new inclusive item tax amount.

```
public void recalculateItemTotal()
```

Tax Line Item Information Interface

This is an interface describing all the information the internal tax engine needs to perform the tax calculation of a transaction line item. The following API must be added to the interface com.extendyourstore.domain.lineitem.TaxLineItemInformationIfc to set the item inclusive tax amount.

```
public void setItemInclusiveTaxAmount(CurrencyIfc value);
```

Sale Return Line Item Class

This class com.extendyourstore.domain.lineitem.SaleReturnLineItem implements the tax line item information interface. It must implement the new api.

```
public CurrencyIfc getItemInclusiveTaxAmount();
public void setItemInclusiveTaxAmount(CurrencyIfc value);
```

It should delegate the task to the contained item price object.

Enhancing Financial Totals Interfaces/Classes

Financial Tax Totals Interface/Class

An instance of a domain financial tax totals interface/class is used to hold tax totals of sales return tax line items of the same tax group rule. It must be enhanced to include an inclusive tax flag.

The following new member functions will be added to interface com.extendyourstore.domain.financial.TaxTotalsIfc and class com.extendyourstore.domain.financial.TaxTotals

```
public boolean getInclusiveTaxFlag();// by default, it is false
public void setInclusiveTaxFlag(boolean flag);
```

An instance of the financial tax totals interface/class is created from an instance of the tax information interface/class (see "Tax Information Interface/Class") in the following member function of the sales return line item class com.extendyourstore.domain.lineitem.SaleReturnLineItem.

```
protected TaxTotalsIfc instantiateTaxTotalsIfc(TaxInformationIfc taxInfo);
```

This function must be enhanced to populate the tax information's inclusive tax flag to the financial tax totals.

Financial Totals Interface/Class

Add Support for Inclusive Tax The financial totals interface com.extendyourstore.domain.financial.FinancialTotalsIfc and class com.extendyourstore.domain.financial.FinancialTotals will be enhanced to hold inclusive tax.

The following member functions will be added to access/collect inclusive tax amount for items sold.

```
public CurrencyIfc getAmountInclusiveTaxItemSales();
public void setAmountInclusiveTaxItemSales(CurrencyIfc value);
public void addAmountInclusiveTaxItemSales(CurrencyIfc value);
```

The following member functions will be added to access/collect inclusive tax amount for items returned.

```
public CurrencyIfc getAmountInclusiveTaxItemReturns();
public void setAmountInclusiveTaxItemReturns(CurrencyIfc value);
public void addAmountInclusiveTaxItemReturns(CurrencyIfc value);
```

The following member functions will be added to access/collect inclusive tax amount on sales transactions.

```
public CurrencyIfc getAmountInclusiveTaxTransactionSales();
public void setAmountInclusiveTaxTransactionSales(CurrencyIfc value);
public void addAmountInclusiveTaxTransactionSales(CurrencyIfc value);
```

The following member functions will be added to access/collect inclusive tax amount on returns transactions.

```
public CurrencyIfc getAmountInclusiveTaxTransactionReturns();
public void setAmountInclusiveTaxTransactionReturns(CurrencyIfc value);
public void addAmountInclusiveTaxTransactionReturns(CurrencyIfc value);
```

Add Support for Shipping Charges Tax The financial totals interface/class must also be enhanced to track tax for shipping charges. The following member function will be added.

```
public CurrencyIfc getAmountTaxShippingCharges();
public void setAmountTaxShippingCharges(CurrencyIfc value);
public void addAmountTaxShippingCharges (CurrencyIfc value);
public CurrencyIfc getAmountInclusiveTaxShippingCharges();
public void setAmountInclusiveTaxShippingCharges(CurrencyIfc value);
public void addAmountInclusiveTaxShippingCharges (CurrencyIfc value);
```

These functions will be used by the following api of the send package line item to populate financial total information for shipping charges tax. See "Send Package Line Item Interface/Class" for more details.

```
public FinancialTotalsIfc getFinancialTotals(boolean isNotVoid);
```

Shipping Method Interface/Class

The shipping method interface com.extendyourstore.domain.financial.ShippingMethodIfc and class com.extendyourstore.domain.financial.ShippingMethod will be enhanced to hold the additional taxable flag, tax group id, and tax rules. For schema enhancement of the ship method, see "Shipping Methods Table CO_SHP_MTH".

The following get/set member functions are added to the interface and class.

```
public boolean getTaxable();
public void setTaxable(boolean taxable);
public int getTaxGroupID();
public void setTaxGroupID(int taxGroupID);
public NewTaxRuleIfc[] getTaxRules() ;
public void setTaxRules(NewTaxRuleIfc[] rules);
```

Send Package Line Item Interface/Class

A new send package line item interface and class will be added to support tax calculation for shipping charges.

