

Sterling Multi-Channel Selling Solution

Developer Guide

Release 8.0.1

Sterling Commerce
An IBM Company

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Preface

Welcome to the Sterling Multi-Channel Selling Solution. This *Developer Guide* and the associated documentation provides all the information required for you to implement the Sterling Multi-Channel Selling Solution at your enterprise.

Purpose

This guide provides an overview to extending current Sterling Commerce applications and developing new applications for the Sterling Multi-Channel Selling Solution. It presents a description of the system architecture, the main Java classes, and a description of the Sterling Multi-Channel Selling Solution Software Development Kit (SDK).

Audience

This guide presupposes an advanced level of information systems knowledge, familiarity with basic network and database concepts, Java (including the J2EE specification) and XML. Readers must have a firm understanding of developing Web applications in Java.

Conventions

Throughout this guide, we will use the following conventions shown in Table 1, "Conventions", on page viii:

TABLE 1. Conventions

Type	Convention
File names	Sample.txt
Paths and directory names	/top_level/next_level/next_level/destination_directory/
Sample code extracts	<code>public void method(String s)</code>
Values to be provided	<i><value supplied by developer></i>

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Introduction to J2EE Web Applications

This chapter presents an overview of the Java 2 Platform, Enterprise Edition (J2EE) and how it is used to deploy Web applications. If you are already familiar with this architecture, then you can skip this chapter.

Architecture

The Sterling Multi-Channel Selling Solution is designed to conform to the Java 2 Platform, Enterprise Edition (J2EE) architecture as defined in *Java 2 Platform Enterprise Edition Specification, v 1.2* published by Sun Microsystems, Inc.

The Sterling Multi-Channel Selling Solution is deployed as a Web application that comprises a set of Java classes together with accompanying configuration files, HTML templates, and JSP (JavaServer Pages) pages. It must be installed into a servlet container that conforms to the J2EE standard.

Web Applications

A J2EE Web application is built to conform to a J2EE specification. You add Web components to a J2EE servlet container in a package called a *Web application archive* (WAR) file. A WAR file is a JAR (Java archive) file compressed file.

A WAR file usually contains other resources besides Web components, including:

- Server-side utility classes
- Static web resources (configuration files, HTML pages, image and sound files, and so on)
- Client-side classes (applets and utility classes)

The directory and file structure of a Web application deployed as a WAR file conforms to a precise structure. A WAR file has a specific hierarchical directory structure. The top-level directory of a WAR file is the *document root* of the application. The document root is the directory under which JSP pages, client-side classes and archives, and static Web resources are stored. The document root contains a subdirectory called **WEB-INF/**, which contains the following files and directories:

- **web.xml**: the Web application deployment descriptor. It describes the structure of the Web application.
- Tag library descriptor files.
- **classes/**: a directory that contains server-side classes: servlet, utility classes, and Java Beans components.
- **lib/**: a directory that contains JAR archives of libraries (tag libraries and any utility libraries called by server-side classes).

web.xml File

Every Web application deployed in a servlet container must have a **web.xml** file present in its **WEB-INF/** directory. The structure of every **web.xml** conforms to a DTD published as part of the J2EE specification.

The purpose of the **web.xml** is to specify the general configuration of the Web application as required by the J2EE standard. Specifically:

- initialization parameter values are provided for the Web application
- servlet classes used by the Web application may be declared and given names
- each servlet class is mapped to one or more URL patterns: when the servlet container receives a request whose URL matches a pattern defined in the **web.xml** file, then the corresponding servlet is used to process the request
- initialization parameter values are provided for each servlet if required

- session information (such as time out)
- the location of custom tag libraries used by the JSP pages

JSP Pages

Early Java-based Web applications used only servlets to generate the HTML that was sent back to users' Web browsers. Over time, template mechanisms were introduced that enabled Web developers to generate dynamic content by using templates to generate the HTML. Several such template systems are available, however the J2EE architecture has settled on the use of JSP (JavaServer pages) pages to display content.

When a J2EE application receives a request from a user's browser, it first processes the request to extract parameters from the request and to perform business logic initiated by the request. Once the processing is complete, the Web application must dispatch the request to a JSP page: it does this by using a *request dispatcher*. Typically, the servlet context invokes a request dispatcher by passing the target JSP page to the dispatcher and then the request and response objects are *forwarded* by the request dispatcher.

A JSP page comprises a combination of HTML, JSP tags, and scripting elements such as *scriptlets*.

- **HTML:** a JSP page can include any amount of normal HTML. This content is passed right through to the browser page without change.
- **JSP tags:** tags populate the dynamically-generated HTML with values calculated as the page is being generated. There are standard JSP tags such as `<jsp:getProperty>`, `<jsp:include>`, and `<jsp:forward>`. These are available to anyone creating a JSP page. In addition, you can specify that your Web application uses one or more custom tag libraries. Each custom tag library must be declared in the **web.xml** file for the Web application and the declaration must specify both the URI for the tag library and the location of the tag library descriptor (TLD) file.

Attention:	In the Sterling Multi-Channel Selling Solution, the use of the tag libraries is now deprecated. For performance reasons, we suggest that you use scriptlets. JSP tags can still be used in some existing applications or specialized integration tasks.
-------------------	---

- **Scripting elements:** You can intersperse the HTML and JSP tags in a JSP page with Java code that is contained between the scriptlet opening tag `<%`

(or `<jsp:scriptlet>`) and the closing tag `%>` (or `</jsp:scriptlet>`). Scriptlets are most commonly used to manage complex flow control in a JSP page.

Note that most JSP scripting elements can be invoked using a shorter form as described in the following table.

TABLE 2. Short Forms of Standard JSP Tags

Short form	XML form
<code><%</code>	<code><jsp:scriptlet></code>
<code><%=</code>	<code><jsp:expression></code>
<code><%!</code>	<code><jsp:declaration></code>
<code><%@</code>	<code><jsp:directive></code>

Data is passed to a JSP page using a variety of mechanisms, the most important of which are implicit objects and beans.

- **Implicit objects:** Every JSP page provides the Web developer with objects that can be used to display data on the generated HTML page. The most important of these are the page, request, session, config, and application objects.
- **Beans:** Most of the data generated by the business logic of the application is passed to the JSP page by adding Java beans to one of the implicit objects listed above.

Model 2 Architecture

The Sterling Multi-Channel Selling Solution is designed to conform to Sun's "Model 2" architecture. In this architecture, three functional components referred to as the Model, View, and Controller (MVC) partition the functionality of the Web application into logically distinct components.

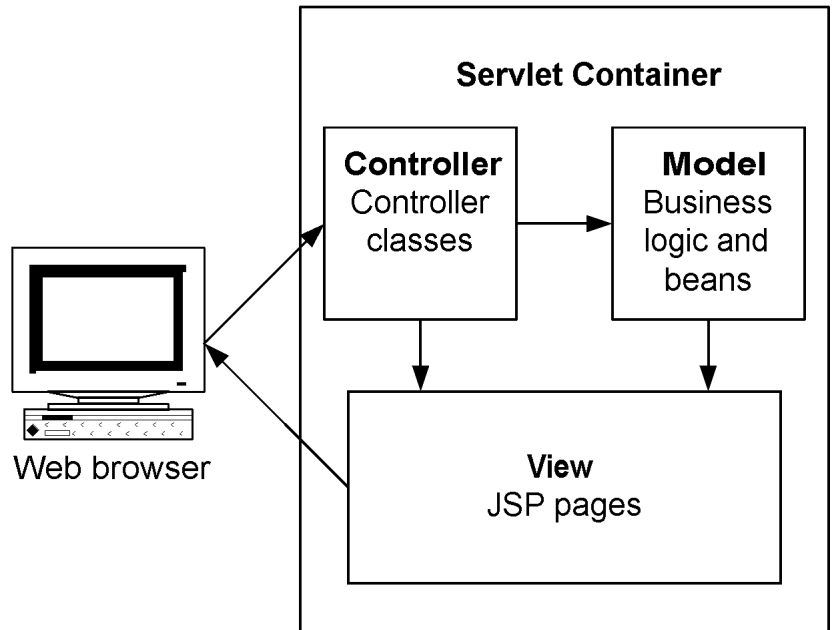


FIGURE 1. Model 2 Architecture

- *Model*: this component manages the data and business objects that are used by the system.
- *View*: this component is responsible for generating the content displayed to the user.
- *Controller*: this component determines the logical flow of the application. It determines what actions are performed on the model and manages the communication between model and view components.

Controllers

In the Model 2 architecture, controllers are Java classes intended to manage the processing of an inbound request and then to forward the request to an appropriate JSP page. The basic structure of a Sterling Multi-Channel Selling Solution controller follows this form:

```
public class GenericController extends Controller
{
```

```
public void execute() throws Exception
{
    //Dispatch some business logic
    BizObjs resultBizObjects = calculate();
    //Generate the beans
    Vector beans = generateBeans(resultBizObjs);
    //Attach the beans to the request
    attachBeans(beans);
    // Dispatch to JSP page
    String pageName = choosePageLogic();
    // Dispatch to JSP page
    Dispatcher rd = request.getDispatcher(pageName);
    rd.forward(request, response);
}

protected BizObjs calculate() throws Exception
{
    //do some processing
    return resultBizObjs;
}

protected Vector generateBeans(BizObjs bizObjs)
{
    //create beans from business objects
    return beans;
}

protected void attachBeans(Vector beans)
{
    Iterator it = beans.iterator();
    while (it.hasNext())
    {
        DataBean bean= (DataBean) it.next();
        request.setAttribute (beanName, bean);
    }
}

protected String choosePageLogic()
{
    //logic to determine where to forward the request
    return pageString;
}
}
```

Model

In the Model 2 architecture, the objects that represent data in the system are maintained by the model component. It is common to distinguish the business objects from the beans used in the JSP pages.

Once the business logic finishes creating and transforming the business objects, the controller class transforms the business objects into their corresponding beans. The beans are then passed to the JSP page for presentation.

View

The user interface of the Web application is served to the browser using JSP pages. Data is passed to each JSP page in the form of beans. These are classes with defined accessor methods that enable the logic on the JSP page to retrieve values using tags of the general form:

```
<%  
    DataBean dataBean = request.getAttribute("nameOfBean");  
    String stringProperty =  
        dataBean.getNamedProperty("nameOfProperty");  
%>
```

Note that it is possible to use a combination of scriptlets, simple JSP tags, and more sophisticated custom tags to manage page layout and the display of data.

Further Reading

The published literature on Web applications, J2EE, servlets, and JSP pages is vast. The following are recommended books for further reading:

- Hall, *Core Servlets and JavaServer Pages*, Second Edition, Prentice Hall, 2003
- Hunter, *Java Servlet Programming*, Second Edition, O'Reilly, 2001
- Fields and Kolb, *Web Development with JavaServer Pages*, Second Edition, Manning, 2001

This chapter presents an overview of the changes made to the Sterling Multi-Channel Selling Solution that affect the way you work to implement, customize, and develop applications. A description of new functionality in Release 8.0.1 is documented in the *Sterling Multi-Channel Selling Solution Release Notes*.

Segmentation

Data related to user segmentation resides on the segmentation database, which is distinct from the Knowledgebase used by the application for transactional data. For performance reasons, we recommend a configuration in which the segmentation database and the transactional database are on distinct DBMS instances on separate physical servers. Other possible configurations include two distinct DBMS instances on a single physical server, and two databases on the same DBMS instance and same physical server. See Chapter 9 “Segmentation Database Schema” in the *Sterling Multi-Channel Selling Solution Reference Guide* and Chapter 5 “Installing the Sterling Multi-Channel Selling Solution” in the *Sterling Multi-Channel Selling Solution Implementation Guide* for further information

Reporting

Release 8.0.1 does not support the reporting features of the Sterling Analyzer.

Data Service

Data services provides constants to set default limits on the number of rows to restore. The `DsConstants.USE_DEFAULT` constant can be passed as a parameter to the appropriate setter method of `DataContext`. See "How do Max Results and Num Per Page work?" on page 68 for more information.

Web Services

The files for Web Services are now located in the **dXML/5.1** directory.

The following web services have been added:

- `PricingLineService`
- `PricingCartService`
- `CouponValidation`

See "Web Services" on page 331 for further information. See the *Sterling Multi-Channel Selling Solution Reference Guide* for details about the XML request and reply messages for the Pricing Service.

Wish Lists/Templates/Registries

To support the new Wish List/Template/Registry features, new data objects and Knowledgebase tables have been created. These extend the `OrderInquiryList` data object and the `CMGT_OIL` table. See "Wish Lists, Templates, and Registries" on page 451 for further details.

API Changes

The following packages have been added to the API:

`com.comergent.api.apps.attribute`
`com.comergent.api.apps.customerSegmentation`
`com.comergent.api.apps.giftCard`
`com.comergent.api.apps.mktAnalytics.identification`
`com.comergent.api.apps.mktAnalytics.logging`

com.comergent.api.apps.mktMgr.mailingList
com.comergent.api.apps.pricingMgr.pricingService.bizlet
com.comergent.api.apps.profileMgr.userMgr.sync
com.comergent.api.apps.registry
com.comergent.api.apps.templatecards
com.comergent.api.apps.wishlist
com.comergent.api.appservices.attributeService
com.comergent.api.appservices.availability
com.comergent.api.appservices.customerSegmentation
com.comergent.api.appservices.customerSegmentation.bizlet
com.comergent.api.appservices.customerSegmentation.helper
com.comergent.api.appservices.customerSegmentation.registry
com.comergent.api.appservices.payment.giftCard
com.comergent.api.appservices.productService.sync
com.comergent.api.appservices.sync
com.comergent.api.appservices.trackingService
com.comergent.api.appservices.uiComponent
com.comergent.api.cipherupdater
com.comergent.api.segmentation
com.comergent.api.tools.columnEncrypter
com.comergent.api.tools.columnEncrypter.exception

See the Javadocs for details about the classes and interfaces included in each of the new packages.

For information about packages that have changed names or classes that have changed packages from previous releases see "Upgrading the Sterling Multi-Channel Selling Solution" on page 157.

Software Development Kit

All the SDK targets in SDK 3.4 are supported in SDK 3.5.1 and the behavior of these targets has not changed.

The following targets were added to SDK 3.5:

TABLE 3. New Targets in SDK 3.5

Target	Description
addMigrateSegData	Upgrades the Segmentation data from one release to another
createSegDB	Creates the database tables for the Segmentation DB
loadMatrixSegDB	Loads the Matrix reference data into the Segmentation DB
loadSegDB	Loads the minimal dataset into the Segmentation DB
MigrateSegDB	Upgrades the Segmentation DB schema from one release to another
setupDB	Creates the Transactional DB schema and loads minimal dataset
setupMatrixDB	Creates the Segmentation DB schema and loads the Matrix reference data

See the *Sterling Multi-Channel Selling Solution SDK Guide* for further information about these targets.

Cross-Site Request Forgery Filter

In Release 8.0.1, you can prevent Cross-Site Request Forgery (CSRF) by configuring a servlet filter that invalidates the current session when it detects a potential CSRF request. For more information about configuring the servlet filter, see the *Sterling Multi-Channel Selling Solution Implementation Guide*.

This chapter describes the Sterling Multi-Channel Selling Solution architecture and introduces some of the important Java classes that the Sterling Multi-Channel Selling Solution and its applications use. It assumes a thorough understanding of the J2EE architecture.

This chapter is intended to help you to modify or extend existing Sterling Commerce applications or write new applications. Note that not all parts of the Sterling Multi-Channel Selling Solution conform to this architectural description. Legacy components that do not match this architecture must be customized by trained Sterling Commerce professional services staff.

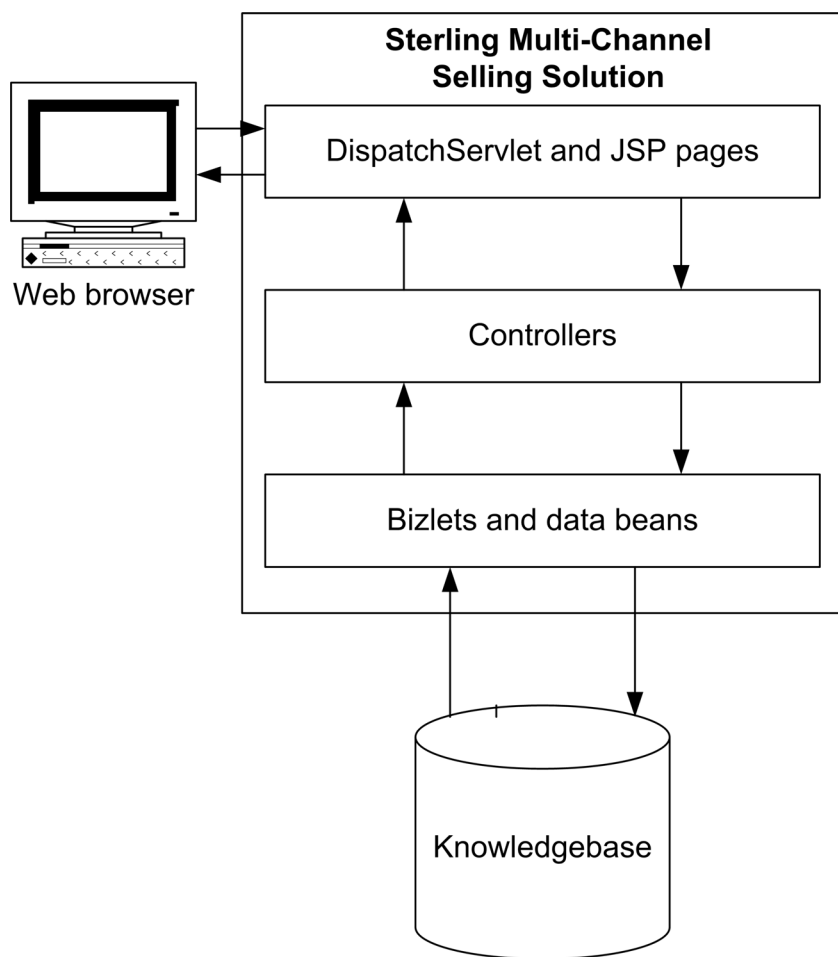


FIGURE 2. Sterling Multi-Channel Selling Solution Architecture

Sterling Multi-Channel Selling Solution Web Application

When you install the Sterling Multi-Channel Selling Solution into your servlet container, it installs as a WAR file, **Sterling.war**. When the WAR file deploys, it

unjars into a directory called **Sterling/**. See the *Sterling Multi-Channel Selling Solution Implementation Guide* for complete instructions to install the Sterling Multi-Channel Selling Solution. See the *Sterling Multi-Channel Selling Solution Reference Guide* for a complete description of the directory structure under the **Sterling/** directory.

The **WEB-INF/** sub-directory contains the **web.xml** file for the application.