The send package line item interface com.extendyourstore.domain.lineitem.SendPackageLineItemIfc extends from the tax line item interface com.extendyourstore.domain.lineitem.TaxLineItemInformationIfc. By extending the tax line item interface, it defines all the information the internal tax engine needs to perform tax calculation on shipping charges. The following is a complete description of the interface. It contains an instance of a shipping method, a send customer, and an item tax. The shipping method instance (ShippingMethodIfc) contains all the details of a shipping method, such as method id, carrier, and shipping charges etc. The item tax instance contains all the tax information of shipping charges.

```
import com.extendyourstore.domain.financial.ShippingMethodIfc;
import com.extendyourstore.domain.customer.CustomerIfc;
import com.extendyourstore.domain.lineitem.ItemTaxIfc;
public interface SendPackageLineItemIfc extends TaxLineItemInformationIfc,
EYSDomainIfc
{
ShippingMethodLineItem(ShippingMethodIfc shippingMethod, CustomerIfc customer);//
item tax is null
ShippingMethodLineItem(ShippingMethodIfc shippingMethod, CustomerIfc customer,
ItemTaxIfc tax);
public ShippingMethodIfc getShippingMethod();
public void setShippingMethod(ShippingMethodIfc shippingMethod);
public CustomerIfc getCustomer();
public void setCustomer(CustomerIfc customer);
protected ItemTaxIfc getItemTax();
protected void setItemTax(ItemTaxIfc itemTax);
}
```

The send package line item class implements all the methods defined in send package line item interface. The following is a complete list of its member functions.

- This function initializes the line item by setting its shipping method, send customer, and item tax instances.

```
public void initialize(ShippingMethodIfc shippingMethod, CustomerIfc customer,
ItemTaxIfc tax);
```

- These two are the get/set functions for the shipping method.

```
public ShippingMethodIfc getShippingMethod();
public void setShippingMethod(ShippingMethodIfc shippingMethod);
```

- These two are the get/set functions for the send customer.

```
public CustomerIfc getCustomer();
public void setCustomer(CustomerIfc customer);
```

- These two are the get/set functions for the item tax.

```
public ItemTaxIfc getItemTax();
public void setItemTax(ItemTaxIfc itemTax);
```

- This function returns the active tax rules. See "Enhancing Sale Return Transaction Interface/Class" to see the logic in determining this shipping method line item's active tax rules.

```
public RunTimeTaxRuleIfc[] getActiveTaxRules();
```

- This should always return false indicating that tax on shipping charges can never be overridden by transaction level tax modifications.

```
public boolean canTransactionOverrideTaxRules();
```

- This function is called before a tax calculation to clear all the tax amounts previously saved. It should delegate the task by calling the clearTaxAmounts function on item tax.

```
public void clearTaxAmounts();
```

- This function returns the taxable amount when the tax rule is set up to use the discounted amount. In this case, it is equivalent to the calculated shipping charges of the shipping method. It should delegate the task by calling the getCalculatedShippingCharge function on the shipping method.

```
public CurrencyIfc getExtendedDiscountedSellingPrice();
```

- This function returns the taxable amount when the tax rule is set up to use the pre-discounted amount. Since no discount is ever applied to shipping charges, this function should just call the getExtendedDiscountedSellingPrice to return the same calculated shipping charges.

```
public CurrencyIfc getExtendedSellingPrice();
```

- This function retrieves the tax information container that the tax calculation results are placed. It should delegate the task by calling getTaxInformationContainer function on item tax.

```
public TaxInformationContainerIfc getTaxInformationContainer();
```

- This function gets the exclusive (add on) tax amount for the shipping charges. It should delegate the task by calling getItemTaxAmount function on item tax.

```
public CurrencyIfc getItemTaxAmount();
```

- This function sets the exclusive (add on) tax amount for the shipping charges. It should delegate the task by calling setItemTaxAmount function on item tax.

  ```
  public void setItemTaxAmount(CurrencyIfc value);
  ```

- This function gets the inclusive tax amount for the shipping charges. It should delegate the task by calling getItemInclusiveTaxAmount function on item tax.

  ```
  public CurrencyIfc getItemInclusiveTaxAmount();
  ```

- This function sets the inclusive tax amount for the shipping charges. It should delegate the task by calling setItemInclusiveTaxAmount function on item tax.

  ```
  public void setItemInclusiveTaxAmount(CurrencyIfc value);
  ```

- This function returns the identifier that uniquely identifies this item. It should delegate the task by calling getLineItemTaxIdentifier on item tax.

  ```
  public int getLineItemTaxIdentifier();
  ```

- This function returns default tax rules when none can be found in the database. It should delegate the task by calling getDefaultTaxRules() on item tax.

  ```
  public NewTaxRuleIfc[] getDefaultTaxRules();
  ```

- This function gets the tax mode. It should delegate the task by calling getTaxMode function on item tax.

  ```
  public int getTaxMode();
  ```

- This function sets the tax mode. It should delegate the task by calling setTaxMode function on item tax.

  ```
  public void setTaxMode(int value);
  ```

- This function must always return false. Shipping charges are not treated as kit header.

  ```
  public boolean isKitHeader();
  ```

- This function sets the tax scope (transaction or item). It should delegate the task by calling setTaxScope function on item tax.

  ```
  public void setTaxScope(int scope);
  ```

- This function returns the tax scope (transaction or item). It should delegate the task by calling getTaxScope function on item tax.

  ```
  public int getTaxScope();
  ```

- This function returns a flag indicating if this send package line item came from an already tendered transaction retrieved from the database.

  ```
  public boolean isFromTransaction();
  ```

- This function set the from transaction flag indicating if this send package line item came from an already tendered transaction retrieved from the database.

  ```
  public void setFromTransaction(boolean val);
  ```

- This function returns the financial totals of a send package line item.

  ```
  public FinancialTotalsIfc getFinancialTotals(boolean isNotVoid);
  ```

If isNotVoid flag is false, the financial data will be negated. It will add the following information to the financial totals.

```
financialTotals.addAmountShippingCharges
financialTotals.addNumberShippingCharges
financialTotals.addAmountTaxShippingCharges
financialTotals.addAmountInclusiveTaxShippingCharges
financialTotals.addTaxes// This adds all the tax at the group rule level based
on // the information saved in the tax information container // of this line
item.
```

- This function returns a clone of this line item.

```
public Object clone();
```

- Determine if two objects are identical.

```
public boolean equals(Object obj);
```

- Method to default display string function

```
public String toString();
```

The following section depicts the logic in determining the active tax rules for the send package line item.

```
If this line item is from a tendered transaction retrieved from db
(isFromTransaction() is true)
Then do not recalculate tax and return an array of reverse tax rules based on the
tax information saved in the line item. For an example on how to get reverse tax
rules, see protected function reverseItemTaxRuleIfc[] getReverseTaxRules() in
class com.extendyourstore.domain.lineitem.SaleReturnLineItem.
Else if the shipping method is not taxable (getShippingMethod().getTaxable() is
false)
Then return an array of tax rules of size 0
Else if this shipping method has at least one tax rules
(getShippingMethod().getTaxRules().size() > 0)
Then return the shipping method's tax rules
Else call getDefaultTaxRules() to return an array of default tax rules.
```

Enhancing Sale Return Transaction Interface/Class

The following two methods will be added to the sale return transaction interface com.extendyourstore.domain.transaction.SaleReturnTransactionIfc and class com.extendyourstore.domain.transaction.SaleReturnTransaction to support adding and updating send (shipping) packages.

```
public void addSendPackageInfo(ShippingMethodIfc shippingMethodUsed,
CustomerIfc shippingToCustomer);
```

This function will create a send package line item based of the shipping method and customer passed in, and adds the line item to the transaction totals. It will invoke the addSendPackage method on the transaction totals to do the adding (see "Transaction Totals Interface/Class" for more details on the transaction totals method).

```
public void updateSendPackageInfo(int index, ShippingMethodIfc shippingMethodUsed,
CustomerIfc shippingToCustomer);
```

This function will create a send package line item based of the shipping method and customer passed in, and set the line item at the location specified by the index. The index is an index to the send package line item vector returned by getSendPackages() function in the transaction totals class (see "Transaction Totals Interface/Class" for more details on the transaction totals method).

The following code illustrates how a send package line item is created from a shipping method and customer in the sales return transaction class.

```
public void addSendPackageInfo(ShippingMethodIfc shippingMethodUsed,
            CustomerIfc shippingToCustomer);
{
…..
ItemTax itemTax =
itemProxy.initializeItemTax.(getTransactionTax().getDefaultRate(),
            shippingMethodUsed.getTaxable());
SendPackageLineItemIfclineItem=newSendPackageLineItem(shippingMethodUsed,
shippingToCustomer, itemTax);
…..
}
```

Enhancing POSLog Interface/Class

Log Retail Transaction Class

The implementation of the following member functions in the LogRetailTransaction class must be enhanced to support the new inclusive item tax amount.

```
protected void addBaseElements(TransactionIfc transaction)
getItemInclusiveTaxAmount()
void makeTaxLineItems(SaleReturnTransactionIfc retailTrans)
```

Log Sale Return Line Item Class

The implementation of the following member functions in the LogSaleReturnLineItem class must be enhanced to support the new getInclusiveTaxFlag() and the getItemInclusiveTaxAmount().

```
public Element createElement(SaleReturnLineItemIfc srli,
                             TransactionIfc transaction,
                             Document doc,
                             Element el,
                             boolean voidFlag,
                             int sequenceNumber)
protected createRetailTransactionTaxElements(SaleReturnLineItemIfc srli,
RetailTransactionItemIfc el)
```

The implementation of the following member functions in the LogSaleReturnLineItem class must be enhanced to support the new shipping details.

```
RetailTransactionDelivery360Ifc addShippingDetails(SaleReturnLineItemIfc srli)
```

IXRetail Constants V21 Ifc Class

This is an interface describing all elements/attributes of a POSLog xml file as constants to be used from other POSLog java classes.

Retail Transaction Delivery 360 Ifc Interface/Class

The implementation of the following member functions in the RetailTransactionDelivery360Ifc and class must be enhanced to support the new shipping elements.

```
public Element createElementDetails()
```

New getter/setter methods must be added in the interface/class for all the new elements of shipping information.

```
Public RetailTransactionTaxIfc [] getShippingTax()
Public void setShippingTax(RetailTransactionTaxIfc [])
```

Schema Types Factory Ifc Interface/Class

A new member function must be added in the SchemaTypesFactoryIfc to return an instance of the ShippingTax360 class.