The most important configuration settings in this file are:

- The definition of the InitServlet and DispatchServlet:
 - InitServlet loads when the servlet container starts. InitServlet reads in all of the configuration information for the Sterling Multi-Channel Selling Solution using the value of the propertiesFile element: by default this is **Comergent.xml**. See the *Sterling Multi-Channel Selling Solution Reference Guide* for a complete description of the configuration files and their settings.
 - DispatchServlet is the main servlet used to process inbound requests. Most of the URLs defined in the servlet mapping section resolve to the DispatchServlet.
- The servlet mapping section maps most URL patterns to the DispatchServlet. Note that “/msg/*” is used to map requests to the MessagingServlet: this ensures that inbound XML messages are processed by this servlet class.
- The session configuration element sets a session timeout value of 30 (minutes). Each implementation of the Sterling Multi-Channel Selling Solution must carefully consider an appropriate value for this parameter. Bear in mind the following:
 - End users of the system may leave their browsers unattended while they step away from their desks. If an unscrupulous user can access the browser when a session is still valid, then they can access the system.
 - End users may punch out to other external systems in the course of using the Sterling Multi-Channel Selling Solution. The session timeout value must give enough time for users to punch out and return.
 - Each session uses system resources. The greater the session timeout value, then the greater the memory usage of the system.
- The location of the Comergent tag library descriptor (TLD) file is provided. The Comergent tag libraries are documented in CHAPTER 30,

"Comergent Tag Library" and CHAPTER 31, "Comergent Internet Commerce Tag Library".

Processing Requests

When the Sterling Multi-Channel Selling Solution receives a request from a user's browser, it must determine how to process the request and how to display the result to the user. It does this using the **MessageTypes.xml** configuration files. These files determine the mapping between a request and the logic processing classes and JSP pages used.

1. When a request is received, the message type is identified and the appropriate controller invoked.
2. Additional business logic may be invoked using a business logic or bizAPI class.
3. The controller then forwards the request to the specified JSP page to render the output back to the user's browser.

The messageTypeFilename element of the GeneralObjectFactory element of the **Comergent.xml** file specifies the comma-delimited list of **MessageTypes.xml** file used to specify the message types. Each **MessageTypes.xml** file declares a list of message types organized by message group.

Each request specifies the message type as the cmd parameter. For example, if the URL is of the form:

```
../Sterling/catalog/matrix?cmd=search
```

then the name of the message type is "search".

Each message type is identified by the Name attribute of its MessageType element. The Name attribute identifies which message type is being requested when a user clicks a URL.

Attention: You must make sure that each message group and message type have a unique name. You must check the collection of **MessageTypes.xml** files to ensure that you have not defined message groups and message types with the same name. See "Overriding MessageType Definitions" on page 17 for an exception to this rule.

We suggest that you list message types alphabetically by name within message groups as a means of quickly identifying the duplication of message type names.

MessageType elements have one or more of the following child elements:

- BizletMapping: used for message processing, it associates a Bizlet class and a method of this class to process the message.
- ControllerMapping: associates a controller to be used to process the request. For message processing, you can specify a BizRouter class to invoke a Bizlet class to process the message.
- JSPMapping: associates a JSP page to be used to display the result of processing the request.

See CHAPTER 5, "Bizlets" for more information about the use of bizlets. A MessageType element may specify any combination of these three elements.

- If no ControllerMapping element is specified, then, by default, the ForwardController class is used. This class simply forwards the request to the JSP page specified by the JSPMapping element. If no JSPMapping element is found or if the specified JSP page is missing, then an error page is displayed.
- If a custom controller is specified, it may process the request itself (see "Controller Classes" on page 20), or it can invoke a business logic class using the *runAppJob()* method of the AppExecutionEnv class (see "AppExecutionEnv Class" on page 26).
- If no JSPMapping element is specified, then the business logic class or controller must specify which JSP page is to be used.

Each request or message is validated against the entitlements system to verify that the user can execute the message type. Not all users can execute all message types: see the *Sterling Multi-Channel Selling Solution Reference Guide* for a discussion of how the entitlements mechanism manages message types as part of the security of the Sterling Multi-Channel Selling Solution.

Overriding MessageType Definitions

The MessageType element has an optional attribute: IsOverlay. If this attribute is set to "true", then the MessageType definition overrides any previous definition of this message type given in any earlier **MessageTypes.xml** file listed in the messageTypeFilename element.

If two or more definitions are given for the same message type without one specifying the isOverlay attribute, then an initialization error is displayed and the first definition of the message type is used.

Note that the `IsOverlay` attribute does not change the location of the `MessageType`: this is still determined by the message group to which the first definition belongs or by the `MessageTypeRef` element that references the message type.

For example, to override the definition of the `adirectLogin` message type, you can define an element as follows:

```
<MessageType Name="adirectLogin" IsOverlay="true">
  <ControllerMapping>
    com.comergent.apps.common.controller.MyLoginController
  </ControllerMapping>
  <JSPMapping>../common/adirectPageLoader.jsp</JSPMapping>
</MessageType>
```

The `IsOverlay` attribute can also be used for `MessageGroup` declarations so that you can overwrite the definition of a message group, but its use is not recommended.

Default Elements

For each message group, you can specify default `BizletMapping`, `ControllerMapping`, and `JSPMapping` elements. These are used when no mapping is specified for a message type that belongs to the message group.

In general, if no default mapping is specified in a message group, then the system looks for a default mapping in the parent message group of the current message group. If no mapping is found anywhere in the message group tree, then values specified in the `MessageGroupDefaults` message group are used.

Key Java Classes

At a schematic level, the Sterling Multi-Channel Selling Solution applications all have the same structure: they are composed of controllers, business objects and bizlets, and JSP pages.

Wrapper Classes

Several of the standard classes used in J2EE Web applications have been wrapped in wrapper classes to manage any minor idiosyncrasies among the supported servlet containers:

ComergentContext

This class is used to wrap the servlet container context. You can use it to retrieve the `Env` object for environment information. Note that any context attribute that is set must be serializable. An exception is thrown if you attempt to set a non-serializable attribute.

It provides the *getResourceAsStream()* method: this method can be used to access a file as a stream for read-only access. You must use the *adjustFileName()* method of the *LegacyFileUtils* class for write access to a file.

ComergentDispatcher

This class is a lightweight wrapper of the standard *RequestDispatcher* class: it provides *forward()* and *include()* methods.

ComergentRequest

This class wraps the standard *HttpRequest* class and provides helper methods to parse the inbound requests and messages.

ComergentResponse

This class wraps the standard *HttpResponse* class. It provides a *localRedirect()* method to pass a request with a new message type. For example, you may want a controller to process a request, and then to pass the result on to another controller: you do this by calling:

```
response.localRedirect(request, "messageType");
```

This has the effect of submitting the request to the *DispatchServlet* as if it had been received as an HTTP request.

ComerentSession

This class wraps the standard *HttpSession* class. When a user first logs in, a *User* data bean is created and added to the *ComerentSession* object. You can access user information through the *ComerentSession* *getUser()* method.

For example:

```
session.getUser().getUserKey()
```

will return the current user's key; and

```
session.getUser().getPartnerKey()
```

returns the key of the partner to whom the user belongs.

The *ComerentSession* object is used to store information that must be persistent for more than one request of a user's session. Use the *setAttribute(String s, Object o)* method to set an object in the session and *getSession(String s)* to retrieve it. Objects stored in the session must implement the *Serializable* interface: all generated data beans implement this interface and so these may be stored in the session.

The `ComergentSession` class also provides a `logout()` method: invoking this method immediately invalidates the servlet container session.

Servlets

The main servlets used are:

- `InitServlet`: this servlet loads when the servlet container starts. Its `init(ServletConfig config)` method initializes the `ComergentAppEnv` class.
- `DispatchServlet`: this servlet is used to service almost all requests processed by the Sterling Multi-Channel Selling Solution. Its principle method call is:

```
void dispatch(HttpServletRequest request, HttpServletResponse response)
```

This method creates a controller to handle the request with:

```
Controller controller createController(ComergentRequest comergentRequest)
```

and then invokes:

```
controller.init(comergentContext, comergentSession, comergentRequest, comergentResponse); controller.execute();
```

Note that the instance of the `Controller` class created by the `createController()` method is a function of the request. The request message type determines the `Controller` class because the controller is created by the `GeneralObjectFactory` class. The `GeneralObjectFactory` uses the **MessageTypes.xml** file to map from the request message type to a `Controller` class. See the *Sterling Multi-Channel Selling Solution Reference Guide* for more information about the configuration files.

- `DebsDispatchServlet`: this servlet is used to process XML messages posted from another system to the Sterling Multi-Channel Selling Solution. If the content type of the request starts with “application/x-icc-xml” or “text/xml”, then it invokes the `MessagingController` to process the request.

Controller Classes

The Sterling Multi-Channel Selling Solution offers two different ways of using controllers to process requests:

Custom Controllers

You can write your own `Controller` class by extending the `com.comergent.dcm.caf.controller.Controller` class. When you do this, you must

provide the application logic to determine the JSP page to which the request should be forwarded. For example:

```
boolean processingSuccess = false;
/*
 *
 * Business logic processes request and sets processingSuccess to
 * true if successful.
 */

if (processingSuccess)
{
    callJSP("SuccessMessageType");
}
else
{
    callJSP("FailureMessageType");
}

protected void callJSP(String messageType) throws
    ControllerException, ICCEException, IOException
{
    String resource = getJSPName(messageType);
    ComerгентDispatcher rd =
        request.getComerгентDispatcher(resource);
    rd.forward(request, response);
}

protected String getJSPName(String messageType) throws ICCEException
{
    JSPObjectID id = new JSPObjectID(messageType);
    return GeneralObjectFactory.getGeneralObjectFactory().-
        getMapping(id);
}
```

SimpleController

You can extend the SimpleController class to process the request if there is only one exit point from the application logic. The SimpleController uses the message type of the request to determine the JSP page to which the request is forwarded once the application logic is finished. To extend the SimpleController class, overwrite the *calculate()* method.

MessagingController

This class is used to process XML requests (such as price and availability or shopping cart transfer requests from other systems).

DataBean Classes

Access to data in the Sterling Multi-Channel Selling Solution is managed through data objects: these are XML documents that describe the business entities such as partners, users, products, and so on. They describe the fields of the data object together with information about how they map to database tables in the Knowledgebase. Each data object XML file is used to generate a corresponding DataBean Java class.

The DataBean classes are the main classes used to represent each business entity in the Sterling Multi-Channel Selling Solution. Each business entity such as a user, partner, product, and so on, is represented in memory by an instance of the appropriate DataBean class. See CHAPTER 6, "Introducing Data Beans and Business Objects" for more information. Some legacy application may still use the BusinessObject class, but in general the use of the BusinessObject class is deprecated.

DataBean classes are also used to pass data to JSP pages. Any data object definition in the Sterling Multi-Channel Selling Solution XML schema may be used to generate a DataBean class by running the generateBean target (see the CHAPTER 14, "Software Development Kit" for more details).

The DataBean class is a general abstract class and all generated data bean classes extend this class. Each DataBean class provides *restore()* and *persist()* methods that retrieve and save data in the database respectively.

Some applications make use of application beans: see "Application, Entity, and Presentation Beans" on page 71 for a discussion of how these beans are used.

ObjectManager and OMWrapper Classes

You should not instantiate DataBean classes by using their constructors. Instead use the ObjectManager and OMWrapper classes to create new instances of objects as your applications require them. These classes follow the Factory pattern in that they provide a class designed to generate object instances as they are required. They enable you to switch from one object class to another without changing the application code that creates and uses the objects.

Creating Objects

In general, you should use the OMWrapper class rather than the ObjectManager class, but both can be used. You use these classes to create objects with the following methods:

```
ObjectClass temp_ObjectClass =  
    (ObjectClass) OMWrapper.getObject("ObjectName");
```

or

```
ObjectManager temp_ObjectManager = ObjectManager.getInstance();
ObjectClass temp_ObjectClass =
    (ObjectClass) temp_ObjectManager.getObject("ObjectName");
```

Mapping Object Names to Object Classes

The ObjectManager and OMWrapper classes use the **ObjectMap.xml** configuration file (located in *debs_home/Sterling/WEB-INF/properties/*) to determine which type of object is created from the object name provided in the *getObject()* method.

Attention: Do not add comments to the **ObjectMap.xml** file: these can cause errors on initialization.

Each Object element is of the form:

```
<Object ID="ObjectName">
    <ClassName>ObjectClass</ClassName>
</Object>
```

When the *getObject("ObjectName")* method is invoked, an instance of the ObjectClass class is returned. The *ObjectName* must be the name of a Java class or interface and the *ObjectClass* must be a subclass of the *ObjectName* class (possibly itself) or a class that implements the *ObjectName* interface.

If the **ObjectMap.xml** file does not have an Object element whose ID attribute matches the ObjectName parameter, then the ObjectManager or OMWrapper creates an instance of the ObjectName class. That is, it behaves as if there is an element of the form:

```
<Object ID="ObjectName">
    <ClassName>ObjectName</ClassName>
</Object>
```

For example, suppose that the **ObjectMap.xml** file contains the element:

```
<Object ID="com.comergent.bean.productMgr.ProductBean">
    <ClassName>
        com.comergent.bean.productMgr.MatrixProductBean
    </ClassName>
</Object>
```

Then the following method invocation will create an instance of the MatrixProductBean class:

```
ProductBean temp_ProductBean = (ProductBean)
    OMWrapper.getObject("com.comergent.bean.productMgr.ProductBean");
```

Note that the `MatrixProductBean` must extend the `ProductBean` class: otherwise a `ClassCastException` would be thrown at runtime. However, if there is no element whose ID attribute is `com.comergent.bean.productMgr.ProductBean`, then the same call would return an instance of the `com.comergent.bean.productMgr.ProductBean` class.

Restrictions

Note that you cannot create Object definitions so that the class specified in the `ClassName` element in one Object element is the ID attribute in another Object element. The only exception to this rule is when the class is used both as the ID and `ClassName` values for a single Object element. In particular, if you extend a data object (see "Extending Data Objects" on page 65), then:

1. Define an Object element that maps the extended class to the extending class:

```
<Object ID="<Extended class>">
  <ClassName><Extending class></ClassName>
</Object>
```

2. Make sure that you replace any reference to the extended data object in any `ClassName` elements to the extending data object.

Passing Parameters

If you need to pass parameters to the object constructors, then the following `OMWrapper` method is also available:

```
ObjectClass temp_ObjectClass = (ObjectClass)
    OMWrapper.getObjectArg("ObjectName", Object arg1, ... ,
        Object arg10);
```

In this form, you can pass up to ten parameters as Objects into the method invocation. The following `OMWrapper` and `ObjectManager` method calls enable you to pass in an unlimited number of parameters as an array of objects:

```
ObjectClass temp_ObjectClass = (ObjectClass)
    OMWrapper.getObject("ObjectName", Object[] args);
```

or

```
ObjectClass temp_ObjectClass = (ObjectClass)
    temp_ObjectManager.getObject("ObjectName", Object[] args);
```

For example, suppose that the **ObjectMap.xml** file contains the element:

```
<Object ID="com.comergent.bean.productMgr.OrderBean">
  <ClassName>com.comergent.bean.matrix.MatrixOrderBean</ClassName>
</Object>
```

Here, the `MatrixOrderBean` class is a subclass of the `OrderBean` class. Suppose that the `MatrixOrderBean` has a constructor of the form `MatrixOrderBean(CartBean cb)`.

Then the following method invocation will create an instance of the `OrderBean` class using an instance of the `CartBean` class as a parameter:

```
Cart temp_CartBean = (CartBean)
    OMWrapper.getObject("com.comergent.bean.partnerMkt.CartBean");
/*
    Code that processes the cart bean object
*/
OrderBean temp_OrderBean = (OrderBean)
    OMWrapper.getObjectArg("com.comergent.bean.productMgr.OrderBean",
        temp_CartBean);
```

Object Pooling

If you expect some classes of object to be created and used frequently, then you can use the `ObjectManager` and `OMWrapper` classes to create a pool of objects. The parent object (identified by the ID attribute) must implement the `poolable` interface. This interface is a part of the `com.comergent.dcm.objmgr` package. It declares one method `reset()` that you must implement.

When you are finished with a `poolable` object, you can return it to the object pool by using the `return()` method as follows:

1. In the **ObjectMap.xml** entry for a pooled class, set the `MaxPoolSize` attribute to the number of objects you want created in the pool:

```
<Object ID="ObjectName" MaxPoolSize="n">
    <ClassName>ObjectClass</ClassName>
</Object>
```

2. Create instances of the object class using `OMWrapper` and `ObjectManager` as described above.
3. When you are finished with the object, then return the instance to the pool using:

```
OMWrapper.return(temp_ObjectClass);
```

4. or

```
temp_ObjectManager.return(temp_ObjectClass);
```

Note that if you create an object by passing in parameters as described in "Passing Parameters" on page 24, then a new object is created rather than re-using an object from the pool.

AppExecutionEnv Class

The AppExecutionEnv class can be used to run business logic classes. However, the use of business logic classes is deprecated, so use this class only to support legacy applications. You use the static methods *runAppObj()* to invoke the creation of a business logic class and to execute its prolog and service methods.

In its most common form, you can use:

```
AppExecutionEnv.runAppObj (String messageType, BizObjTable bizObjects)
```

The AppExecutionEnv class invokes the business logic class determined by the messageType string and which takes the BizObjTable vector of business objects as the input business objects.

AppsLookupHelper Class

There are many situations in the Sterling Multi-Channel Selling Solution where the status of a data object is managed using a lookup code. For example, the order status of an order can change several times through the placing of an order. There are also several examples of display fields such as the Title of a user which can take several well-defined values and which need to be managed for different locales. This data is stored in the CMGT_LOOKUPS table of the Knowledgebase database schema. See the *Sterling Multi-Channel Selling Solution Reference Guide* for further information about this table.

For each lookup type, there can be one or more lookup codes and each code has an associated description string. For example:

TABLE 4. Lookup Example

Lookup Type	Lookup Code	Description
AddressType	10	Billing
AddressType	20	Shipping

You can use the AppsLookupHelper class to map a lookup code to a description string. By invoking the appropriate method of the AppsLookupHelper class, pass in the lookup code as a parameter and the corresponding String is returned. Depending on which lookup type you are interested in, you choose the appropriate method for that lookup type. The method used determines which lookup type is used to retrieve the lookup code from the CMGT_LOOKUPS table. For example, to retrieve an order status code string, you can write:

```
String orderStatusString =  
    AppsLookupHelper.getOrderStatusForCode (orderStatusCode);
```

Conversely, you can retrieve the lookup code using:

```
int orderStatusCode =  
    AppsLookupHelper.getCodeForOrderStatus(orderStatusString);
```

Most, though not all, lookup types have helper methods defined. Check the Java doc for the AppsLookupHelper class for details. For further information, see "Support for Lookup Codes" on page 33.

ComergentAppEnv Class

Use the ComergentAppEnv class to provide your code with environment information specific to the application. It provides the following useful methods:

- *adjustFileName()*: this method has been moved to the LegacyFileUtils class. See "LegacyFileUtils Class" on page 28.
- *constructExternalURL()*: use this method to construct a URL that enables a client to be re-directed back to the server. Primarily, you use this method to generate a redirect URL to enable the server to restore session information.
- *getEnv()*: this method returns the environment object.
- *getContext()*: this method returns the application context.

Global Class

The use of this class is deprecated. See "Global Class" on page 465 for a description of its legacy methods. Its logging function has been replaced by the log4j API: see CHAPTER 8, "Logging" for more information. Its support for retrieving the values of properties has been replaced by the Preferences mechanism. If you need to continue to use code that uses the Global class, then replace each usage by the LegacyPreferences class.