Retail Transaction Line Item Ifc Interface/Class

New member functions must be added to RetailTransactionLineItem interface/class to support the additional elements for the POSLog xml content.

For the Import POSLog, the following changes need to be made:

XmlToSqlTaxHistoryInsert Class The field_flag_tax_inclusive needs to inserted to the HST_TX Table. This will retrieved from the POSLog xml file.

XmlToSqlFinancialTotalsCommon Class The six new till/store/workstation history fields need to be added. Also logic for calculating the cp_inc_tx_tot column in the history table needs to be added i.e. , getNetInclusiveTaxAmount.

The seven new fields are

- FIELD_STORE_INCLUSIVE_TAX_TOTAL_AMOUNT
- FIELD_STORE_REFUND_INCLUSIVE_TAX_TOTAL_AMOUNT
- FIELD_STORE_RETURN_INCLUSIVE_TAX_TOTAL_AMOUNT
- FIELD_STORE_ITEM_SALES_INCLUSIVE_TAX_AMOUNT
- FIELD_STORE_TRANSACTION_SALES_INCLUSIVE_TAX_AMOUNT
- FIELD_STORE_SHIPPING_CHARGE_TAX_AMOUNT
- FIELD_STORE_SHIPPING_CHARGE_INCLUSIVE_TAX_AMOUNT

XmlToSqlDeliveryTax Class New Class needs to be created to insert values from the POSLog to the ShippingRecord Tax Table.

JdbcSaveIXRetailRetailTransaction Class SaveTransactionDetail() method of this class needs to be enhanced to make a call to a new method :

saveShippingRecordTax(dataConnection, transaction); - This method will make a call to the XmlToSqlDeliveryTax to insert records into the SHP_RDS_SLS_RTN_TX table.

360POSLogLibrary.xsd Schema changes must be done to include all the new fields for the various element types defined in the 360POSLogLibrary xsd file.

Commerce Service Transaction DTO Classes

Retail Transaction DTO

The existing retail transaction DTO class com._360commerce.commerceservices.transaction.RetailTransactionDTO will be modified to have the following additional get/set methods for the newly added column to table TR_RTL (see "Retail Transaction Table TR_RTL").

```
public BigDecimal getInclusiveTaxTotal();
public void setInclusiveTaxTotal(BigDecimal total);
```

Transaction Group Rule Tax DTO

The group rule tax DTO class com._360commerce.commerceservices.transaction.tax.GroupRuleTaxDTO will be created to hold a transaction's tax information at the group rule level. It is the base class for sale return line item tax dto and shipping record tax dto classes. It will contain the following methods.

```
public String getStoreID();
public void setStoreID(String storied);
public String getWorkstationID();
public void setWorkstationID(String workstationId);
public Date getBusinessDate();
public void setBusinessDate(Date date);
public int getTransactionSequenceNumber();
public void setTransactionSequenceNumber(int number);
public int getTaxAuthorityId();
public void setTaxAuthorityId(int id);
public int getTaxGroupId();
public void setTaxGroupId(int id);
public int getTaxType();
public void setTaxType(int type);
public boolean getTaxHolidayFlag();
public void setTaxHolidayFlag(boolean flag);
public int getTaxMode();
public void setTaxMode(int mode);
public BigDecimal getTaxableAmount();
public void setTaxableAmount(BigDecimal amount);
public boolean getInclusiveTaxFlag();
public void setInclusiveTaxFlag(boolean flag);
public BigDecimal getTaxAmount();
public void setTaxAmount(BigDecimal amount);
public String getTaxRuleName();
public void setTaxRuleName(String name);
public BigDecimal getTaxPercentage();
public void setTaxPercentage(BigDecimal percentage);
public String getUniqueID();
public void setUniqueID(String id);
public Date getCreationTimeStamp();
void public setCreationTimeStamp(Date timestamp);
public Date getModificationTimeStamp();
void public setModificationTimeStamp(Date timestamp);
```

Sale Return Line Item Tax DTO

The sale return line item tax DTO class com._360commerce.commerceservices.transaction.salereturn.SaleReturnLineItemTaxDTO will be created to hold information for a row in sale return line item tax table TR_LTM_SLS_RTN_TX (see "Sales Return Tax Line Item Table TR_LTM_SLS_RTN_TX"). It will contain get/set methods for each column in the row. It extends the transaction group rule tax dto class com._360commerce.commerceservices.transaction.tax.GroupRuleTaxDTO. In addition to the methods inherited from its base class, it will have the following additional methods.

```
public int getLineItemSequenceNumber();
public void setLineItemSequenceNumber(int number);
public BigDecimal getLineItemTaxAmount();
public void setLineItemTaxAmount(BigDecimla amount);
public BigDecimal getLIneItemInclusiveTaxAmount();
public void setLineItemInclusiveTaxAmount(BigDecimal amount);
```

Sale Return Line Item DTO

This existing sale return line item DTO class com._360commerce.commerceservices.transaction.salereturn.SaleReturnLineItemDTO will be modified to have the additional methods to get/set line item tax for tax columns in table TR_LTM_SLS_RTN (see "Sales Return Line Item Table TR_LTM_SLS_RTN").

```
public BigDecimal getTax();    // This one is missing from the class
public void setTax(BigDecimal tax);    // This one is missing from the class
public BigDecimal getInclusiveTax();// add this one for the new column
public void setInclusiveTax(BigDecimal inclusiveTax);// add this one for the new
column
```

It will also be enhanced to take an array of sale return line item tax DTO objects. The following methods will be added.

```
public SaleReturnLineItemTaxDTO[] getTaxInformation();
public void setTaxInformation(SaleReturnLineItemTaxDTO[] dtos);
```

Shipping Record Tax DTO

The shipping record tax DTO class com._360commerce.commerceservices.transaction.shipping.SaleReturnShippingRecordTaxDTO will be created to hold information for a row in shipping record tax table SHP_RDS_SLS_RTN_TX (see "Shipping Record Tax Table SHP_RDS_SLS_RTN_TX"). It will contain get/set methods for each column in the row. It extends the transaction group rule tax dto class com._360commerce.commerceservices.transaction.tax.GroupRuleTaxDTO. In addition to the methods inherited from its base class, it will have the following additional methods.

```
public int getSendLabelCount();
public void setSendLabelCount(int count);
public BigDecimal getSendTaxAmount();
public void setSendTaxAmount(BigDecimla amount);
public BigDecimal getSendInclusiveTaxAmount();
public void setSendInclusiveTaxAmount(BigDecimal amount);
```

Shipping Record DTO

This existing shipping record DTO class com._360commerce.commerceservices.transaction.shipping.SaleReturnShippingRecordDTO will be modified to have the additional get/set methods for the newly added columns in table SHP_RDS_SLS_RTN (see "Shipping Record Table SHP_RDS_SLS_RTN").

```
public int getTaxGroupId();
public void setTaxGroupId(int taxGroupId);
public BigDecimal getTax();
public void setTax(BigDecimal tax);
public BigDecimal getInclusiveTax();
public void setInclusiveTax(BigDecimal inclusiveTax);
```

It will also be enhanced to take an array of shipping record tax DTO objects. The following methods will be added.

```
public SaleReturnShippingRecordTaxDTO[] getTaxInformation();
public void setTaxInformation(SaleReturnShippingRecordTaxDTO[] dtos);
```

Web Modules Transaction View Bean Classes

An instance of a transaction view bean class com._ 360commerce.webmodules.transaction.app.TransactionDetailViewDTO serves as a bean for jsp pages to render transaction details display. It must be enhanced to hold transaction summary tax information broken down by tax group rules. An array of group rule tax DTO objects of class com._ 360commerce.commerceservices.transaction.tax.GroupRuleTaxDTO will be added for inclusive tax summary. The following api will be added to access the array.

```
public GroupRuleTaxDTO[] getInclusiveTaxSummaryInformation();
public void setInclusiveTaxSummaryInformation(GroupRuleTaxDTO[] taxInformation);
```

The array will be populated in transaction manager bean when a transaction is retrieved (see "Enhancing Transaction Manager Bean").

Database Design / Changes -- Tables /Views

Tax Group Rule Table RU_TX_GP

For each tax group rule, A Boolean flag will be added to indicate if the tax amount is already included in the item price. The following column is added to table RU_TX_GP for this purpose. Its two possible values are '0' or '1', with '0' being the default.

```
   FL_TX_INC             CHAR(1)         DEFAULT '0'// InclusiveTaxFlag
```

Retail Transaction Table TR_RTL

In addition to the exclusive (add on) tax, this table must be enhanced to store inclusive tax. A decimal column is added to store the inclusive tax amount at the transaction level.

```
MO_TAX_INC_TOT             DECIMAL(13,2)   DEFAULT 0//
TransactionInclusiveTaxTotal
```

Tax Line Item Table TR_LTM_TX

In addition to the exclusive (add on) tax, this table must be enhanced to store inclusive tax. A decimal column is added to store the inclusive tax amount at the transaction level.

```
MO_TX_INC             DECIMAL(13,2)   DEFAULT 0// InclusiveTaxAmount
```

Sales Return Line Item Table TR_LTM_SLS_RTN

In addition to the exclusive (add on) tax, this table must be enhanced to store inclusive tax. A decimal column is added to store the inclusive tax amount at the line item level.

```
MO_TAX_INC_LN_ITM_RTN       DECIMAL(13,2)   DEFAULT 0
                                            //SaleReturnLineItemInclusiveTaxAmount
```

Sales Return Tax Line Item Table TR_LTM_SLS_RTN_TX

Each row of this table stores the tax information at the tax group rule level of a line item. Two enhancements will be made to this table. First of all, a Boolean inclusive tax flag will be added to indicate if the stored tax mount is inclusive or exclusive of the item price. Second, a decimal column will be added to store the inclusive tax amount at the line item level.

```
FL_TX_INC               CHAR(1)         DEFAULT '0'// InclusiveTaxFlag
MO_TX_INC_RTN_SLS_TOT   DECIMAL(16,5)   DEFAULT 0 NOT NULL
                                           //InclusiveTaxAmountTotal
```