GlobalCache Interface

Use this interface to define a cache that provides access to cached objects used by all Sterling Multi-Channel Selling Solution applications. It can be used to support a clustered environment in which the Sterling Multi-Channel Selling Solution is running on more than one machine.

To use a cache class that implements the GlobalCache interface, you must implement the methods of the interface. The cache class is loaded when the InitServlet *init()* method is invoked. You must provide the name of the class as the General.globalCacheImplClass element of the **Comergent.xml** file. A default

implementation is provided with Sterling Multi-Channel Selling Solution:
`com.comergent.dcm.cache.impl.AppContextCache`.

You access the implementation of the `GlobalCache` interface by:

```
GlobalCache globalCache = GlobalCacheManager.getGlobalCache();
```

The interface supports the following methods:

- *`public String store(Serializable entry)`*: stores an object in the global cache, which remains until the application cleans it up.
- *`public boolean store(String id, Serializable entry)`*: stores an object in the global cache, which remains until the application cleans it up.
- *`public String cache(Serializable entry)`*: stores an object in the global cache. The object is available as long as the application is using it, but the cache system cleans it up automatically.
- *`public String cache(Serializable entry, long lease)`*
- *`public boolean cache(String id, Serializable entry)`*
- *`public boolean cache(String id, Serializable entry, long lease)`*
- *`public boolean contains(String id)`*: checks if the cache contains the specific object.
- *`public Object get(String id)`*: retrieves the cacheable object.
- *`public Object remove(String id)`*: removes a cacheable object.
- *`public boolean gc()`*: This method should be called by a Cron job so the cache can clean up unused entries.

LegacyFileUtils Class

The `LegacyFileUtils` class provides helper methods for working with files. Its use is deprecated, but it provides support for methods previously provided by the `ComergentAppEnv` class:

- *`adjustFileName()`*: It returns the real path name of a file. Use this method to access files for either reading or writing: do not use the `getRealPath()` method because this can return null.. In a clustered environment, the `adjustFileName()` method ensures that all members of the cluster access the same file. You must use this method with four parameters:

```
adjustFileName(String fileName, boolean share, boolean xPublic,
```



```
boolean xLoadable);
```

Use of the one-parameter form of this method is deprecated. The boolean parameters are used to determine the location of the file using the configuration parameters specified in the `WritableDirectory` element of the **web.xml** file.

OutOfBandHelper Class

The `OutOfBandHelper` class provides a means to generate an output stream using a JSP page as a template. An example of its use is given here:

```
ComergentRequest request = ComergentAppEnv.getRequest();
ComergentResponse response = ComergentAppEnv.getResponse();
ByteArrayOutputStream stream = new ByteArrayOutputStream();
OutOfBandHelper outOfBandHelper = new OutOfBandHelper(request,
    response, stream);
outOfBandHelper.getRequest().setAttribute(
    ComergentRequest.COMERGENT_SESSION_ATTR,
    request.getComergentSession());
outOfBandHelper.callJSP(messageType);
/*
 * Initialize SendSMTP and use the stream to to set the body of the
 * message
 */
String mimeType = "text/html";
String smtpHost = Global.getString(
    "C3_Commerce_Manager.SMTP.SMTPHost");
SendSMTP smtp = new SendSMTP(smtpHost);
StringBuffer sb = new StringBuffer(subject);
String message = null;
String enc = ComergentI18N.getComergentEncoding();
message = stream.toString(enc);
//Send the mail
smtp.send( from, to, cc, subject, message, mimeType);
```

In this example, you can see how the `OutOfBandHelper` class is initialized using the existing request and response objects and an output stream. Its `callJSP()` method, generates the output stream by passing the request and response objects to the JSP page determined by the message type parameter, and the output stream can be used by the application to retrieve the content.

The `OutOfBandHelper` class makes use of session and context information when mapping a message type to a JSP page. Consequently, you can use different JSP pages for different locales in the same way as you do for processing browser requests and the `OutOfBandHelper` class will resolve which locale's JSP page to use and apply the same failover logic as described in "Failover Behavior" on page 418.

Preferences Class

The Preferences module provides the mechanism for accessing Sterling Multi-Channel Selling Solution properties. It is one of the modules provided in the platform modules: see "Preferences Service" on page 46 for more information. The basic usage of the Preferences API is as follows:

```
private static Preferences temp_Preferences =
    Preferences.getPreferences();
String temp_MyPropertyString =
    temp_Preferences.getString("MyProperty");
```

The main methods it supports to retrieve properties are:

- public String getString(String key, String def)
- public boolean getBoolean(String key, boolean def)
- public double getDouble(String key, double def)
- public float getFloat(String key, float def)
- public int getInt(String key, int def)
- public long getLong(String key, long def)

There are corresponding *putType()* methods for each *getType()* method: for example:

- public void putString(String key, String value)

If you invoke the *getPreferences()* method without a parameter, then you retrieve the singleton Preferences object that the Sterling Multi-Channel Selling Solution supports. If you pass in the name of a class (for example *getPreferences(MyClass.class)*), then the object you retrieve is scoped: that is, the name of the properties whose values you retrieve using the Preferences object have the package path of the class prepended to the property name you provide.

For example, suppose that *MyClass* is in the *com.comergent.myApplication* package. Then the following fragments of code are equivalent:

```
private static Preferences temp_Preferences =
    Preferences.getPreferences();
String temp_MyPropertyString =
    temp_Preferences.getString("com.comergent.myApplication.MyProperty");
```

and:

```
private static Preferences temp_Preferences =
    Preferences.getPreferences(com.comergent.myApplica-
tion.MyClass.class);
```

```
String temp_MyPropertyString =  
temp_Preferences.getString("MyProperty");
```

PriceCheckAPI Class

The PriceCheckAPI class provides the main means for applications to retrieve pricing information for products. It provides a number of static methods: these take as arguments a Vector of pricing line items and partner keys for the current user and the partner serving up the prices: either the enterprise or one of the Partner.com partners.

The main method is *Check()*: this method has several forms, but in general they all specialize the following method:

```
public static Vector Check (Vector lineItems, Timestamp date,  
    Long partnerKey, Long storefront, Long verticalKey,  
    Long currencyKey)
```

All products must be passed in the Vector of pricing line items: these are objects of the PricingLineItem class. You can specify a quantity in each pricing line item. The date parameter enables you to retrieve prices as they would appear on a specified date: if the parameter is null, then the current date is used. The partnerKey parameter is the partner key of the user whereas the storefront parameter is the partner key of the current storefront: that is, think of the partnerKey as representing the buyer and the storefrontKey as the seller. The verticalKey parameter is the key of the current customer type and currencyKey is the key of the current currency.

It also provides methods to retrieve a list of price lists:

- *getAssignedPriceListKey()* returns a List of all price list keys assigned to the partner of the current user regardless of the current selection of currency and customer type.
- *getContextPricePriceListKey()* returns a List of all price list keys assigned to the partner of the current user based on the session settings for currency and customer type.

Transactions

The Sterling Multi-Channel Selling Solution for provides support for transactions: database actions that span one or more atomic operations. In general, you use the Transaction class to manage situations in which several data objects must be persisted together, and if one fails, then they should all fail. See "Transactions" on page 291 for more information.

Message Conversion Classes

Converter Classes

The Sterling Multi-Channel Selling Solution must be able to transform XML documents from one form to another. The system uses converters for this purpose: these are classes that implement the Converter interface.

Note:	The converter makes use of stylesheets: these can be compiled into Java classes. A system property setting, <code>compileStyleSheets</code> , controls whether the stylesheets are compiled or not.
--------------	---

Message Categories

In order to convert from one document format to another, you must specify the source and target formats precisely. Each message must belong to a message family and a message version: together these define a *message category*. There can only be one form of a given message type within a message category.

For example, the message family dXML and the message version 5.0 uniquely determine a message category. Within this message category, there is only one form of the message type `ShoppingCartTransfer`.

Converter Interface

The Converter interface is defined by:

```
public interface Converter
{
    public void setConfig(MessageConversion mc);
    public MessageConversion getConfig();
    public Object getProperty(String name);
    public void setNext(Converter next);
    public Converter getNext();
    public String getIncomingMessageType();
    public String getConvertedMessageType();
    public void setSource(Document doc);
    public void setSource(InputStream is);
    public void setSource(Reader reader);
    public void setSource(DefaultHandler handler);
    public void setTarget(Document doc);
    public void setTarget(OutputStream os);
    public void setTarget(Writer writer);
    public void setTarget(DefaultHandler handler);
    public void setParameter(String paramName, String paramValue);
    public void convert() throws ConverterException;
}
```

To create a converter class, you must implement these methods. In your code, you create a converter using the `ConverterFactory`:

```
ConverterFactory cf = ConverterFactory.getConverterFactory();
Converter converter = cf.getConverter(String sourceMsgType,
    String sourceMsgCategory, String targetMsgCategory);
```

The static `getConverter()` method of the `ConverterFactory` class uses several parameters to identify which `Converter` class should be instantiated. It reads from the **MessageMap.xml** using the source and target message categories together with the message types to determine which `Converter` class must be used. Once created, the converter converts from a source document to a target document:

```
converter.setSource(srcDoc);
converter.setTarget(targetDoc);
converter.convert();
```

Note that the input and output to the conversion process can either be documents or streams.

Support for Lookup Codes

The Sterling Multi-Channel Selling Solution uses lookup codes to provide a mechanism for maintaining and displaying locale-specific strings to users. For each lookup type, you can define one or more lookup codes, and for each lookup code, you can define a string for each supported locale. See the *Sterling Multi-Channel Selling Solution Reference Guide* for more information.

What lookup support does the Sterling Multi-Channel Selling Solution provide?

The Sterling Multi-Channel Selling Solution has the capability of automatically providing lookups between code values and their corresponding strings and from lookup code strings to code values.

If the “code” `DsElement` is set, then the “string” is automatically populated from the lookup cache. If the “string” value is set, then the “code” is looked up using the string value.

Are string values localized?

Yes. For a code-to-string lookup, the mechanism uses the user’s locale to determine which string value to use. For a string-to-code lookup, the mechanism uses the user’s locale when searching on a string value to find a corresponding code.

How do I define a code to string mapping?

Code-to-string relationships are defined in the **DsDataElement.xml** schema file. If both of the “code” and “string” DsDataElements are then used in a data object, then the code-to-string mapping is handled automatically.

The following is an example of a DataElement code-string pair.

```
<DataElement Name="OrderStatus" Description="Order Status"
  DataType="LONG" MaxLength="20" LookupType="OrderStatus"
  LookupString="OrderStatusString"/>
<DataElement Name="OrderStatusString" Description="Order Status"
  DataType="STRING" MaxLength="260" LookupType="OrderStatus"
  LookupCode="OrderStatus"/>
```

Are lookups performed for XML messages?

Yes. If a dataobject used for messaging contains a code-string pair, then the string value will automatically be used to look up the code.

How is the lookup cache loaded?

The lookup cache is loaded at system startup.

The Sterling Multi-Channel Selling Solution modular architecture is designed to make implementations easy to customize and upgrade. This chapter provides an overview of modular architecture, platform modules, and the module interfaces, and describes each module. It covers the following topics:

- "Overview" on page 36
- "Platform Modules" on page 37
- "Access Policy" on page 38
- "Authentication" on page 38
- "Base64" on page 38
- "Classpath Appender" on page 39
- "Cryptography Service" on page 39
- "Data Services" on page 39
- "Dispatch Authorization" on page 39
- "Dispatch Framework" on page 39
- "Email Service" on page 39
- "Event Service" on page 39

- "Exception Service" on page 39
- "Global Cache Service" on page 40
- "Help" on page 40
- "Initialization Service" on page 40
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- "Logging" on page 42
- "Memory Monitor" on page 45
- "Message Type Entitlement" on page 45
- "Object Manager" on page 45
- "Out Of Band Response" on page 46
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- "Tag Libraries" on page 47
- "Thread Management" on page 47
- "XML Message Converter" on page 48
- "XML Message Service" on page 48
- "XML Services" on page 49

Overview

The Sterling Multi-Channel Selling Solution platform architecture enables building the platform in a more modular way, so that changes and upgrades to the platform can be made more quickly and simply, and so that the modules can be re-used to support different products built using them.

The benefits of providing a means of delivering platform functionality in platform modules and requiring that modules make calls to other modules only through their external interfaces areas follows:

- It is easier to compartmentalize the functionality of applications.
- It is easier to understand and manage the dependencies between parts of the Sterling Multi-Channel Selling Solution.
- It is easier to contain the customizations to single modules and understand what effect changes made in a module have on the whole system.

- Modules can be more easily upgraded independently of each other, minimizing the effect that an upgrade may have.
- Upgrades to modules that have not been customized will not affect customizations made in other modules.
- New functionality can be delivered in the form of a module that may be dropped into an existing deployment of the Sterling Multi-Channel Selling Solution.

Platform Modules

The Sterling Multi-Channel Selling Solution platform is developed as a set of interdependent modules that conform to a common organizational structure. In general, each platform module corresponds to a functional component of the Sterling Multi-Channel Selling Solution such as a service or a component of the Sterling Multi-Channel Selling Solution platform. The platform modules provide a Java API to other modules. Some modules provide a set of “helper” classes which are used by a number of other modules.

In general, each platform module has the following structure:

- Java classes: organized into the following trees. At build time, the directories for the module are assembled into a single JAR file.
 - `com.comergent.api.module`: external API interfaces: used by other modules to access functionality provided by the module. In general, when one module makes a call to another module’s class, it must do so through the other module’s external API. This is the `com.comergent.api` package for the module.
 - `com.comergent.module`: implementation classes: the implementation of the external API interfaces. When another module makes a call to the module’s external API, then the actual classes used are the implementing classes of the module’s interface. The implementation packages may include internal classes: used by the implementation classes, but not exposed to the outside world and not part of the supported Javadoc.
- Configuration files specific to the module such as properties files. These are intended to live in the class hierarchy so that they can be referenced through `getResource()` calls.

Module Interfaces

Each platform module must provide an external interface so that all calls to Java classes and interfaces within the module are invoked through the interface. This external interface provides a comprehensive set of Javadoc pages so that writers of other modules can use the external interface reliably and easily.

The external interfaces are organized under the following main packages:

- `com.comergent.api`: this package has all the external APIs supported by the modules. These are organized by module:
`com.comergent.api.converter`, `com.comergent.api.logging`, and so on.

Invoking Interfaces

You can invoke an interface from a Java class by casting any object or child interface to the interface and then invoke any method that the interface declares. Each module uses one or other of these techniques, but not both. As you work on an existing module or create a new one, be consistent in how you invoke the interfaces. It will make it easier for your colleagues to work on the same module.

In general, you should always try to work with interfaces provided by the `com.comergent.api` packages: these are the interfaces that the platform modules will support from one release to the next, even though the underlying implementations of the interfaces may change.

Platform Module Descriptions

This section provides a brief description of the purpose of each platform module and examples of its use.

Access Policy

This module provides the service used to check access policies.

Authentication

This module provides the APIs used to authenticate credentials and users.

Base64

This module provides the classes used to convert data to and from Base 64 notation.

Classpath Appender

This module provides classes used to add paths to the classpath.

Cryptography Service

This module provides the services used to encrypt and decrypt data. See the *Sterling Multi-Channel Selling Solution Implementation Guide* for more information on this subject.

Data Services

This module provides a re-packaging and clean-up of the existing data services functionality. Its API has been moved out to a separate `com.comergent.api.dataservices` package. Data services now uses the same preferences mechanism as the rest of the Sterling Multi-Channel Selling Solution to manage its properties. Connection pooling has been unified into one pool, and is tunable. Pagination has been updated, and no longer relies on pagination files being written to the file system.

Dispatch Authorization

This module manages access checking that ensures that each user sees only those parts of the application to which they have been granted access.

Dispatch Framework

This module manages the dispatch framework of the Sterling Multi-Channel Selling Solution classes that wrap the servlet request, response, context, and session classes together with the base controller classes used by the dispatch mechanism.

Email Service

This module provides the basic APIs to initiate sending email from the Sterling Multi-Channel Selling Solution.

Event Service

This module provides the classes used by the EventBus and Events. See CHAPTER 9, "Events" for more information on how to use events.

Exception Service

This module provides the basic exception framework and classes used by the Sterling Multi-Channel Selling Solution.

Global Cache Service

This module provides the APIs to be used to access the cache.

Help

This module provides the `ComergentHelpBroker` class: this is a simple wrapper class to the `ServletHelpBroker` class of the JavaHelp 2.0 implementation. See "Online Help" on page 257 for more information.

Initialization Service

The Initialization module provides the Initialization service. This is a package that helps you initialize the Sterling Multi-Channel Selling Solution using a consistent framework of classes and methods.

The Initialization Manager provides a focal point in which:

- Initialization tasks can be defined
- Policy on failed initialization can be enforced
- Configuration fragments can be aggregated

The Initialization Manager main responsibility is to act on a list of initialization tasks in a well-defined and predictable manner. That implies an ordered list which:

- either, can be defined programmatically
- or, can be specified as an XML-format file

The following code extract provides a typical example of using the `InitManager` class.

```
InitManager initManager = InitManager.getInitManager();
try
{
    String resourceName = args[0];
    initManager.init(resourceName);
    // or programmatically created
    //List modules = initModules();
    //ResourceLocator resourceLocator = createNewResourceLocator();
    //initManager.init(modules, resourceLocator);
}
catch (InitManagerException ime)
{
    log.error(ime, ime);
    System.exit(1);
}
// Initialization completed. OK to go on //
```

...

You can specify the initialization process using an configuration file. Here is a sample file:

```
<?xml version="1.0" encoding="UTF-8"?>
<initializationManager>
  <resourceLocator>
    <path>/a/b/c</path>
    <path>.</path>
    <path>CLASSPATH</path>
  </resourceLocator>
  <module name="ObjectManager"
    initClass="com.comergent.objectManager.InitHelper"
    <config name="Preferences">
      /com/comergent/objectManager/preferences.xml
    </config>
    <init-param name="param0">param0Value</init-param>
  </module>
  <module name="module1" initClass="com.comergent.module1.InitHelper"
    <config name="ObjectManager">
      /com/comergent/module1/objectMap.xml
    </config>
    <config name="MessageTypes">
      /com/comergent/module1/messageTypes.xml</config>
    <config name="Preferences">
      /com/comergent/modules1/preferences.xml
    </config>
    <init-param name="param1">param1Value</init-param>
  </module>
  <module name="module2" initClass="com.comergent.module2.InitHelper"
    <config name="ObjectManager">
      /com/comergent/module2/objectMap.xml
    </config>
    <config name="MessageTypes">
      /com/comergent/module2/messageTypes.xml
    </config>
    <config name="Preferences">
      /com/comergent/modules2/preferences.xml
    </config>
    <init-param name="param2">param2Value</init-param>
  </module>
  <!-- it is allowable to have no initClass -->
  <module name="custom1" >
    <config name="ObjectManager">
      /com/comergent/module1/overlay/objectMap.xml
    </config>
  </module>
</initializationManager>
```

In this example, when the following method is called by the Initialization Manager:

```
com.comergent.objmgr.ObjManagerInitHelper.init (initParams,  
        configFragments, resourceLocator)
```

the following information is available:

- initParams has a list of key-value pairs: param0-param0Value
- configFragments has a list of:
 - /com/comergent/module1/objectMap.xml
 - /com/comergent/module12/objectMap.xml
- resourceLocator can find the resource along the path of: /a/b/c, current, and the current classpath.