Order Item Table OR_LTM

In addition to the exclusive (add on) tax, this table must be enhanced to store inclusive tax. A decimal column is added to store the inclusive tax amount at the order item level.

```
MO_TAX_INC_LN_ITM_RTN       DECIMAL(13,2)   DEFAULT 0
// OrderLineItemInclusiveTaxAmount
```

Point-of-Service Department History Table LE_HST_PS_DPT

In addition to the exclusive (add on) tax, this table must be enhanced to store inclusive tax. Three decimal columns are added to store the inclusive net tax, sales tax, and returns tax at Point-of-Service department level.

```
CP_INC_TX_TOT             DECIMAL(13,2) DEFAULT 0,
CP_SLS_ITM_INC_TX         DECIMAL(13,2) DEFAULT 0,
CP_RTN_INC_TX_TOT         DECIMAL(13,2) DEFAULT 0,
```

Till History Table LE_HST_TL

In addition to the exclusive (add on) tax, this table must be enhanced to store inclusive tax. Five decimal columns are added to store the inclusive net tax, refund tax, returns tax, item sales tax, and transaction sales tax at the till level.

```
CP_INC_TX_TOT             DECIMAL(13,2) DEFAULT 0,
MO_RFD_INC_TX_TOT         DECIMAL(13,2) DEFAULT 0,
MO_RTN_INC_TX_TOT         DECIMAL(13,2) DEFAULT 0,
CP_SLS_ITM_INC_TX         DECIMAL(13,2) DEFAULT 0,
CP_TRN_SLS_INC_TX         DECIMAL(13,2) DEFAULT 0,
```

To support tax for shipping charges, two decimal columns must be added to store inclusive and exclusive shipping charges tax totals.

```
MO_SHP_CHR_TX_TOT         DECIMAL(13,2) DEFAULT 0,
MO_SHP_CHR_INC_TX_TOT     DECIMAL(13,2) DEFAULT 0
```

Register History Table LE_HST_WS

In addition to the exclusive (add on) tax, this table must be enhanced to store inclusive tax. Five decimal columns are added to store the inclusive net tax, refund tax, returns tax, item sales tax, and transaction sales tax at the register level.

```
CP_INC_TX_TOT             DECIMAL(13,2) DEFAULT 0,
MO_RFD_INC_TX_TOT         DECIMAL(13,2) DEFAULT 0,
MO_RTN_INC_TX_TOT         DECIMAL(13,2) DEFAULT 0,
CP_SLS_ITM_INC_TX         DECIMAL(13,2) DEFAULT 0,
CP_TRN_SLS_INC_TX         DECIMAL(13,2) DEFAULT 0,
```

To support tax for shipping charges, two decimal columns must be added to store inclusive and exclusive shipping charges tax totals.

```
MO_SHP_CHR_TX_TOT         DECIMAL(13,2) DEFAULT 0,
MO_SHP_CHR_INC_TX_TOT     DECIMAL(13,2) DEFAULT 0
```

Store History Table LE_HST_STR

In addition to the exclusive (add on) tax, this table must be enhanced to store inclusive tax. Five decimal columns are added to store the inclusive net tax, refund tax, returns tax, item sales tax, and transaction sales tax at the store level.

```
CP_INC_TX_TOT             DECIMAL(13,2) DEFAULT 0,
MO_RFD_INC_TX_TOT         DECIMAL(13,2) DEFAULT 0,
MO_RTN_INC_TX_TOT         DECIMAL(13,2) DEFAULT 0,
CP_SLS_ITM_INC_TX         DECIMAL(13,2) DEFAULT 0,
CP_TRN_SLS_INC_TX         DECIMAL(13,2) DEFAULT 0
```

To support tax for shipping charges, two decimal columns must be added to store inclusive and exclusive shipping charges tax totals.

```
MO_SHP_CHR_TX_TOT         DECIMAL(13,2) DEFAULT 0,
MO_SHP_CHR_INC_TX_TOT     DECIMAL(13,2) DEFAULT 0
```

Tax History Table HST_TX

For each tax history row, A Boolean column will be added to indicate if the tax amount is already included in the item price. Its two possible values are '0' or '1', with '0' being the default.

```
FL_TX_INC             CHAR(1)         DEFAULT '0'
```

Shipping Methods Table CO_SHP_MTH

Since shipping charges are subject to VAT, a tax group id and taxable flag columns will be added to each row in the shipping method table.

```
LU_EXM_TX         VARCHAR(20),
ID_GP_TX          INTEGER         DEFAULT 0,
```

Shipping Record Table SHP_RDS_SLS_RTN

Since shipping charges are subject to VAT, tax columns are added to the table to record tax group id, inclusive and exclusive (add on) tax amounts.

```
ID_GP_TX           INTEGER         DEFAULT 0,
MO_TX              DECIMAL(13,2)   DEFAULT 0,
MO_TX_INC          DECIMAL(13,2)   DEFAULT 0,
```

Shipping Record Tax Table SHP_RDS_SLS_RTN_TX

This new table will be created to store detailed shipping charges tax information at the tax group rule level of each shipping record.

```
    ID_STR_RT           VARCHAR(5)      NOT NULL,// store id
    ID_WS               VARCHAR(3)      NOT NULL,// register id
    DC_DY_BSN           VARCHAR(10)     NOT NULL,// business date
    AI_TRN              INTEGER         NOT NULL,// transaction sequence number
    CNT_SND_LAB         SMALLINT        DEFAULT 0 NOT NULL,// send label count
    ID_ATHY_TX          INTEGER         DEFAULT 0 NOT NULL,    // tax authority id
    ID_GP_TX            INTEGER         DEFAULT 0 NOT NULL,// tax group id
    TY_TX               INTEGER         DEFAULT 0 NOT NULL,// tax type
    FLG_TX_HDY          CHAR(1)         DEFAULT '0' NOT NULL,// tax holiday flag
    TX_MOD              INTEGER         DEFAULT 0 NOT NULL,// tax mode
    MO_TXBL_RTN_SLS     DECIMAL(16,5)   DEFAULT 0 NOT NULL,// taxable amount
    FL_TX_INC           CHAR(1)         DEFAULT '0',// inclusive tax flag
    MO_TX_RTN_SLS       DECIMAL(16,5)   DEFAULT 0 NOT NULL,// tax amount
    MO_TX_RTN_SLS_TOT   DECIMAL(16,5)   DEFAULT 0 NOT NULL,
// total add on tax amount at shipping record level
    MO_TX_INC_RTN_SLS_TOT   DECIMAL(16,5)   DEFAULT 0 NOT NULL
// total inclusive tax amount at shipping record level
    NM_RU_TX            VARCHAR(40)     DEFAULT 'LOCAL TAX',// tax rule name
    PE_TX               DECIMAL(8,5)    DEFAULT 8.25 NOT NULL,// tax percentage
    ID_UNQ                 VARCHAR(35)     DEFAULT '1001-0-0' NOT NULL,
//Unique Id which is authorityId-groupId-taxType
    TS_CRT_RCRD     TIMESTAMP,// creation time stamp
    TS_MDF_RCRD     TIMESTAMP// modification time stamp
```

The primary keys are:

```
ID_STR_RT
ID_WS
DC_DY_BSN
AI_TRN
CNT_SND_LAB
ID_ATHY_TX
ID_GP_TX
TY_TX
```

Permanent Price Change Rule Table TR_CHN_PRN_PRC

A new column “Applied On” is added in the PermanentPriceChange Rule table, which indicates whether the pricechange applied is on the MRP or on the Selling Retail.

```
APPLIED_ON              VARCHAR2(20)      NULLABLE//applied on
```

Temporary Price Change Table TR_CHN_TMP_PRC

A new column “Applied On” is added in the TemporaryPriceChange Rule table, which indicates whether the promotion applied is on the MRP or on the Selling Retail.

```
APPLIED_ON              VARCHAR2(20)      NULLABLE//applied on
```

Temporary Price Change Item Table MA_ITM_TMP_PRC_CHN

New columns "MaximumRetailPrice", "Activation Date","InactivationDate","Primary Flag" and " Active Flag" are added in the PermanentPriceChangeItem table. The table identifies the permanet price for a given item-location-mrp combination for a date. The

MaximumRetailPrice column is added as part of the existing composite primary key (EventId, RetailStoreId, and ItemId).

```
TS_MRP_ACTV                TIMESTAMP(9)          NULLABLE//Activation
DateTimeStamp for MaximumRetailPrice
TS_MRP_INACTV              TIMESTAMP(9)          NULLABLE//Inactivation
DateTimeStamp for MaximumRetailPrice
SC_PRMY_PRC_MXM_RT         CHAR(1)               NULLABLE//Status Flag which
indicates whether MRP is primary or not
SC_ACTV_PRC_MXM_RT         CHAR(1)               NULLABLE//Status code indicating
MRP is active or not
PRC_MXM_RT                 DECIMAL(7,2)           NULLABLE//Maximum Retail Price
```

The primary keys are:

```
PRC_MXM_RT
ID_EV
ID_STR_RT
ID_ITM
```

Permanent Price Change Item Table MA_ITM_PRN_PRC_ITM

New columns "MaximumRetailPrice", "Activation Date","InactivationDate","Primary Flag" and " Active Flag" are added in the PermanentPriceChangeItem table. The table identifies the permanet price for a given item-loc-mrp for a date. The MaximumRetailPrice column is added as part of the existing composite primary key (EventId, RetailStoreId, ItemId).

```
TS_MRP_ACTV                TIMESTAMP(9)          NULLABLE//Activation
DateTimeStamp for MaximumRetailPrice
TS_MRP_INACTV              TIMESTAMP(9)          NULLABLE//Inactivation
DateTimeStamp for MaximumRetailPrice
SC_PRMY_PRC_MXM_RT         CHAR(1)               NULLABLE//Status Flag which
indicates whether MRP is primary or not
SC_ACTV_PRC_MXM_RT         CHAR(1)               NULLABLE//Status code indicating
MRP is active or not
PRC_MXM_RT                 DECIMAL(7,2)          NULLABLE//Maximum Retail Price
```