Internationalization

This module provides basic support for the internationalization capabilities provided by the Sterling Multi-Channel Selling Solution. See CHAPTER 32, "Internationalization" for more details on how this module can be used.

Logging

This module provides access to the logging service used to record activity in the Sterling Multi-Channel Selling Solution. Its property file, **log4j.properties**, is used to configure the behaviour of the logging service. The module is based on the log4j open source project and uses the same syntax for its configuration as follows:

Log4j has the following main components: *loggers*, *appenders*, and *layouts*. These three types of components work together to enable developers to log messages according to message type and level, and to control at runtime how these messages are formatted and where they are reported.

Configuration

You configure the logging platform module using the log4j.properties configuration file by specifying the properties of its loggers, appenders, and layout. For example, the following snippet is used to configure the root logger and the CMGT appender:

```
# Set root category priority  
#log4j.rootCategory=info, CMGT  
log4j.rootCategory=info, STDOUT  
#log4j.rootCategory=info, CMGT, RTS  
  
### START - CMGT  
# CMGT appender  
log4j.appender.CMGT=com.comergent.logging.ComergentRollingFileAp-
```

```
pender
#log4j.appender.CMGT=com.comergent.logging.ComergentDailyRolling-
FileAppender

#log4j.appender.CMGT.layout=org.apache.log4j.PatternLayout
log4j.appender.CMGT.layout=com.comergent.logging.ConversionPattern

# The log format defaults to the "classic" format. This format is
# recommended for actual deployment to allow a log analyzer to
# work correctly.
log4j.appender.CMGT.layout.ConversionPattern=%d{yyyy.MM.dd
HH:mm:ss:SSS} Env/%t:%p:%c{1} %m%n
```

Loggers

Loggers are named entities. Logger names are case-sensitive and they follow the hierarchical naming rule: a logger is said to be an ancestor of another logger if its name followed by a dot is a prefix of the descendant logger name. A logger is said to be a parent of a child logger if there are no ancestors between itself and the descendant logger.

For example, the logger named “com.foo” is a parent of the logger named “com.foo.Bar”. Similarly, “java” is a parent of “java.util” and an ancestor of “java.util.Vector”. This naming scheme should be familiar to most developers.

The root logger resides at the top of the logger hierarchy. It is exceptional in two ways:

- It always exists;
- It cannot be retrieved by name.

Invoking the class static *Logger.getRootLogger()* method retrieves it. All other loggers are instantiated and retrieved with the class static *Logger.getLogger(String name)* method. This method takes the name of the desired logger as a parameter. For example:

```
private static final org.apache.log4j.Logger log =
    org.apache.log4j.Logger.getLogger(PriceCheckAPI.class);
log.debug("got current date: " + date);
```

Loggers may be assigned levels. The set of possible levels, that is DEBUG, INFO, WARN, ERROR and FATAL are defined in the org.apache.log4j.Level class. If a given logger is not assigned a level, then it inherits one from its closest ancestor with an assigned level. More formally:

Level Inheritance: the inherited level for a given logger, is equal to the first non-null level in the logger hierarchy, starting at the logger and proceeding upwards in the hierarchy towards the root logger.

To ensure that all loggers can eventually inherit a level, the root logger always has an assigned level.

Appenders

The ability to selectively enable or disable logging requests based on their logger is only part of the picture. More than one appender can be attached to a logger.

The `addAppender` method adds an appender to a given logger. Each enabled logging request for a given logger will be forwarded to all the appenders in that logger as well as the appenders higher in the hierarchy. In other words, appenders are inherited additively from the logger hierarchy. For example, if a console appender is added to the root logger, then all enabled logging requests will at least print on the console. If in addition a file appender is added to a logger, then enabled logging requests for the logger and its children will print on a file and on the console. It is possible to override this default behavior so that appender accumulation is no longer additive by setting the additivity flag to false.

The rules governing appender additivity are summarized below:

- The output of a log statement of logger C will go to all the appenders in C and its ancestors. This is the meaning of the term "appender additivity".
- However, if an ancestor of logger has the additivity flag set to false, then logger's output will be directed to all its appenders and its ancestors up to and including the ancestor, but not the appenders in any of the ancestors the ancestor.
- Loggers have their additivity flag set to true by default.

Layouts

Sometimes, you may wish to customize not only the output destination but also the output format. This is accomplished by associating a layout with an appender. The layout is responsible for formatting the logging request according to your wishes, whereas an appender takes care of sending the formatted output to its destination. The `PatternLayout`, part of the standard log4j distribution, lets you specify the output format according to conversion patterns similar to the C language `printf` function.

For example, the `PatternLayout` with the conversion pattern:


```
%r [%t] %-5p %c - %m%
```

will output something like this:

```
176 [main] INFO PriceCheckAPI - got current date: 10/22/2005.
```

The first field is the number of milliseconds elapsed since the start of the program. The second field is the thread making the log request. The third field is the level of the log statement. The fourth field is the name of the logger associated with the log request. The text after the “-” is the message of the statement.

Memory Monitor

This module provides classes used to monitor and log memory consumption.

Message Type Entitlement

This module provides the service that checks the entitlement of users to invoke message types.

The interfaces are defined in the `com.comergent.api.dispatchAuthorization` package. This package contains factory classes, interfaces, and exceptions needed for the service. The implementation classes are in the `com.comergent.dispatchAuthorization` package.

The main entry point for this module is the class `EntitlementRepository`. An instance of this class is obtained from the `EntitlementFactory` class. Applications can create named instances of the `EntitlementRepository` class. Named instances will facilitate unit testing, and may be useful for alternative deployment environments.

An application needing to specify dispatch rules or other message type entitlement objects will execute logic similar to the following:

```
import com.comergent.api.dispatchAuthorization.EntitlementRepository;
import com.comergent.api.dispatchAuthorization.EntitlementFactory;
import javax.xml.dom.Document;
...
Document document = ...;
...
EntitlementRepository repository =
    EntitlementFactory.getEntitlementRepository();
repository.setRules(document);
```

Object Manager

This module provides the classes used to instantiate objects: see "ObjectManager and OMWrapper Classes" on page 22 for details.

Out Of Band Response

This module is used to send output to output streams other than the standard JSP pages. See CHAPTER 10, "Sending Email from the Sterling Multi-Channel Selling Solution" for an example of how it is used.

Preferences Service

The Preferences module is used to retrieve and set configuration properties used by the Sterling Multi-Channel Selling Solution. You can retrieve properties along these lines:

```
private static final Preferences prefs =
    Preferences.getPreferences(MyClass.class);
// implicit scope of "com.comergent.apps.module.MyClass"
int max = prefs.getInt("PromotionManager.maxValue", 100);
int min = prefs.getInt("PromotionManager.minValue", 1);
```

The second parameter in the *getInt()* calls specify the value to return if no property with that name is found. The configuration file in which the property is defined is assumed to be on the classpath: for example in the file **com.comergent.apps.module.Preferences.xml**. If the XML properties file is read in using the Preferences service, then make sure that the XML file uses the Comergent root element. For example:

```
<Comergent>
  <PromotionManager>
    <maxValue>50</maxValue>
    <minValue>20</minValue>
  </PromotionManager>
</Comergent>
```

You can ensure that the Preferences service is used to initialize the properties by customizing the **WEB-INF/properties/init.xml** configuration file by adding an element along these lines:

```
<module name="PromotionMgr">
  <config name="Preferences">
    com/comergent/reference/apps/mktMgr/controller/Init.xml
  </config>
</module>
```

The Preferences class provides methods to get and put property values. For example:

```
prefs.putInt("PromotionManager.maxValue", 25);
prefs.putObject("currentShoppingCart", cartBean);
```

When using the *putObject()* method, the object must meet the requirements of the XMLEncoder API: essentially, that the object's fields must provide getter and setter methods.

Tag Libraries

The tag libraries provided by the Sterling Multi-Channel Selling Solution are produced as a platform module. They are documented in CHAPTER 30, "Comergent Tag Library" and CHAPTER 31, "Comergent Internet Commerce Tag Library", and in the accompanying Javadoc.

Thread Management

This module provides a centralized facility for handling threads: their creation, obtaining their status, and re-use. It is provided by the **backport-util-concurrent.jar** library. In general, an application developer will no longer have to invoke:

```
Thread t = new Thread(new MyRunnable());
```

Instead, having a centralized facility will allow you to:

- Pool and re-use thread when appropriate
- Track all running threads to help provide better accounting for CPU and resource usage.
- Provide simple status reporting (scoreboard strategy: central shared location where running thread can report its status).
- Provide simple aborting and interrupt signal via *Thread.interrupt()* invocations to allow long running (but looping) thread to quit early.

The module provides the following functionality:

1. Transparently provide pooling and re-use of thread.
2. For administrative functionality, provide means to query all running threads tracked by the thread manager.
3. For user of thread service, provide means to report current thread status to a common scoreboard.
4. Provide guidance to following simple loop or check interrupted status protocol to allow a long running or looping thread to quit early.
5. Provide a timer facility to allow running thread to be notified when a timer expired. This can be used to implement a simple time-out or timeshare policy.

API and Usage

The API will continue to follow the `Runnable()` pattern: the application obtains a Thread-like object and use it to execute.

```
Excutor executor = ExecutorFactory.getPooledExecutor();
executor.execute(new MyComergentRunnable());
```

XML Message Converter

This module provides a facility for converting XML documents from one message category (family and version) to another. The package name for the API is `com.comergent.api.converter` and `com.comergent.converter` for the implementation classes.

The API package includes:

- `ConverterFactory`: this is the Factory class to create converters.
- `Converter`: this is the class that converts a document from one message category to another. It can take either documents or streams as the source and targets for conversion.

See "Converter Classes" on page 32 for more information.

XML Message Service

This module is used to create and post outbound messages as XML documents. The API includes `MsgContext` interface, `MsgService` interface, `MsgServiceFactory` class, and the `MsgServiceException` classes in the `com.comergent.api.msgService` package and the implementation classes are in the `com.comergent.msgService` package.

The `MsgService` interface contains a generic `service()` method to post a databean and an XML document as specified in the message context.

The general usage pattern is as follows:

1. create a `MsgContext` instance using the `MsgContextFactory`;
2. set appropriate attributes on the context object;
3. create a `MsgService` instance for the target message family;
4. post a message by invoking the service method with a data bean and message context.

For example:

```
MsgContext ctx = new MsgContext();
ctx.setMessageType("ERPOrderCreateRequest");
```

```
ctx.setURL("http://www.server.com");
ctx.setMessageCategory("ERPOrderCreateRequest");
ctx.setContentType("text/xml");
ctx.setRemoteUser(username);
ctx.setRemotePassword(password);
MsgService msgService =
    MsgServiceFactory.getMsgService(ctx.getMessageCategory());
resultBean = msgService.service(requestBean, ctx);
```

XML Services

This module encapsulates functionality for XML parsing, XSL transformation, DOM wrappers, and utility classes.

Using Bizlets for Message Processing

The Sterling Multi-Channel Selling Solution makes use of a bizlet framework for handling inbound XML messages posted to the system. This framework can be used to expose functionality of the Sterling Multi-Channel Selling Solution to client applications through the combination of HTTP and XML. See "Example Bizlet Usage" on page 55 for an example of using bizlets in this way.

Each inbound message has a message type such as "OrderChangeRequest" declared as the `MessageType` element of its `MessageHeader` element. When the message is posted into the system (typically using the `http://<machine:port>/Sterling/msg/matrix` URL), the value of the message type element determines that the appropriate Bizlet processes the message.

The content type of the inbound message must correspond to a content type declared in the **MessageCrackerMap.xml** configuration file. For example:

```
<URLExt Name="integrator">
  <ContentType Name="application/x-icc-xml">
    <MessageCrackerImpl>
      com.comergent.dcm.messaging.ComergentMessageCrackerEx
    </MessageCrackerImpl>
    <ControllerImpl>
      com.comergent.dcm.messaging.MessagingController
    </ControllerImpl>
  </ContentType>
</URLExt>
```

```
<Request>com.comergent.dcm.messaging.XMLRequest</Request>
<Response>com.comergent.dcm.messaging.XMLResponse</Response>
</ContentType>
</URLExt>
```

Standard content types are “text/xml”, “application/xml”, and “application/x-icc-xml”.

Note: Do not use encoded content types such as “application/x-www-form-urlencoded” because the servlet container will attempt to unencode the message before the message cracker.
--

Bizlet Interfaces and Implementation

Each Bizlet that you create should be defined as an interface: for example, the following is the interface for the OrderBizlet used to process inbound Order processing messages:

```
package com.comergent.apps.orderMgmt.bizlet;

public interface OrderBizlet extends Bizlet
{
    public OrderBean createOrder(OrderBean orderBean)
        throws ICCEException;
    public OrderBean createOrderEx(OrderBean orderBean)
        throws ICCEException;
    public OrderBean changeOrder(OrderBean orderBean)
        throws ICCEException;
    public OrderBean cancelOrder(OrderBean orderBean)
        throws ICCEException;
}
```

Currently beans are the only supported parameters for the interface methods.

Note: The naming convention for the parameters is that you must use the same name as the bean with first letter being in lower case.

Bizlet interfaces must be created in packages whose last component is “bizlet”: for example com.comergent.apps.orderMgmt.bizlet. This ensures that the SDK generates the IDL files when the project target is run.

You should create a corresponding implementation class that implements the bizlet methods. Update the **ObjectMap.xml** file so that when an instance of the bizlet class is required an appropriate object is returned. For example, if OrderBizletImpl implements the OrderBizlet interface, then add the following to **ObjectMap.xml**:

```
<Object ID="com.comergent.apps.orderMgmt.orders.bizlet.OrderBizlet">
  <ClassName>
    com.comergent.apps.orderMgmt.orders.bizlet.OrderBizletImpl
```



```
</ClassName>
</Object>
```

Each implementation class should extend the `AbstractBizlet` class (which includes a default definition of the `init()` method) and implement its appropriate interface. For example, here is a fragment of the `OrderBizletImpl` source code:

```
public class OrderBizletImpl extends AbstractBizlet
    implements OrderBizlet
{
    /**
     * The BizletFactory will call this method upon instantiation,
     * and Bizlet session maintains the previous session state.
     */
    public void init(BizletSession state)
    {
        // initialization code goes here
    }

    /**
     * Create an order that corresponds to the incoming order
     * @param OrderBean orderBean incoming order
     * @return OrderBean created order
     * @exception BizletException
     */
    public OrderBean createOrder(OrderBean orderBean)
        throws BizletException
    {
        // Business logic code goes in here
    }
}
```

Logging the Inbound XML Messages

You can capture the inbound XML message for logging purposes using code along these lines:

```
XMLRequest xReq = (XMLRequest) ComergentAppEnv.getRequest();
XMLRequestAccessor xAcc =
    (XMLRequestAccessor) xReq.getParameterAccessor();
```

To retrieve messages before they are converted, use:

```
ComergentDocument comergentDocument = xAcc.getInboundMessage();
```

To retrieve messages after they have been converted, use:

```
ComergentDocument comergentDocument = xAcc.getMessage();
```

BizletInvoker Classes

Bizlets are invoked indirectly using BizletInvoker classes. The Invoker classes manage the method invocation to ensure that the correct parameters are passed to the method. By default, these Invoker classes take the same name as the Bizlet interface, but with “Invoker” appended to the class name. For example, OrderBizlet and OrderBizletInvoker.

Invoker classes are generated classes using the following process.

1. When you run SDK merge, the merge target invokes an internal target called generateIDL which identifies all interfaces that extend the Bizlet interface. For each such interface, it generates an interface definition language (IDL) file.
2. For each IDL file, a BizletInvoker class is generated: each BizletInvoker implements the corresponding Bizlet interface.
3. You should declare each BizletInvoker class in the **ObjectMap.xml** file.

```
<Object ID="com.comergent.apps.orderMgmt.orders.bizlet.-
  OrderBizletInvoker">
  <ClassName>
    com.comergent.apps.orderMgmt.orders.bizlet.-
      OrderBizletInvokerImpl
  </ClassName>
</Object>
```

A standard Invoker class is automatically generated for each bizlet, and unless you need to perform some special processing as part of invoking the bizlet, you should be able to use the generated Invoker classes unchanged.

Note that a naming convention will ensure that if no BizletInvoker class is declared, the BizRouter will invoke a class whose name is the name of the declared Bizlet appended with “Invoker”.

BizletSession Classes

BizletSession classes provide session-oriented state information to the bizlet classes. The naming convention for the session object is to append “Session” to the Bizlet name (for example, OrderBizletSession). Use BizletSession classes to set and retrieve any state that has session scope. When the Bizlet is invoked, its initialization method is called and you can provide initialization information:

```
public void init(BizletSession state)
{
    // initialization code goes here
}
```

Invoking Bizlets

Bizlets are invoked by mapping message types to bizlet methods using the BizletMapping elements of **MessageTypes.xml** files. For example:

```
<MessageType Name="OrderChangeRequest">
  <ControllerMapping>
    com.comergent.dcm.bizlet.BizRouter
  </ControllerMapping>
  <BizletMapping>
    com.comergent.apps.orderMgmt.orders.bizlet.OrderBizlet.-
      changeOrder
  </BizletMapping>
</MessageType>
```

The ControllerMapping element ensures that the correct BizRouter class is used to invoke the correct BizletInvoker class and method. Note that the interface is referenced in the BizletMapping element and that it provides the name of the method that should be invoked to process this message type.

Example Bizlet Usage

This section shows how to use a bizlet to access Sterling Multi-Channel Selling Solution functionality. We create a bizlet that can provide support to create, delete, or view shopping carts. After you create the supporting message types and bizlet, your client application can simply HTTP post XML messages as described below, and then process the reply once it is received.

You must make sure that the content type used to post the inbound message is declared in the **MessageCrackerMap.xml** configuration file.