The primary keys are:

```
PRC_MXM_RT
ID_EV
ID_STR_RT
ID_ITM
```

TEMPRORAY PRICE CHANGE View

New columns "MaximumRetailPrice", "Activation Date","InactivationDate","Primary Flag","Applied On" and " Active Flag" is added in the TEMPORARY_PRICE_ CHANGE view. This view identifies the temporary price for a given item-loc-mrp for a date.

```
TS_MRP_ACTV                TIMESTAMP(9)          NULLABLE//Activation
DateTimeStamp for MaximumRetailPrice
TS_MRP_INACTV              TIMESTAMP(9)          NULLABLE//Inactivation
DateTimeStamp for MaximumRetailPrice
SC_PRMY_PRC_MXM_RT         CHAR(1)               NULLABLE//Status Flag which
indicates whether MRP is primary or not
SC_ACTV_PRC_MXM_RT         CHAR(1)               NULLABLE//Status code indicating
```

```
MRP is active or not
PRC_MXM_RT                  DECIMAL(7,2)          NULLABLE//Maximum Retail Price
APLY_ON                     VARCHAR2(20)          NULLABLE//Applied On
```

The primary key includes:

```
PRC_MXM_RT
```

PERMANENT_PRICE_CHANGE View

New columns "MaximumRetailPrice", "Activation Date","InactivationDate","Primary Flag","Applied On" and " Active Flag"needs to be added in the PERMANENT_ PRICE_CHANGE view, which will identify the permanet price for a given item-loc-mrp for a date.

```
TS_MRP_ACTV                 TIMESTAMP(9)          NULLABLE//Activation
DateTimeStamp for MaximumRetailPrice
TS_MRP_INACTV               TIMESTAMP(9)          NULLABLE//Inactivation
DateTimeStamp for MaximumRetailPrice
SC_PRMY_PRC_MXM_RT          CHAR(1)               NULLABLE//Status Flag which
indicates whether MRP is primary or not
SC_ACTV_PRC_MXM_RT          CHAR(1)               NULLABLE//Status code indicating
MRP is active or not
PRC_MXM_RT                  DECIMAL(7,2)          NULLABLE//Maximum Retail Price
APLY_ON                     VARCHAR2(20)          NULLABLE//Applied On
```

The primary key includes:

```
PRC_MXM_RT
```

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Appendix: Changing Currency

In order to switch to another base and alternate currency, perform the following steps:

1. Set the base currency flag in the primary currency of the currency table. For example, if EUR is the base currency:

   ```
   update co_cny set FL_CNY_BASE='1' where DE_CNY='EUR'
   ```

2. Remove the base currency flag from any other currencies in that table. For example:

   ```
   update co_cny set FL_CNY_BASE='0' where DE_CNY='USD'
   ```

3. Enforce ordering so that the primary currency is first and the alternate currency is second for the AI_CNY_PRI column in the currency table. Other rows should be ordered, but the specific order isn't important. For example if EUR is base currency and GBP is the alternate:

   ```
   update co_cny set AI_CNY_PRI=0 where DE_CNY='EUR'
   update co_cny set AI_CNY_PRI=1 where DE_CNY='GBP'
   update co_cny set AI_CNY_PRI=2 where DE_CNY='USD'
   update co_cny set AI_CNY_PRI=3 where DE_CNY='CAD'
   update co_cny set AI_CNY_PRI=4 where DE_CNY='MXN'
   update co_cny set AI_CNY_PRI=5 where DE_CNY='JPY'
   ```

4. Update the country code for the money order record to reflect the country of base currency. For example if EUR is base currency:

   ```
   update le_tnd_str_sf set LU_CNY_ISSG_CY='EU' where ty_tnd='MNYO'
   ```

5. There are some application parameters that must be changed as well:

- Tender Group:
  - `CashAccepted`: For example, if EUR is base and GBP is alternate, make sure that the `CashAccepted` parameter is changed so that EUR and GBP are selected.
  - `TravelersChecksAccepted`: For EUR as base and GBP as alternate, the values for the `TravelersChecksAccepted` parameter should be EURCHK and GBPCHK.
  - `ChecksAccepted`: For EUR as base and GBP as alternate, the values for the `ChecksAccepted` parameter should be EURCHK and GBPCHK.

- Reconciliation Group:
  - `TendersToCountAtTillReconcile`: For EUR as base and GBP as alternate, the values for the `TendersToCountAtTillReconcile` parameter should be:
    * Cash
    * Check
    * ECheck
    * Credit
    * Debit
    * TravelCheck
    * GiftCert
    * Coupon
    * GiftCard
    * StoreCredit
    * MallCert
    * PurchaseOrder
    * MoneyOrder
    * GBPCash
    * GBPTravelCheck
    * GBPCheck
    * GBPGiftCert
    * GBPStoreCredit