Message Types

We must support the following message types:

- ShoppingCartXMLCreateRequest
- ShoppingCartXMLDeleteRequest
- ShoppingCartXMLLookupRequest

We want to create the messages along these lines:

- **ShoppingCartXMLCreateRequest.xml**: we use this to create a new shopping cart.

```
<?xml version="1.0" encoding="UTF-8" ?>
<Comergent>
```

```
<MessageHeader>
  <MessageType>ShoppingCartXMLCreateRequest</MessageType>
  <MessageVersion>4.0</MessageVersion>
  <MessageID/>
  <SessionID/>
</MessageHeader>
<RemoteUser>
<UserLogin>cchen</UserLogin>
<UserFullName/>
<UserAuthenticator>cchen</UserAuthenticator>
</RemoteUser>
<OrderInquiryList type="BusinessObject">
  <Name>Toro Demo</Name>
  <LineItemList>
    <LineItem>
      <SKU>MX-LNXA</SKU>
      <Quantity>101</Quantity>
    </LineItem>
  </LineItemList>
</OrderInquiryList>
</Comergent>
```

- **ShoppingCartXMLDeleteRequest.xml:** we use this to delete a shopping cart.

```
<?xml version="1.0" encoding="UTF-8" ?>
<Comergent>
  <MessageHeader>
    <MessageType>ShoppingCartXMLDeleteRequest</MessageType>
    <MessageVersion>4.0</MessageVersion>
    <MessageID/>
    <SessionID/>
  </MessageHeader>
  <RemoteUser>
    <UserLogin>cchen</UserLogin>
    <UserFullName/>
    <UserAuthenticator>cchen</UserAuthenticator>
  </RemoteUser>
  <OrderInquiryList type="BusinessObject">
    <ShoppingCartKey>600568</ShoppingCartKey>
  </OrderInquiryList>
</Comergent>
```

- **ShoppingCartXMLLookupRequest.xml:** we use this to view an existing shopping cart.

```
<?xml version="1.0" encoding="UTF-8" ?>
<Comergent>
  <MessageHeader>
    <MessageType>ShoppingCartXMLLookupRequest</MessageType>
```

```
<MessageVersion>4.0</MessageVersion>
<MessageID/>
<SessionID/>
</MessageHeader>
<RemoteUser>
  <UserLogin>cchen</UserLogin>
  <UserFullName/>
  <UserAuthenticator>cchen</UserAuthenticator>
</RemoteUser>
<OrderInquiryList type="BusinessObject">
  <ShoppingCartKey>600568</ShoppingCartKey>
</OrderInquiryList>
</Comergent>
```

You must create DTDs for the requests and their replies, and copy them to the **WEB-INF/messages/** directory. For example, these are the DTDs for **ShoppingCartXMLCreateRequest.dtd** and **ShoppingCartXMLCreateReply.dtd**, the DTDs for the request to create a shopping cart:

```
<?xml version="1.0" encoding="UTF-8"?>
<!--
  ShoppingCartXMLCreateRequest
  Document Type Declaration (DTD)
  Version 4.0 Comergent
  14-June-2004
  Authors:
    Comergent
    Contact: (650) 232-6000
    support@comergent.com
-->
<!ENTITY % MessageHeader SYSTEM "MessageHeader.dtd">
%MessageHeader;
<!ENTITY % RemoteUser SYSTEM "RemoteUser.dtd">
%RemoteUser;
<!ENTITY % OrderInquiryList SYSTEM "../bizobjs/OrderInquiryList.dtd">
%OrderInquiryList;
<!ELEMENT Comergent (MessageHeader, RemoteUser, OrderInquiryList)>
```

and

```
<?xml version="1.0" encoding='UTF-8' ?>

<!--
  ShoppingCartXMLCreateReply
  Document Type Declaration (DTD)
  Version 4.0 Comergent
  14-June-2004
  Authors:
    Comergent
```

```
        Contact: (650) 232-6000
        support@comergent.com
-->

<!ENTITY % MessageHeader SYSTEM "MessageHeader.dtd">
%MessageHeader;
<!ENTITY % ReplyHeader SYSTEM "ReplyHeader.dtd">
%ReplyHeader;
<!ENTITY % OrderInquiryList SYSTEM "../bizobjs/OrderInquiryList.dtd">
%OrderInquiryList;
<!ELEMENT Comergent (MessageHeader, RemoteUser, OrderInquiryList)>
```

Bizlets

We create the ShoppingCartBizlet interface as follows:

```
package com.comergent.apps.channelMgmt.bizlet;

import com.comergent.dcm.bizlet.Bizlet;
import com.comergent.dcm.util.ICCException;
import com.comergent.bean.simple.OrderInquiryListBean;

public interface ShoppingCartBizlet extends Bizlet
{
    public OrderInquiryListBean lookupShoppingCart(OrderInquiryListBean
        orderInquiryListBean) throws ICCException;

    public OrderInquiryListBean createShoppingCart(OrderInquiryListBean
        orderInquiryListBean) throws ICCException;

    public OrderInquiryListBean deleteShoppingCart(OrderInquiryListBean
        orderInquiryListBean) throws ICCException;
}
```

We also create the corresponding implementation class:

```
/*
 * ShoppingCartBizletImpl.java
 * Copyright (c) 2004 Comergent. All rights reserved.
 */
package com.comergent.apps.channelMgmt.bizlet;

import com.comergent.dcm.bizlet.Bizlet;
import com.comergent.dcm.bizlet.AbstractBizlet;
import com.comergent.dcm.dataservices.DataBean;
import com.comergent.dcm.util.ICCException;
import com.comergent.bean.simple.OrderInquiryListBean;
import com.comergent.bean.simple.OrderInquiryListLineItemBean;
import com.comergent.api.apps.commerce.IInquiryList;
import com.comergent.api.apps.commerce.CommerceAPI;
```

```
import com.comergent.api.apps.commerce.IInquiryListTypes;
import com.comergent.api.apps.pricingMgr.APIPriceListAttribute;

import java.util.Iterator;

public class ShoppingCartBizletImpl extends AbstractBizlet
    implements ShoppingCartBizlet
{
    public OrderInquiryListBean lookupShoppingCart (OrderInquiryListBean
        orderInquiryListBean) throws ICCEException
    {
        IInquiryList list = CommerceAPI.getFactory(
            IInquiryListTypes.ORDER_INQUIRY_LIST).getInquiryList(
                orderInquiryListBean.getShoppingCartKey(), true);
        return (OrderInquiryListBean) list.getDataBean();
    }

    public OrderInquiryListBean createShoppingCart (OrderInquiryListBean
        orderInquiryListBean) throws ICCEException
    {
        String name = orderInquiryListBean.getName();
        if ((name == null) || (name.length() == 0))
        {
            name = "New Cart";
        }
        Long currencyCode = orderInquiryListBean.getCurrencyLookupCode();
        if (currencyCode == null)
        {
            currencyCode = APIPriceListAttribute.getDefaultCurrencyCode();
        }
        Long customerTypeCode =
            orderInquiryListBean.getCustomerTypeCode();
        if (customerTypeCode == null)
        {
            customerTypeCode =
                APIPriceListAttribute.getDefaultCustomerType();
        }
        IInquiryList list = CommerceAPI.getFactory(
            IInquiryListTypes.ORDER_INQUIRY_LIST).createNewInquiryList(
            name, currencyCode, customerTypeCode);
        Iterator it = orderInquiryListBean.getLineItemIterator();
        while (it.hasNext())
        {
            OrderInquiryListLineItemBean oilLineItemBean =
                (OrderInquiryListLineItemBean) it.next();
            list.addLineItem(oilLineItemBean.getSKU(),
                oilLineItemBean.getQuantity());
        }
        list.save();
    }
}
```

```
        return (OrderInquiryListBean)list.getDataBean();
    }

    public OrderInquiryListBean deleteShoppingCart(OrderInquiryListBean
        orderInquiryListBean) throws ICCEException
    {
        IIquiryList list = CommerceAPI.getFactory(
            IIquiryListTypes.ORDER_INQUIRY_LIST).getInquiryList(
            orderInquiryListBean.getShoppingCartKey(), true);
        list.delete();
        return (OrderInquiryListBean)list.getDataBean();
    }
}
```

You must add the following element to the **ObjectMap.xml** to map the interface to the implementation class:

```
<Object
    ID="com.comergent.apps.channelMgmt.bizlet.ShoppingCartBizlet">
    <ClassName>
        com.comergent.apps.channelMgmt.bizlet.ShoppingCartBizletImpl
    </ClassName>
</Object>
```

You must add the message types to the appropriate MessageTypes.xml file:

```
<MessageType Name="ShoppingCartXMLCreateRequest">
    <ControllerMapping>
        com.comergent.dcm.bizlet.BizRouter
    </ControllerMapping>
    <BizletMapping>
        com.comergent.apps.channelMgmt.bizlet.-
        ShoppingCartBizlet.lookupShoppingCart
    </BizletMapping>
</MessageType>

<MessageType Name="ShoppingCartXMLLookupRequest">
    <ControllerMapping>
        com.comergent.dcm.bizlet.BizRouter
    </ControllerMapping>
    <BizletMapping>
        com.comergent.apps.channelMgmt.bizlet.-
        ShoppingCartBizlet.createShoppingCart
    </BizletMapping>
</MessageType>

<MessageType Name="ShoppingCartXMLDeleteRequest">
    <ControllerMapping>
        com.comergent.dcm.bizlet.BizRouter
    </ControllerMapping>
```



```
<BizletMapping>  
  com.comergent.apps.channelMgmt.bizlet.-  
  ShoppingCartBizlet.deleteShoppingCart  
</BizletMapping>  
</MessageType>
```


Introducing Data Beans and Business Objects

This chapter presents a brief tutorial that demonstrates how you can use the Sterling Multi-Channel Selling Solution to work easily with data beans and business objects. You can also consult the *Sterling Multi-Channel Selling Solution Reference Guide* for more information on data beans and business objects.

Attention:	In Release 6.4 and later, the use of business objects is not supported. You should use data beans wherever possible. See CHAPTER 40, "Deprecated Concepts" for more information about business objects.
-------------------	---

What are Data Beans?

A data bean is a data source-independent representation of a real-world entity in the Sterling Multi-Channel Selling Solution. The Sterling Multi-Channel Selling Solution uses an external schema (defined as a set of XML files) to define the structure of each type of data bean. For example, data beans are used as data structures for users, product inquiry lists, partners, products, and workspaces.

- Use the OMWrapper and ObjectManager classes to create instances of the DataBean classes. See "ObjectManager and OMWrapper Classes" on page 22 for more information.

- You can create a `DataBean` using the `DataManager`. Invoke the `DataManager` method `getDataBean(String beanName)` to create a `DataBean` of the named type. This method throws an `InvalidBizobjException` if no such `DataBean` class exists.

Note:	The use of this method is deprecated because it does not support extensions of the data object.
--------------	---

Lifecycle of a Data Bean

In general, the basic flow of working with a data object is:

1. Instantiate a data bean object using the `OMWrapper` class.
2. Add data to the bean by using the set methods to directly insert values into the data fields.
3. Persist the data bean to save the new data object to its data source for the first time.
4. Subsequently, you can retrieve the same data object by setting the value for key fields, and then performing a `restore()` on the data bean to retrieve the current data field values from its data source.
5. Perform any business logic required on the data bean. This may change the in-memory values of fields, but not the values stored in the data bean's data source.
6. Save the changes to the data bean by persisting the data bean to its data source.
7. Later, you may want to delete the data object if it is no longer in use.
8. Eventually, you may want to remove the data from the data source entirely by erasing the data object.

In the case of data objects whose underlying data source is a database, the following table summarizes the Java method calls and the corresponding SQL methods called.

TABLE 5. Data Bean Lifecycle

Step	Java Method	SQL Method
Instantiate data object	<code>OMWrapper.getObject()</code>	
Populate data fields	<code>setDataField()</code>	
Persist for the first time	<code>persist()</code>	INSERT
Retrieve data object	<code>restore()</code>	SELECT

TABLE 5. Data Bean Lifecycle

Step	Java Method	SQL Method
Business logic that updates field values	<i>getDataField()</i> <i>setDataField()</i>	
Save changes	<i>persist()</i>	UPDATE
Delete data object	<i>delete()</i>	UPDATE ^a
Erase data object	<i>erase()</i>	DELETE

a. The Delete operation updates the ACTIVE_FLAG column of the underlying database table row: it does not remove the record from the table.

Defining a Data Bean

Data beans are defined using an XML schema. Data beans provide accessor methods to get and set values of particular data fields. In general, you should use data beans when customizing Sterling Multi-Channel Selling Solution applications.

Defining the Structure of a Data Object

Each data object must have a defined structure to enable the Sterling Multi-Channel Selling Solution to create an instance of the data object. The structure of a data object is defined in its schema XML file: it specifies what fields the data object has and whether it has child objects.

Each data object corresponds to a Java class that extends the `DataBean` class. We refer to these as data bean classes. The data bean classes are generated automatically as part of the SDK merge process. When you generate the corresponding data bean class, it provides methods that access the fields and child data beans that are declared in the data object XML file.

You can change the definition of the XML schema and hence of data objects and their corresponding data bean classes by editing the XML schema files.

The **DsRecipes.xml** configuration file is used to link each data object and its data source. It also specifies whether the ordinality of the data object is “1” or “n”. The data object file is used to specify the precise structure of the data object, and the **DsDataElements.xml** configuration file is used to specify the data type (LIST, LONG, STRING, and so on) of each element.

Extending Data Objects

When you define a data object with an XML schema file, you can declare that it extends another data object by using the `Extends` attribute. This capability is used in two ways:

- You can use one data object as the parent of several different extending data objects which all share a common set of data fields. For example, many data objects in the Sterling Multi-Channel Selling Solution extend the C3PrimaryRW data object: this data object provides the basic OwnedBy and AccessKey data fields used to manage access control.
- You can customize a data object by creating a data object that extends it. By adding data fields to the extending data object, you can add attributes that you need to use as part of your customization. By using the ObjectManager, you can ensure that the extending data object is created when the system is called upon to create a data object of the extended type. Provided that existing code uses the ObjectManager to instantiate instances of the extended data object, then when this code is invoked, instances of the extending data object are created, but these still support the extended data object's interfaces, and so the existing code will continue to work.

The DataManager uses a *recipe* and a *data object* to determine the element structure of the data bean or business object and the location of the data source that provides the element values. When you change the definition of data objects or create new definitions, you must re-run the generateDTD and generateBean SDK targets to create and compile the DataBean classes. See CHAPTER 14, "Software Development Kit" for more details. See "Extending Data Objects" on page 78 for alternate ways to extend data objects.

Data Bean and Business Object Creation

The Sterling Multi-Channel Selling Solution's ObjectManager and OMWrapper classes create data beans, and business logic classes and controllers process them. See "ObjectManager and OMWrapper Classes" on page 22 for more information.

Business logic classes are invoked by controllers: each controller is responsible for determining which business logic class (if any) must be created in response to a message and its message type.

The use of business objects and the BusinessObject class is deprecated. Where possible, you should use data bean classes, and use business objects only to maintain legacy code.

DataContext

The *restore()* method takes an instance of the DataContext class as a parameter. The DataContext class is used to specify information about the context in which the *restore()* operation is being performed. It can be used to specify the maximum number of results to be returned and for determining the number of results on each

page (pagination). It can also be used to specify whether an access check should be performed on the results of the *restore()* operation. By default, an access check is performed.

For example, the following code snippet creates a *DataContext*, sets some context values, and then uses the context and a query to restore a data bean:

```
DataContext temp_DataContext = new DataContext();
temp_DataContext.setMaxResults(DsConstants.NO_LIMIT);
temp_DataContext.setNumPerPage(-1);
skuMappingListBean.restore(temp_DataContext, query);
```

When a *DataContext* object is initialized, it retrieves from the configuration files values of the *DataService.General.MaxResults* and *DataService.General.NumPerCachePage* element to set these parameters for the restore operation. By default, no limit is set on either. There are accessor methods available if the behavior of the *DataContext* needs to be modified. See the *DataContext* Javadoc for further information.

The *DataContext* class provides a *setCacheId(String cacheId)* method to support pagination: it identifies the particular cache being used.

What is the DataContext class?

The *DataContext* class is used to control the behavior of restore and persist operations.

What behavior can be controlled?

A *DataContext* instance can control the following:

- How many query results appear on a page.
- The maximum number of query results that will be processed.
- The use of multiple page sets per Data Bean type and Session.

What are the Cache Id methods for?

The Cache Id methods allow an application to specify a unique identifier for pagination of result sets. This new capability allows an application to maintain multiple distinct result sets for a given Data Bean and Session.

If an application does not specify a Cache Id then a combination of Bean name and Session Id are used to identify the cache. In this case any subsequent attempt to restore the same Data Bean within the same session will overwrite any results.

The *DataContext* class provides the following methods to control Cache Id on Data Bean restore requests:

- `void setCacheId(String cacheId)`: Sets a new cache id. This string is used in combination with the Bean name and session id to generate a unique identifier.
- `String getCacheId()`: Returns the current cache id (or null if it is not set).

How do Max Results and Num Per Page work?

The setting of Max Results determines the maximum number of records that can be retrieved during a restore. When that number is reached the request is freed.

The setting of Num Per Page determines how many records are saved in each result cache page. If the number found is less than Num Per Page, then no result cache is created.

Note that this combination of attributes allow the application to retrieve a set of paginated results while still specifying a maximum number of records to retrieve.

The `DataContext` class provides the following methods to Max Results and Num Per Page on Data Bean restore and persist requests:

- `void setMaxResults(int maxResults)` sets the maximum number of results returned for non-paginated results
- `int getMaxResults()` gets the maximum number of results to return for non-paginated results
- `void setMaxPaginatedResults(int maxResults)` sets the maximum number of results returned for paginated results
- `int getMaxPaginatedResults()` gets the maximum number of results to return for paginated results
- `void setNumPerPage(int numPerPage)`
- `int getNumPerPage()`

If an application wants to use the data services default limits, the appropriate property in `DataContext` must be set to **DsConstants.USE_DEFAULT**. The following are the default values:

- `maxResults`: 125
- `maxPaginatedResults`: 125
- `numPerPage`: 25

If the application does not specify a value for `numPerPage`, then the value specified in `prefs.xml` will be used. If a value is not set by the application nor the `prefs.xml` file, a value of -1 will be used, which means the request will not be paginated.

In addition, the following methods provide result set limits that are passed directly to the database as part of the SQL query. Since the Sterling Multi-Channel Selling Solution may discard results as part of its access policy checking (for example, does the user have the right to see this data?), these methods allow you to set a higher result set limit.

- `public void setDBResultLimit(int limit)`
- `public int getDBResultLimit()`

You can also set the `DataService.General.LimitDBResults` preference. If `LimitDBResults` is set to true, results are automatically limited to the number allowed by `MaxResults` (or by `MaxPaginatedResults` for paginated results). Access policies must be expressed as SQL to use this mechanism. For Oracle databases, do not set the `LimitDBResults` preference to true.

Our access policies are handled in one of two ways. Many are converted to SQL WHERE clauses that are applied to the query. This allows the database to handle the access policy. If the policy is too complex (for example, it relies on a hierarchy of partners), then the access policy can be applied only when processing the results from the database. Such policies cannot be converted to SQL.

With Oracle, there are some cases in which the SQL generation will require that column aliases be defined in the XML schema. This is necessary only when the query joins multiple tables that use the same column name. This is not an issue for SQL Server or DB2.

How do I instantiate a DataContext instance?

A new `DataContext` instance is currently instantiated using the standard “new” mechanism:

```
DataContext dc = new DataContext();
```

What are the Default Settings for a new DataContext?

When “new DataContext()” is invoked, the attributes receive the following default values:

TABLE 6. DataContext Default Values

Attribute	Default Value
doAccessCheck	true
maxResults	DataService.xml maxResults property
numPerPage	DataService.xml numPerPage property
CacheId	null

List Data Beans

A special class of business objects are called *list data beans* and *list business objects*. You use these classes to manage a list of data objects of the same type. Whenever a data object element is declared with ordinality “n” in a Recipe element, then a list data bean is created. Access entitlements are still managed at the level of the singular business object.

Note:	Earlier versions of data objects defined ordinality in the data object definition file. Now it is the recipe file that determines the ordinality of a data object. In Version 6.0 data objects, the ordinality attribute is still used to declare child, reference, and included data objects.
--------------	--

In general, you do not need to create DataBeans for list data objects: they are created automatically. See "DataBean Classes" on page 22 for more information. They support automatically generated methods that return a list of the data objects. For example, the following code fragment demonstrates how to restore a list of users. A DataContext object identified by “context” and a DsQuery object identified as “query” are used to restrict the users returned by the *restore()* call:

```
UserListBean userList = (UserListBean)
    OMWrapper.getObject("com.comergent.bean.simple.UserListBean");
// Restore the list.
userList.restore(context, query);
// Return immediately if no results found.
if (userList.getUserCount() == 0)
{
    return;
}
// At least one user in list, so walk through the list of users
ListIterator userIterator = userList.getUserIterator();
while (userIterator.hasNext())
```

```
{
    UserBean user = (UserBean) userIterator.next();
    // Perform any business logic on each user.
}
```

Note the use of the `DataContext` and `DsQuery` parameters in the `restore()` method: these are used to manage how the query is executed against the Knowledgebase. See CHAPTER 22, "Data Services Guidelines" for more information about the use of the `DsQuery` class.

See "Adding Functionality" on page 182 for an example of using a list data bean.

Application, Entity, and Presentation Beans

There are several main sorts of data beans used in the Sterling Multi-Channel Selling Solution: data beans, application beans, entity beans, and presentation beans. This section describes the main differences between them.

- Data beans are the Java classes created automatically from the XML schema description of the business objects. Running the `generateBean` SDK target generates the source code for each data bean. These beans comprise the `com.comergent.bean.simple` package.

Where possible, you should use the `instanceof` command to determine the class of a data bean rather than querying for the business object type.

- Application beans are Java classes created to add functionality that simple beans do not support. For example, an application bean may provide extra methods that cannot be automatically generated, or it may combine two or more simple beans to pass data to a JSP page. The application beans are organized by application and each application has a package for its application beans whose name is `com.comergent.apps.<application name>.bean`

Application beans can be subclasses of simple beans, but more often they are Java classes that contain one or more simple beans as member variables.

For example, the

`com.comergent.appservices.productService.productMgr.BizProductBean` application bean class is a Java class that contains a member variable that implements the `com.comergent.bean.simple.IDataProduct` interface. The `BizProductBean` application bean class delegates methods such as `getProductID()` to the `com.comergent.bean.simple.IDataProduct` member variable, but in addition it provides methods to retrieve a product's features,

its supersession chain, and prices. Note the use of the `IDataProduct` interface rather than the `ProductDataBean` itself: this is an example of using a generated interface rather than the class. See "Generated Interfaces" on page 129 for more information on the generation and use of these interfaces. By convention, if you create an application bean to wrap a data bean, then you must provide a method called `getDataBean()` that retrieves the data bean.

- Presentation beans are also used to pass data to JSP pages: typically, they differ from application beans in that they do not provide business logic. They may aggregate several data beans into a single class for ease of use, or provide formatting information. As with application beans, presentation beans must provide a method to provide access to the underlying data bean. For example, the `IPresProduct` interface provides the `getIRdProduct()` method: this returns the `IRdProduct` interface and you can downcast this to the underlying data bean or extended data bean if need be.
- Entity beans were used in prior releases of the Sterling Multi-Channel Selling Solution. They performed the same role as application beans. Their use is deprecated.

Using Stored Procedures

You can make use of stored procedures to restore data objects. The name of the stored procedure is declared in the `ExternalName` element of the data object. See "Stored Procedures" on page 280 for more information.

When you define data objects, take care to specify the `SourceType` attribute. It can take the following values:

- "1": the underlying data source uses a table. This is the default value.
- "2": the underlying data source uses a stored procedure.

If no `SourceType` attribute is defined, then the default value means that a table is the underlying source type for the data object.

Data Bean Methods

In general, you should make use of the generated interfaces that each data bean provides: these organize the accessor and data methods to help you manage access

to the data objects during their lifecycle. See "Generated Interfaces" on page 129 for more information.

Use the access policy security mechanism to provide access control. See "Managing Access to Data Objects Using Access Policies" on page 94 for more information. See the section "Data Bean Methods" on page 469 in CHAPTER 40, "Deprecated Concepts", for information about the access-checking methods supported by data beans.

IData Methods

The IData interface has these important methods:

- *copyBean()*: this method can be used to copy the values of data fields from one bean to another. It takes one argument: this must be a bean that is either an instance of the same class or a sub-class of the bean invoking this method.
- *delete()*: this method marks the corresponding data object as deleted: the ACTIVE_FLAG column of the database table corresponding to this data object is set to "N" when the object is persisted. Note that you must call *persist()* after calling *delete()*: if you do not, then the deletion does not take effect.
- *erase()*: this method removes the database record corresponding to the business object. Note that removing records from database tables can lead to data integrity problems if other tables refer to keys that have been deleted. In general, you should use this method only if you can account for all usages of the record and its keys and can delete the corresponding records from other tables.
- *generateKeys()*: this method populates the key fields of the data bean. You can call this method without invoking *persist()*. By invoking this method, you can use the generated keys to create other objects that require the keys.
- *setDataContext()*: this method sets the data context so that *restore()* and *persist()* calls use the right values for parameters such as the number of results per page in a paginated data set. See "DataContext" on page 66 for more information on the DataContext class.
- *persist()*: this method saves the data in the data bean to its data source.
- *prune()*: this method is used to mark the bean for deletion in memory. Calling *restore()* after *prune()* has no effect on the bean's underlying data source.

- *restore()*: this method retrieves the data for the data bean from its data source. See "DataContext" on page 66 for information on the use of the DataContext class in the *restore()* method. See CHAPTER 22, "Data Services Guidelines" for information on using the DsQuery class to specify queries as part of the *restore()* operation.
- *update()*: this method updates the database record corresponding to this business object.

Note that any method calls that change state must be followed by a *persist()* call to actually make the change to the database record.

The IData interface also provides the methods, *isRestorable()* and *isPersistable()*, that check whether a data object may be restored or persisted respectively.

IRd and IAcc Interface Methods

The IRd interface provides the read-only accessor methods to the data object fields. The IAcc interface extends the IRd interface by adding the set accessor methods for each data field. Distinguishing between these two interfaces provides you with the ability to pass a read-only object to a client application or JSP page.

For example, suppose that in the Condition data object file, **Condition.xml**, a DataField element is specified as follows:

```
<DataField Name="ControlType"
  Writable="y" Mandatory="y"
  ExternalFieldName="CONTROL_TYPE"/>
```

Then, in the automatically-generated IRdCondition interface, there is a method called:

```
public Long getControlType()
```

In the automatically-generated IAccCondition interface, there is a method called:

```
public void setControlType(Long value) throws ICCException
```

The signatures of these accessor methods is determined by the corresponding DataElement definition in the **DsDataElements.xml** file:

```
<DataElement Name="ControlType" DataType="LONG"
  Description="Condition Control Type" MaxLength="20" />
```

Note:	If you set the Writable attribute of a data field to "n", then the corresponding <i>setDataField()</i> method is not generated.
--------------	---

Restoring and Persisting Data

These important operations may be performed on a data object: *delete()*, *persist()*, and *restore()*.

- By calling the *delete()* method on a data object, you mark this object as deleted, and no other application will retrieve this data object. The `ACTIVE_FLAG` column of the underlying database table has its value set to 'N'. Note that the data object data is not deleted from the data source. If the underlying database table for data object does not have an `ACTIVE_FLAG` column, then do not use the *delete()* method. You can still use the *erase()* method to remove such data objects from the Knowledgebase.
- When you *persist* a data bean, the Sterling Multi-Channel Selling Solution saves the data held in the data object's `DsElement` tree to its external data source(s). Note that the Sterling Multi-Channel Selling Solution manages both the update of existing data objects and the creation of new data objects with the *persist()* method.
- When you *restore* a data bean or business object the Sterling Multi-Channel Selling Solution retrieves its data from its external data source(s). If no query object is specified in the *restore()* method, then all of the data objects whose values in the key fields match those in the data bean are restored.
 - Note that if you call *restore()* on a non-list data bean, then you should expect that its data is uniquely retrievable from the values set in its key fields. When the *restore()* call is issued, no check is performed to verify that only one record is retrieved, and so the first record retrieved will be used to populate the data bean. If no record is retrieved, then the *restore()* call throws an `ICCEException`.
 - When you call *restore()* on a list data bean, then you must usually specify a `DsQuery`. If no `DsQuery` is specified, then the restored list data bean will contain all the data beans of this type. See CHAPTER 22, "Data Services Guidelines" for more information about the `DsQuery` class.

restore() Method

This section provides description of the main forms of the `DataBean` *restore()* method.

```
public void restore(DataContext dataContext, DsQuery dsQuery)
```

The principal form of the *restore()* method. Use the *dsQuery* parameter to specify query to be executed by the restore operation. The *dataContext* parameter determines the maximum number of objects returned, and for pagination the number of results per page. Use the *dataContext* parameter to specify whether to check that the current user has the correct entitlements to perform this operation. By default, an access check is performed, so you have to override the access check if you do not want this to be done, using the *disableAccessCheck()* method.

```
public void restore(DataContext dataContext)
```

This is equivalent to calling *restore(dataContext, null)*.

Here is an example of using the *DataContext* and *DsQuery* classes together to manage the *restore()* call:

```
try
{
    DataContext dataContext = new DataContext();
    if (doAccessCheck == true)
    {
        dataContext.enableAccessCheck();
    }
    else
    {
        dataContext.disableAccessCheck();
    }
    dataContext.setNumPerPage(pageSize);
    DsQuery dsQuery = QueryHelper.newWhereClause("PartnerKey",
        DsConstants.EQUALS, partnerKey);
    LightweightPartnerBean partnerBean =
        (com.comergent.bean.simple.LightWeightPartnerBean)
        com.comergent.dcm.util.OMWrapper.getObject(
            "com.comergent.bean.simple.LightWeightPartnerBean");
    partnerBean.restore(dataContext, dsQuery);
    QueryHelper.freeQuery(dsQuery);
    return partnerBean;
}
catch (ICCEException e)
{
    throw (new ProfileMgrException(e));
}
```

***persist()* Method**

This section provides description of the main forms of the *DataBean persist()* method.

```
public void persist(DataContext dataContext)
```


If the `dataContext` specifies that an access check should be performed, then this form of the `persist()` method performs an access check before performing the operation. If the user does not have the appropriate entitlement, then the operation is not performed.

Miscellaneous Methods

getBizObj() Method

If you want to retrieve a business object representation of the data object and its data, then you can invoke the `getBizObj()` method. This is useful if you want to display the internal structure of the object. For example:

```
BusinessObject bo = bean.getBizObj();
ComergentDocument doc = bo.serializeToXml();
doc.prettyPrint();
```

Note that this is now a deprecated method.

writeExternal() Method

Use this method to write out an XML representation of the data bean and its data.

Child Data Objects

Many data objects declare child data objects using the `ChildDataObject` element. For example, the `ShoppingCart` data object declares `LineItem` as a child data object as follows:

```
<DataObject Name="ShoppingCart" Extends="C3PrimaryRW"
  ExternalName="CMGT_CARTS" ObjectType="JDBC" Version="6.0">
...
<ChildDataObject Access="RWID" Name="LineItem">
  <Relationship CascadeDelete="y" CascadeErase="n"
    ChangeUpdatesParent="y">
    <JoinKeys>
      <JoinKey DstJoinField="ShoppingCartKey"
        SrcJoinField="ShoppingCartKey"/>
    </JoinKeys>
  </Relationship>
</ChildDataObject>
...
</DataObject>
```

Its `Relationship` element has attributes that describe how child objects should be managed when the parent is updated and whether to update the parent when a child is changed. The `JoinKey` elements describes how to restore the child data objects: typically, by specifying how values in the parent data object are used to set values in the child data object.

When the parent data bean is generated, it generates a method called *getChildDataObjectIterator()* which returns an *ListIterator* object containing the child data beans. By iterating through the objects, you can examine each child data bean in turn and access its fields using the standard accessor methods.

For example, the *ShoppingCartBean* class supports the *getLineItemIterator()* method. The following lines of code demonstrate how to retrieve a field of a line item:

```
/*
shoppingCartBean is a ShoppingCartBean object that has already been
restored
*/
ListIterator lineItemIterator =
    shoppingCartBean.getLineItemIterator();
LineItemBean lineItemBean =
    (LineItemBean) lineItemIterator.getLineItemBean(0);
Long quantity = lineItemBean.getQuantity();
```

When a parent data object is restored, the child data objects are not restored. They are restored only when the application accesses the children as described above.

Extending Data Objects

It is common for any implementation of the Sterling Multi-Channel Selling Solution to need to add data fields to data objects or to create data objects that extend existing data objects.

We recommend storing the additional data in a new database table. A new *DataObject* should then be defined that accesses the new table. Another new *DataObject* is then defined that extends the original *DataObject* by adding a new *IncludeDataObject*.

For example, suppose that you need to add a new data field to the *Order* data object to track “hosted” orders: orders that are placed at storefront partners. The extra data field is the partner key of the storefront partner. The recommended approach is as follows:

1. Create a new data object called *HostedPartner* that has exactly two fields: an *OrderKey* and a *PartnerKey*. Set it up to point to a two-column table: *CMGT_ORDER_X_PARTNER* with columns *ORDER_KEY* and *PARTNER_KEY*.

```
<?xml version="1.0"?>
<DataObject Name="HostedPartner"
    ExternalName="CMGT_ORDER_X_PARTNER" ObjectType="JDBC"
    Version="6.0">
    <KeyFields>
```

```
<KeyField Name="OrderKey" ExternalName="ORDER_KEY"/>
<KeyField Name="PartnerKey" ExternalName="PARTNER_KEY"/>
</KeyFields>
<DataFieldList>
  <DataField Name="OrderKey" ExternalFieldName="ORDER_KEY"
    Mandatory="n" Writable="y"/>
  <DataField Name="PartnerKey"
    ExternalFieldName="PARTNER_KEY"
    Mandatory="n" Writable="y"/>
</DataFieldList>
</DataObject>
```

2. Create a new data object called `HostedOrder` that extends `Order`. The **HostedOrder.xml** file looks like this:

```
<?xml version="1.0"?>
<DataObject Name="HostedOrder" Extends="Order" ObjectType="JDBC"
  Version="6.0">
  <IncludedDataObject Access="RWID" Name="HostedPartner"
    Ordinality="1">
    <Relationship CascadeDelete="y" CascadeErase="n"
      ChangeUpdatesParent="y">
      <JoinKeys>
        <JoinKey DstJoinField="OrderKey"
          SrcJoinField="OrderKey"/>
      </JoinKeys>
    </Relationship>
  </IncludedDataObject>
</DataObject>
```

There are three basic approaches that can be used:

1. You can use extension to simply add any additional `DataFields` and override the table name. This allows you to include all of the data in a new table. This approach is most useful when you need the same data, but need a distinct copy of it. (Perhaps you maintain a snapshot of how an `Order` looked before it was turned into a `HostedOrder`)
2. You can extend `Order` to add an `IncludedDataObject` for `HostedOrder`, where `HostedOrder` only defines additional data for storage in another table. This means that changes to the original `Order` `DataFields` will still be persisted to the `Order` table, but the additional data for `HostedOrder` will be persisted to a different table. This is the recommended approach described above.
3. You can define `HostedOrder` specifying that `Order` is a `IncludedDataObject`. This accomplishes the same thing as the second alternative. The problem with this approach is that a `HostedOrder` does not extend `Order`, and can no longer be treated as an `Order` by application code.

Note: Using two tables has a slight disadvantage in performance, but query execution has not been a problem area. Using two tables may reduce data redundancy (depending on your requirements).

If you only occasionally reference the customer extension, then you may want to use a `ChildDataObject` to take advantage of the lazy link mechanism.

Data Bean Example

This section presents the process of defining and using a data object. Suppose that you want to use a data object to represent a simple enquiry from a customer. This will comprise:

- an email address for the customer
- the date the enquiry was made
- the date a response was returned (optional)
- the content of the enquiry
- the content of the response (optional)
- the product ID of the product about which the enquiry was made (optional)

To Create a Data Object Definition

1. Create the business object element `Enquiry` and add it to the **`DsBusinessObjects.xml`** file.

```
<BusinessObject Name="Enquiry" Version="6.0"
  Description="Customer enquiry"/>
```

Use the `Version` attribute to manage different versions of business objects that may be in use simultaneously. Note that the `Version` attribute is also used to determine whether access checks are performed automatically (Version 5.0 or higher) or not.

2. Create the recipe for this business object and add it to the **`DsRecipes.xml`** file.

```
<Recipe Name="Enquiry" Version="6.0" Ordinality="n"
  Description="Customer enquiry">
  <DataObjectList>
    <DataObject Name="Enquiry"
      DataSourceName="ENTERPRISE" />
  </DataObjectList>
</Recipe>
```

The Name attribute of the recipe must match exactly (it is case-sensitive) to the Name of the business object. In Release 8.0, each recipe may have more than one data object defined in the data object list, but only one may be a *writable* data object. The data objects define the data source names as an attribute of each data object element. It is these entries that determine the sources from which the business object retrieves its data and the source to which the business object may be persisted.

3. Create a file called **Enquiry.xml** to define the data object. The Name of the data object element must match exactly (it is case-sensitive) the Name attribute defined in the DataObject entry of the recipe element.

In this example, the data for these data objects is held in a database table called CMGT_ENQUIRY, and the ExternalFieldName attribute of each DataField element specifies which column is to be used to retrieve the DataField value. For example, the EMAIL_ADDRESS column of the CMGT_ENQUIRY table holds the email address value associated with an enquiry.

```
<?xml version="1.0"?>
<DataObject Name="Enquiry" Extends="C3PrimaryRW" Version="6.0"
  ExternalName="CMGT_ENQUIRY"
  Access="R" ObjectType="JDBC">
  <KeyFields>
    <KeyField Name="Key" ExternalName="ENQUIRY_KEY"/>
  </KeyFields>
  <DataFieldList>
    <DataField Name="EnquiryKey"
      Writable="n" Mandatory="y"
      ExternalFieldName="ENQUIRY_KEY"/>
    <DataField Name="EmailAddress"
      Writable="n" Mandatory="y"
      ExternalFieldName="EMAIL_ADDRESS"/>
    <DataField Name="EnquiryDate"
      Writable="n" Mandatory="y"
      ExternalFieldName="ENQUIRY_DATE"/>
    <DataField Name="ResponseDate"
      Writable="n" Mandatory="n"
      ExternalFieldName="RESPONSE_DATE"/>
    <DataField Name="TimeToRespond"
      Writable="n" Mandatory="n"/>
    <DataField Name="EnquiryContent"
      Writable="n" Mandatory="y"
      ExternalFieldName="ENQUIRY_CONTENT"/>
    <DataField Name="ResponseContent"
      Writable="y" Mandatory="n"
      ExternalFieldName="RESPONSE_CONTENT"/>
    <DataField Name="SKU"
```

```
        Writable="n" Mandatory="n"
        ExternalFieldName="SKU"/>
    </DataFieldList>
</DataObject>
```

Note the definition of the `TimeToRespond` data field: it has no `ExternalFieldName` attribute because it does not correspond to a database column. Values for this field are calculated at runtime and are set in the `EnquiryBean` so that its value can be displayed.

4. Define Enquiry and EnquiryList DataElements in **DsDataElements.xml**:

```
<DataElement Name="Enquiry" Description="Enquiry"
    DataType="HEADER"/>
<DataElement Name="EnquiryList" Description="Enquiry list"
    DataType="LIST"/>
```

5. Define a DataElement for each DataField in **DsDataElements.xml**.

DataElements provide data type information used by the `DataManager` when it is retrieving or saving data for this business object type. For example:

```
<DataElement Name="EnquiryKey" LongName="Enquiry Key"
    DataType="LONG" MaxLength="20" />
<DataElement Name="EnquiryDate" LongName="Enquiry Date"
    DataType="DATE" />
<DataElement Name="ResponseDate" LongName="Response Date"
    DataType="DATE" />
<DataElement Name="EnquiryContent" LongName="Enquiry content"
    DataType="STRING" MaxLength="256" />
<DataElement Name="ResponseContent" LongName="Response content"
    DataType="STRING" MaxLength="256" />
```

Note that we have not included a `DataElement` for `EmailAddress` and `SKU`. The `DataElements` for these `DataFields` are already defined and you can re-use `DataElements` any number of times (as long as the data type is the same in each occurrence).

6. Create entries in the **ObjectMap.xml** file for this data bean. For example:

```
<Object ID="com.comergent.bean.simple.EnquiryBean">
    <ClassName>com.comergent.bean.simple.EnquiryBean</ClassName>
</Object>
<Object ID="com.comergent.bean.simple.IRdEnquiry">
    <ClassName>com.comergent.bean.simple.EnquiryBean</ClassName>
</Object>
<Object ID="com.comergent.bean.simple.IAccEnquiry">
    <ClassName>com.comergent.bean.simple.EnquiryBean</ClassName>
</Object>
<Object ID="com.comergent.bean.simple.IDataEnquiry">
    <ClassName>com.comergent.bean.simple.EnquiryBean</ClassName>
```

```
</Object>
```

7. Finally, define a data source element to correspond to the `DataSourceName` attribute defined in the `DataObject` element. This data source is defined in the **`DsDataSources.xml`** file as part of the schema. In most cases, this data source will already be defined: You only need define a new one if you are using a different database or other data source than the rest of the Knowledgebase. For example:

```
<DataSource Name="ENTERPRISE" Version="2.0">
  <Primary Type="SQL" DataService="JdbcService"
    SubType="ORACLE"
    ConnectionString="jdbc:<driver>:<server>:<port>:<sid>"
    UserId="userid" Password="password" />
  <Alternate Type="SQL" DataService="JdbcService"
    SubType="MSSQL"
    ConnectionString="jdbc:<driver>:<server>:<port>:<sid>"
    UserId="userid" Password="password" />
</DataSource>
```

The `DataService` attribute of the `Primary` and `Alternate` elements determine which class is used to process the `EnquiryBean` *restore()* and *persist()* methods. The remaining attributes determine exactly how the external source is accessed.

8. Run the `generateBean` SDK target to generate the source code for the new `EnquiryBean` and `EnquiryListBean` data beans and the corresponding interfaces. See "Generated Interfaces" on page 129 for more information on these interfaces.

You can now use `Enquiry` data beans and its interfaces in business logic classes. To create an instance of an `Enquiry` data bean, you invoke a method of the form:

```
OMWrapper().getObject("com.comergent.bean.simple.EnquiryBean")
```

This returns an `EnquiryBean` data bean and its structure is as specified in the `Enquiry DataObject`. Once you have an instance of the `QueryBean` class, then populate its key fields and restore the bean to retrieve its data:

```
int queryIndex = 0;
try
{
    String queryKey = request.getParameter("querykey");
    queryIndex = Integer.parseInt(queryKey);
}
catch (Exception e)
{
    //Throw exception if parameter not valid
}
QueryBean queryBean = (QueryBean)
```

```
OMWrapper().getObject("com.comergent.bean.simple.EnquiryBean");
queryBean.setKey(queryIndex);
queryBean.restore();
```

To retrieve a list of enquiries:

```
// Use default settings for DataContext parameters
DataContext context = new DataContext();
// Retrieve enquiries relating to a particular product ID, MXWS-7000
DsQuery query =
    QueryHelper.newWhereClause("SKU", DsQueryOperators.EQUALS,
        "MXWS-7000");
EnquiryListBean enquiryList = (EnquiryListBean)
    OMWrapper.getObject("com.comergent.bean.simple.EnquiryListBean");
// Restore the list.
enquiryList.restore(context, query);
// Walk through the list...
ListIterator enquiryIterator = enquiryList.getEnquiryIterator();
while (enquiryIterator.hasNext())
{
    boolean isModified = false;
    EnquiryBean enquiry = (EnquiryBean) enquiryIterator.next();
    // Process each enquiry
}
```

In general, you should try to ensure that applications that use the EnquiryBean use one of the generated interfaces rather than the data bean itself. This will enable the application to separate out the implementation of the data object from its interface and let you manage what access the application has to the object's data. To retrieve an instance of a class that implements the IAccEnquiry interface, you can use:

```
IAccEnquiry temp_IAccEnquiry = (IAccEnquiry)
    OMWrapper.getObject("com.comergent.bean.simple.IAccEnquiry");
```

DsElement Tree

This section describes methods to retrieve metadata about databeans. It also describes the DsElement tree used to store data in the data object and business object classes. It is covered here only to support legacy applications: all new applications that use the data bean classes should not need to be concerned with it.

Data objects are created as objects of data bean classes. Each data object holds its content as a tree of components called DsElements (see "DsElements" on page 85).

Their content is retrieved from external systems using the XML schema, and the recipes and data sources defined in the XML schema.

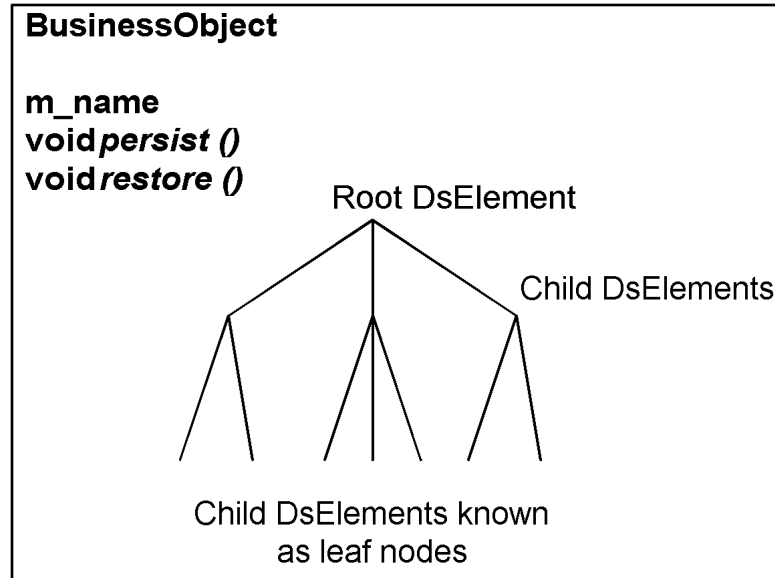


FIGURE 3. Business Object

When the DataManager creates a data bean or business object, it uses the XML schema to determine the structure of its DsElement tree. The DsElement tree is the Java representation of the structure of the business object. The schema also determines the data types that may be inserted at leaf nodes and whether constraints are placed on the values of the node. You access the DsElement tree by invoking the business object method *getRootElement()*.

DsElements

Each DsElement contains data and a DataMap that defines how its data corresponds to its data source. A DsElement may be the child of another DsElement (its *parent*). A DsElement tree is a collection of DsElements, all but one of which have another element in the tree as its parent. By definition, the DsElement with a null parent is the *root* DsElement.

DsElement**m_children****m_parent****m_dataMap****m_value****DsElementcloneDsElement ()****DsElementaddChild (DataMap dataMap)****voiddelete ()****StringgetName ()****intgetType ()****DsElementgetParent ()****DsElementgetByName (String s)****voiddeleteChild (DsElement child)****FIGURE 4. DsElement Methods**

The DsElement class provides various additional methods to support navigating through a DsElement tree, notably *children()* that returns an Iterator of the child DsElements of a given DsElement. As well as *getRootElement()*, the business object class also provides the *getElementByName()* method to access directly a named DsElement in its tree.

All DsElements that have the same name, for example *child_name*, and which are children of a DsElement must have a parent whose name is *<child_name>List*. The XML schema identifies such elements by defining their ordinality to be “n” as opposed to “1”. A DsElement maintains its children in a Vector called *m_children*.

The DsElement has these important methods:

- *addChild()*: adds a new DsElement defined by the DataMap of this DsElement.
- *cloneDsElement()*: returns a copy of this DsElement.
- *delete()*: sets the DsElemState to DsElemState.DELETED.

- *deleteChild()*: removes a child from the vector *m_children* by specifying it as a *DsElement*.
- *getName()*: returns the name of the element as defined by its *MetaData*.
- *getParent()*: returns the parent of this *DsElement*.
- *getType()*: returns the type of the element as defined by its *DataMap*.

DsElement MetaData

It is sometimes useful to retrieve information about a data field and its underlying *DsElement*. You can use the *IData* interface method *getMetaData(String elementName)* to this. It returns an object that implements the *IMetaData* interface. This interface supports the following methods:

- `public int getDataType()`: returns values as defined in *DsDataTypes*
- `public long getMaxLength()`: returns maximum length in bytes
- `public long getMaxCharLength(Locale locale)`: returns maximum length in characters
- `public Object getMinValue()`: returns the minimum allowed value (or null if there is no minimum)
- `public Object getMaxValue()`: returns the maximum allowed value (or null if there is no maximum)
- `public int getCountAllowedValues()`
- `public ListIterator getAllowedValueIterator()`
- `public Object getDefaultValue()`

Note that each generated *DataBean* class implements the *IData* interface, and so these methods are available to all the generated data beans.

BusinessObject Methods

Use of business objects is deprecated. This section provides information about some business object methods for reference only.

***restore()* Method**

This section provides description of the main forms of the *BusinessObject restore()* method.

```
public void restore(BusinessObject queryObj, int maxResults,
    boolean accessCheck)
```

The principal form of the *restore()* method. Use the *queryObj* parameter to specify query to be executed by the restore operation. The *maxResults* parameter determines the maximum number of objects returned. Use the *accessCheck* parameter to specify whether to check that the current user has the correct entitlements to perform this operation. Once the access check has been performed, then the *restore(BusinessObject queryObj, int maxResults)* is called.

```
public void restore(BusinessObject queryObj, int maxResults)
```

This method calls the *restore()* method *restore(this, queryObj, maxResults, false)* of the underlying data object.

```
public void restore(BusinessObject queryObj)
```

This is equivalent to calling *restore(queryObj, 0)*.

```
public void restore()
```

This form of the method calls the *restore(null, 0)* method.

***persist()* Method**

This section provides descriptions of the main forms of the *BusinessObject persist()* method.

```
public void persist(boolean synch, boolean commit,
    boolean accessCheck)
```

The boolean parameters determine respectively whether the *persist* operation is synchronized, should be committed to the underlying data source, and whether an access check should be performed prior to persisting.

```
public void persist(boolean synch, boolean commit)
```

This form of the method is equivalent to *persist(synch, commit, false)* for business objects whose *Version* attribute is 4.0 or less. It is equivalent to *persist(synch, commit, true)* for business objects whose *Version* attribute is 5.0 or more.

```
public void persist()
```

This form of the method calls *persist(false, true)*.

The *BusinessObject* class also has these methods:

- *delete()*: empties the business object by deleting its *DsElement* tree.
- *getRootElement()*: returns the root *DsElement* of the *DsElement* tree.

- *getType()*: returns the name of the root element of the DsElement tree. This is the type of the business object.
- *setRootElement()*: sets the root element of this business object.

The Sterling Multi-Channel Selling Solution offers developers several mechanisms to manage security in their applications. This chapter describes how you can use the entitlements, access control lists, and access policies to manage what users can do: what functions they may perform and what access they to have data objects. It covers:

- "Managing Message Types" on page 91
- "Managing Access to Data Objects Using Access Policies" on page 94
- "Password Policies" on page 100
- "Passing Login Data Through a URL" on page 102

Please consult the *Sterling Multi-Channel Selling Solution Reference Guide* for a description of the underlying security architecture.

Managing Message Types

As you customize the Sterling Multi-Channel Selling Solution, you must take into account which types of users can execute which message types and which Web pages should be accessible to which users.

Each message type corresponds to a request that the user's browser makes to the server. Message types are organized into message groups. A role is defined as a collection of message groups that are either granted or denied to the role.

```
<RoleDefinition Name="Partner.SalesRep">
  <Description>
    This is the role associated with the Lead Users.
    Lead Users can work leads that are assigned to them.
  </Description>
  <Grant>LeadMgmtDetailGroup</Grant>
  <Grant>ProposalGroup</Grant>
</RoleDefinition>
```

In Release 8.0, roles are aggregated into functions: a function is intended to be the collection of roles that correspond to a business function such as finance or sales. Users are assigned functions, and the set of functions available to be assigned to a user depends on their user type. A function is declared in the **Entitlements.xml** configuration file using an element of this form:

```
<UserFunctionMapping Name="IndirectSalesExecutive">
  <Description>Sales</Description>
  <Role>Partner.IndirectBuyer</Role>
  <Role>Partner.SalesRep</Role>
  <Role>Partner.SalesManager</Role>
  <Role>Partner.CustomerServiceRepresentative</Role>
</UserFunctionMapping>
```

The same role can be included in more than one function. Consequently, you can define functions that overlap in some roles, or define a function that is only a subset of another function.

Checking for Entitlement

The system will test whether a user can execute a message type when a request is received. However, to prevent users from seeing error pages, in general, you should perform an entitlement check for each link on a JSP page to test that the user can execute the message type associated to the link.

You can use the *canRequest(String messageType)* method of the User class. You can retrieve the current User object from the session as follows:

```
User sessionUser = comergentSession.getUser();
```

For example, the following lines in a JSP page are used to determine whether the current user can access a promotion detail page.

```
User sessionUser = comergentSession.getUser();
...
<% if (sessionUser.canRequest("PromotionDetailDisplay"))
```



```
    {
%>
        <A HREF="<%= link("partnerMkt", "PromotionDetailDisplay",
            "PromotionKey=<%= promotion.getKey() %>") %>" %>">
            <%= ph(promoName) %></A>
    } else {
%>
        <%= ph(promoName) %>
    }
%>
```

Managing User Types

There may be situations in which you need to modify an existing user type or you may need to create a new user type.

Adding a Role to a User Type

The definitions of user types are declared in the `UserTypeDefinition` elements in **Entitlements.xml**. For example, in Release 8.0, this is the definition of the `RegisteredUser` user type:

```
<UserTypeDefinition Name="RegisteredUser">
  <Description>
    Known direct commerce users with no partner affiliation.
  </Description>
  <Label>User</Label>
  <MandatoryRoleSet>
    <Role>Registered.User</Role>
    <Role>Review.User</Role>
  </MandatoryRoleSet>
</UserTypeDefinition>
```

You can add a function or role to a user type simply by editing the **Entitlements.xml** file accordingly and by granting appropriate message groups to the new role. Note that you must restart the Sterling Multi-Channel Selling Solution for the new function to be available for assignment.

The `MandatoryRoleSet` element specifies the set of roles that cannot be removed from a user's entitlements. All users of this user type have these roles.

Creating a User Type

You can create the definition of a new user type simply by adding it to the **Entitlements.xml** file. Each user type is associated with partner types. The

PartnerTypeDefinition elements of the **Entitlements.xml** configuration file determine which user types are available to which partners, so that only users of those types can be created for each partner. For example, consider the following PartnerTypeDefinition element:

```
<PartnerTypeDefinition Name="IndirectPartner">
  <Description>
    An IndirectCommercePartnerType partner has a
    relationship with the enterprise for
    the purpose of indirect commerce.
  </Description>
  <UserType>IndirectUser</UserType>
</PartnerTypeDefinition>
```

This says that when a user is created for a partner whose type is IndirectPartner, then only the IndirectUser user type may be selected.

Managing Access to Data Objects Using Access Policies

Access policies are designed to conform with the Java Authentication and Authorization Services (JAAS) model.

Access policies are particularly important for data objects that can be modified using the DsUpdate functionality. If your implementation of the Sterling Multi-Channel Selling Solution uses DsUpdate, then you must use access policies to manage the data objects updated using DsUpdate.

Access policies are applied to a data object by use of a ResourceClass element. For example:

```
<ResourceClass>com.comergent.bean.simple.PartnerBean</ResourceClass>
```

This element is declared within an AccessPolicy element. You can apply the same access policy to several different data objects by listing each of them as a ResourceClass element. Access policies are inherited by data objects that extend other data objects. For example, if an access policy declares the ShoppingCart as a ResourceClass, then the same access policy is also applied to the ChannelShoppingCart data object because it extends the ShoppingCart data object.

Release 7.1 and higher support *predictive access control*: when a data object controlled by an access policy is restored, the data services layer will attempt to amend the restoring query to reflect the access privileges defined in the access policy. If the data services layer does this, then it will not perform the access policy check on the returned result set.

Overview

An access policy controls access to a data object by specifying the conditions under which a user can perform an action on the data object, referred to as the *resource*. The following actions can be performed on data objects:

- Create
- Delete
- Restore
- Update

The conditions are specified as evaluating principals and expressions, and comparing them to the permitted values of the access policy. In general, principals are attributes of the user attempting an action on the data object, but they may be defined more generally. Expressions may be likened to SQL queries: they act as filters on the lists of data object being tested for access.

For example, suppose that you want to use an access policy to specify that only users that belong to a partner can update their partner profile. In this case, the action is Update and the condition that you want to define is that if you evaluate the partner key of the user object, then it must equal the partner key of the partner data object. In this example, the principal being evaluated is the partner key of the user.

Inheritance

When you define an access policy on a data object, it is inherited by all the data objects that extend it. Note that this means that if one data object extends another and you want to define different access policies for each, then you must declare distinct access policies for each of them.

AccessPolicy.xml Configuration File

You define access policies using an **AccessPolicy.xml** configuration file. Each AccessPolicy element declared in this file can be applied to one data object type: the data object is specified as the DataObject attribute of the AccessPolicy element.

Principal Qualifiers

Principal qualifiers are defined using the PrincipalQualifierDefinition element of the **AccessPolicy.xml** configuration file. Principal qualifiers are essentially Java classes that implement the PrincipalQualifier interface.

```
<PrincipalQualifierDefinition PrincipalType="UserType"  
    Class="com.comergent.dcm.entitlement.UserTypeQualifier"/>
```

Access Policies

Each `AccessPolicy` element specifies which `PrincipalQualifier` is to be used to evaluate the principal conditions by specifying the name of the `PrincipalQualifier` as the `PrincipalQualifier` attribute of the `AccessPolicy` element.

```
<AccessPolicy Name="UserPolicy" DataObject="UserContact"
  PrincipalQualifier="UserType">
```

Access Checkers

`AccessChecker` elements are used to define the individual checks that can be made to determine whether a user can access a data object. Each `AccessPolicy` element declares one or more `AccessChecker` elements. Each `AccessChecker` element specifies the permitted values of the principal to be compared, the action type to be checked, and any expressions to be evaluated to filter the data objects that can be acted on.

```
<AccessChecker>
  <Principal Select="Partner.DirectCommerceUser"/>
  <Principal Select="Partner.User"/>
  <ActionType Type="Restore"/>
  <BooleanExpression>
    <ComparativeExpression Operator="Equals">
      <Term>user.PartnerKey</Term>
      <Term>resource.PartnerKey</Term>
    </ComparativeExpression>
  </BooleanExpression>
</AccessChecker>
```

In this example of an `AccessChecker` element, the action type being checked for is “Restore”. The access policy is checked by comparing the user role of the user to see if one matches either “Partner.DirectCommerceUser” or “Partner.User”. The Expression element is evaluated to see if the `PartnerKey` field of the data object is equal to the partner key of the user, and this filter is applied to the data objects in question.

If there is more than one `BooleanExpression` element in an `AccessChecker` element, then use the `Operator` attribute to specify whether the boolean expressions should be combined using AND or OR. If no `Operator` attribute is specified, then OR is used by default.

Access Services

You can make use of access services to help retrieve information used to check access policies. Each `AccessServiceDefinition` element provides a name and a class. For example:

```
<AccessServiceDefinition Name="ownersPartnerKey" Type="resource" >
```

```
com.comergent.reference.dcm.entitlement.OwnersPartnerKeyService
<Description>
    Returns the partner key as a Long value for the owner of the
    resource if the resource extends C3PrimaryRWBean. Otherwise
    returns null.
</Description>
</AccessServiceDefinition>
```

This access service retrieves the owner key of the resource on which access is being checked.

Boolean Expressions

BooleanExpression elements are used to express the exact conditions under which access is granted to objects. They may be nested and they take an Operator attribute to specify how child elements should be combined.

As well as child BooleanExpression elements, you can also use ComparativeExpression elements, SetExpression elements, and Not elements to build up complex conditions:

- ComparativeExpression: use this element to compare the values of two fields.
- SetExpression: use this element to test membership of lists.
- Not: use this to wrap another expression so that the opposite boolean value is used.

Example

This fragment of the **AccessPolicy.xml** configuration file provides an example of how access policies are used. It determines access to order inquiry lists as described below.

```
<AccessPolicy Name="OrderInquiryListPolicy"
  PrincipalQualifier="UserRole">
  <Description>
    Controls access to Order Inquiry Lists.
  </Description>
  <ResourceClass>
    com.comergent.bean.simple.OrderInquiryListBean
  </ResourceClass>
  <ResourceClass>
    com.comergent.bean.simple.LightWeightOILBean
  </ResourceClass>
  <AccessChecker>
    <Description>
      Direct partner users with the listed roles can read an
```

```
        inquiry list if they own it or routed it to another user.
    </Description>
    <Principal>Anonymous.User</Principal>
    <Principal>Registered.User</Principal>
    <Principal>Partner.DirectBuyer</Principal>
    <Principal>Partner.ProcurementUser</Principal>
    <Principal>StorefrontCustomer*.TransferUser</Principal>
    <Principal>StorefrontCustomer*.User</Principal>
    <Principal>StorefrontCustomer*.AnonymousUser</Principal>
    <Principal>StorefrontCustomer*.RegisteredUser</Principal>
    <ActionType>Restore</ActionType>
    <BooleanExpression Operator="Or" >
        <ComparativeExpression Operator="Equals">
            <Term>user.UserKey</Term>
            <Term>resource.OwnedBy</Term>
        </ComparativeExpression>
        <ComparativeExpression Operator="Equals">
            <Term>user.UserKey</Term>
            <Term>resource.RouteFromUserKey</Term>
        </ComparativeExpression>
        <BooleanExpression Operator="And">
            <SetExpression Operator="Intersection" >
                <Set>
                    <Term>"Partner.BasicAdministrator"</Term>
                </Set>
                <Set>user.roleNameSet</Set>
            </SetExpression>
            <ComparativeExpression Operator="Equals">
                <Term>user.PartnerKey</Term>
                <Term>service.ownersPartnerKey</Term>
            </ComparativeExpression>
        </BooleanExpression>
    </BooleanExpression>
</AccessChecker>
<AccessChecker>
    <Principal>Anonymous.User</Principal>
    <Principal>Registered.User</Principal>
    <Principal>Partner.DirectBuyer</Principal>
    <Principal>Partner.ProcurementUser</Principal>
    <Principal>StorefrontCustomer*.TransferUser</Principal>
    <Principal>StorefrontCustomer*.User</Principal>
    <Principal>StorefrontCustomer*.AnonymousUser</Principal>
    <Principal>StorefrontCustomer*.RegisteredUser</Principal>
    <ActionType>Update</ActionType>
    <ActionType>Create</ActionType>
    <ActionType>Delete</ActionType>
    <BooleanExpression Operator="Or">
        <ComparativeExpression Operator="Equals">
            <Term>user.UserKey</Term>
```

```
<Term>resource.OwnedBy</Term>
</ComparativeExpression>
<BooleanExpression Operator="And">
  <SetExpression Operator="Intersection" >
    <Set>
      <Term>"Partner.BasicAdministrator"</Term>
    </Set>
    <Set>user.roleNameSet</Set>
  </SetExpression>
  <ComparativeExpression Operator="Equals">
    <Term>user.PartnerKey</Term>
    <Term>service.ownersPartnerKey</Term>
  </ComparativeExpression>
</BooleanExpression>
</BooleanExpression>
</AccessChecker>
<AccessChecker>
  <Description>CustomerServiceRepresentatives can create,
  modify or delete any enterprise cart, but not storefront
  carts.
</Description>
<Principal>
  Enterprise.CustomerServiceRepresentative
</Principal>
<ActionType>Restore</ActionType>
<ActionType>Update</ActionType>
<ActionType>Create</ActionType>
<ActionType>Delete</ActionType>
<BooleanExpression Operator="And">
  <Not>
    <SetExpression Operator="Intersection">
      <Set><Term>service.ownersUserType</Term></Set>
      <Set>
        <Term>"StorefrontCustomerUser"</Term>
        <Term>"StorefrontCustomerAnonymousUser"</Term>
        <Term>"StorefrontCustomerRegisteredUser"</Term>
      </Set>
    </SetExpression>
  </Not>
  <SetExpression Operator="Intersection">
    <Set>service.csrAssignedPartners</Set>
    <Set><Term>service.ownersRootPartnerKey</Term></Set>
  </SetExpression>
</BooleanExpression>
</AccessChecker>
<AccessChecker>
  <Principal>*</Principal>
  <ActionType>Restore</ActionType>
  <ActionType>Create</ActionType>
```

```
<ActionType>Update</ActionType>
<ActionType>Delete</ActionType>
<BooleanExpression>
  <Never/>
</BooleanExpression>
</AccessChecker>
</AccessPolicy>
```

The way to read this fragment is as follows:

- This access policy determines access to `OrderInquiryListBeans` and `LightWeightOILBeans`
- Users who have one of the listed roles (`Anonymous.User`, `Registered.User`, and so on) may have `Restore` access (that is, have read access to the resource) if they satisfy one of the declared `BooleanExpressions`:
 - Either:
 - The user's key is equal to the owner key of the resource.
 - Or:
 - The user's key is equal to the routed from key of the resource.
 - Or:

Password Policies

Users authenticate themselves when they log in to the Sterling Multi-Channel Selling Solution using a username and a password. The Sterling Multi-Channel Selling Solution supports the ability to specify explicit password policies: these control the length and format of passwords as well as how passwords are created. Password policies are also used to determine what to do if a number of unsuccessful attempts are made to log in to the Sterling Multi-Channel Selling Solution. You can customize the password policies for your implementation. This section describes the password policies configuration file and how you can customize your password policies.

Configuration

The configuration of your password policies is managed in the **PasswordPolicies.xml** configuration file. This file declares each policy, the class used to implement the policy, and the parameters associated with the policy. For

example, the following PasswordPolicy element specifies the policy governing the permitted lengths of passwords:

```
<PasswordPolicy Name="PasswordLengthPolicy" Type="Password"
  Enabled="true">
  <Description>
    This is the Policy to enforce password length
  </Description>
  <PolicyClass>
    com.comergent.reference.authentication.password.PasswordLength
  </PolicyClass>
  <ParamList>
    <Param Name="MinLength" Value = "5"/>
    <Param Name="MaxLength" Value = "15"/>
  </ParamList>
</PasswordPolicy>
```

The PolicyClass element declares the class used to test the policy. Each policy class must implement the IPolicyClass interface. The ParamList element provides the specific parameters used to test policies. In this example, the minimum length for passwords is set to be five characters and the maximum length is set to twelve characters.

Each policy has a type: this determines when the policy is exercised. The current types are:

- Initialization: policies of this type are used to determine how passwords are created.
- Password: policies of this type are exercised whenever a password is created or modified.
- Creation: policies of this type are used when passwords are created.
- Login: policies of this type are used to manage what to do when users log in.

You can customize the **PasswordPolicies.xml** configuration file using the SDK. By changing the parameter values you can change the behavior of the current out-of-the-box policies. You can also add your own policies: see "Creating a Custom Password Policy" on page 102.

The current password policies include:

- UserCreatePolicy: This policy specifies whether passwords can be created by users or whether they must be system generated.
- PasswordLengthPolicy: This policy specifies the permitted lengths of passwords. The value of PasswordLengthPolicy's "MaxLength"

parameter must be less than the value set in the `UserAuthenticator` field in the **DsDataElements.xml** file.

- **DictionaryCheckPolicy:** This policy checks for strings that cannot be used for passwords.
- **PasswordReusePolicy:** This policy controls the re-use of passwords by users.
- **PasswordExpirationPolicy:** This policy determines how frequently passwords must be changed by users.
- **IncorrectLoginPolicy:** This policy determines how many unsuccessful logins can be attempted before a user is locked out of the Sterling Multi-Channel Selling Solution.

Creating a Custom Password Policy

You can create your own password policy. Your policy class must implement the `IPolicyClass` interface. This interface declares the following method:

```
public PolicyCheckResult checkPolicy(IPasswordPolicy pp, HashMap hm);
```

The `IPasswordPolicy` interface is documented in the Javadoc provided with the Sterling Multi-Channel Selling Solution. The `HashMap` object is used to pass in the parameters required for the policy.

The `PolicyCheckResult` class has a `hasError()` method. If this returns true, then you should handle the error condition appropriately.

Passing Login Data Through a URL

Most users of the Sterling Multi-Channel Selling Solution enter the system by pointing their browsers to the appropriate login page. However, sometimes, you may want to enable users to access a specific page such as the detail page of an order directly.

You can do this simply by constructing the URL as you would like it to be, for example:

```
http://server/Sterling/en/US/direct/matrix?cmd=OrderDisplay&-ShoppingCartKey=600501
```

When a user clicks on this link, their request is routed to the appropriate login page. In the login form, the request data from the original URL is automatically encoded as hidden form parameters, for example:

```
<input type="hidden" name="cmd" value="directLogin" >
<input type="hidden" name="validate" value="true" >
<input type="hidden" name="LoginData-messageType"
    value="OrderDisplay"/>
<input type="hidden" name="LoginData-ShoppingCartKey"
    value="600501"/>
<input type="hidden" name="LoginData-entryPoint" value="direct"/>
```

When the login form is submitted, if the login is successful, then the parameters that begin with “LoginData-” are processed by the LoginController and added back to the request object with “LoginData-” removed from the parameter names. When the request is forwarded to the message type specified by the LoginData-messageType parameter, the original parameters are now available to the controller and JSP pages used to process the request.

Note that in general the message type in the original URL will be changed to the fallback redirect message type for the message type or message group to which the message type belongs. Consequently, take care that your intended message type is the fallback redirect message type for its message group.

You specify the fallback redirect message type along these lines:

```
<MessageGroup Name="AdvisorGroup">
    <FallbackRedirect>
        <Redirect EntryPoint="partnerMkt">PartnerHomePageDataDisplay"
        </Redirect>
        <Redirect EntryPoint="catalog">MatrixHomePageDisplay"</Redirect>
        <Redirect EntryPoint="advisor">MatrixHomePageDisplay"</Redirect>
        <Redirect EntryPoint="configurator">MatrixHomePageDisplay"
        </Redirect>
    </FallbackRedirect>
    ...
    Message type definitions
    ...
</MessageGroup>
```

The way to read this XML extract is as follows: if an unauthenticated request is tries to execute any message type in the AdvisorGroup of message types, then redirect them to the PartnerHomePageDisplay message type if the entrypoint of the request is “partnerMkt” or redirect them to the MatrixHomePageDisplay message type if the entrypoint is one of the other three declared.

The LoginData-entrypoint is used to specify which entry point is used to access the system. It is retrieved from the original URL to ensure that the user is directed to the correct login page. A message group may have more than one default message type: they are differentiated by their Key attribute that specifies different entry points. For example:

```
<GroupDefault Key="partnerMkt" Value="IndirectWorkspaceDisplay" />  
<GroupDefault Key="marketPlace" Value="DirectWorkspaceDisplay" />
```

This chapter describes the logging mechanism provided by the Sterling Multi-Channel Selling Solution. It enables application writers to log activity in the Sterling Multi-Channel Selling Solution. It uses the log4j API and **log4j.properties** configuration files to configure the logging behavior.

The logging capability also provides support for auditing changes to data objects. See "Auditing Changes to Data Objects" on page 107 for more information.

Overview

The log4j API provides a flexible and extensible logging framework to manage the logging behavior of the Sterling Multi-Channel Selling Solution. Its basic configuration and use is described in the *Sterling Multi-Channel Selling Solution Implementation Guide*. This section describes the use of the framework as you customize and extend the Sterling Multi-Channel Selling Solution.

Note that this framework replaces the previous framework used by the Sterling Multi-Channel Selling Solution: this used the Global class and its *logLevel()* methods. These are now deprecated. See "Global Class" on page 465 for more information on these methods.

To use the log4j API, you should create a Logger class in each class file along these lines:

```
private static final org.apache.log4j.Logger log =
    org.apache.log4j.Logger.getLogger(ClassName.class);
```

When you want to make a log entry call:

```
log.info("This is a log entry");
```

The method you call depends on the logging level at which you want to record the message. You can use the following methods:

- *debug()*
- *error()*
- *fatal()*
- *info()*
- *warning()*

You can also use *log(priority, message)*, but in general the listed methods should be sufficient.

log4j.debug System Property

By setting the log4j.debug system property to true, you can echo out the current log settings. For example, include the following in the servlet container startup script:

```
-Dlog4j.debug=true
```

On startup, you should see logging output like this:

```
log4j: Trying to find [log4j.xml] using context classloader
sun.misc.Launcher$AppClassLoader@136228.
log4j: Trying to find [log4j.xml] using sun.misc.Launcher$AppClass-
Loader@136228 class loader.
log4j: Trying to find [log4j.xml] using ClassLoader.getSystemRe-
source().
log4j: Trying to find [log4j.properties] using context classloader
sun.misc.Launcher$AppClassLoader@136228.
log4j: Using URL [jar:file:/home/hle/ws/32-cmgt-modules/modules.cryp-
tography-tool/target/cmgt-cryptography-tool-2.0.0-SNAPSHOT-app.jar!/
log4j.properties] for automatic log4j configuration.
log4j: Reading configuration from URL jar:file:/home/hle/ws/32-cmgt-
modules/modules.cryptography-tool/target/cmgt-cryptography-tool-
2.0.0-SNAPSHOT-app.jar!/log4j.properties
log4j: Parsing for [root] with value=[WARN, A1].
log4j: Level token is [WARN].
log4j: Category root set to WARN
log4j: Parsing appender named "A1".
log4j: Parsing layout options for "A1".
log4j: Setting property [conversionPattern] to [%-4r [%t] %-5p %c %x -
```

```
%m%n].
log4j: End of parsing for "A1".
log4j: Parsed "A1" options.
log4j: Finished configuring.
```

Auditing Changes to Data Objects

In many implementations, you may want to provide an audit trail that tracks changes made to data in the Sterling Multi-Channel Selling Solution. In Release 7.0.1 and higher, you can do this by logging any changes made to data objects. If you set the logging level to INFO or higher in any DataBean class, then whenever *persist()* is invoked on an instance of this class, a log message is written out to the Logger for the class. For example: the following is a sample line that is written out when a change is made to a partner:

```
2006.01.18 13:41:05:546 Env/http-8080-Processor23:INFO:PartnerBean
Updating: com.comergent.bean.simple.PartnerBean KeyFields - Partner-
Key: 301 Changes -PartnerKey -> old: 301 new: 301PartnerName -> old:
Scalar2 new: Scalar2 LegalName -> old: null new: null ParentCompany -
> old: null new: nullStatus -> old: A new: A DunBradID -> old: null
new: nullBusinessID -> old: Scalar2-001 new: Scalar2-
001PartnerTypeCode -> old: 10 new: 10PartnerLevelCode -> old: 20 new:
20XMLMessageVersion -> old: dXML 4.0 new: dXML 4.0BusinessTransaction
-> old: SELL new: SELL NetWorth -> old: null new: null NumEmployees -
> old: null new: null PotRevCurrFy -> old: null new: null PotRevNextFy
-> old: null new: null ReferenceUseFlag -> old: null new: null Coterm-
DayMonth -> old: null new: nullURL -> old: http://www.scalar.com new:
http://www.scalar2.com LogoURL -> old: null new: null DistiAccess ->
old: null new: null YearEstd -> old: null new: null AnalysisFy -> old:
null new: null FyEndMonthCode -> old: null new: null AccountManagerKey
-> old: null new: null MessageURL -> old: null new: null EmailAddress
-> old: null new: nullCommerceCategory -> old: 2 new: 2 PartnerRefNum
-> old: null new: null ParentKey -> old: null new: null RootPartnerKey
-> old: null new: null ParentCode -> old: null new: null CustomField1
-> old: null new: null CustomField2 -> old: null new: null
CustomField3 -> old: null new: null CustomField4 -> old: null new:
null CustomField5 -> old: null new: null PartnerCom -> old: null new:
null Storefront -> old: null new: null URLName -> old: null new: null
ContentType -> old: null new: nullPartnerStatusCode -> old: 10 new:
10OrganizationType -> old: DirectPartner new: DirectPartner Inherited-
PartnerStatusCode -> old: null new: nullCreditLimit -> old: 0.0000
new: 0.00AvailableCredit -> old: 0.0000 new: 0.0000CreditCurrencyCode
-> old: 23 new: 23 MaxAssignableReps -> old: null new: null Remote-
Prices -> old: null new: null RemotePriceExpiryInterval -> old: null
new: nullCoopPercentage -> old: 0.000000 new: 0.000CoopAccountMax ->
old: 0.000000 new: 0.00 PartnerID -> old: null new: nullOwnedBy ->
old: 0 new: 0AccessKey -> old: 5601 new: 5601UpdateDate -> old: 2006-
```

```
01-18 13:39:33.0 new: 2006-01-18 13:41:05.484UpdatedBy -> old: 0 new:
0CreateDate -> old: 2006-01-04 13:19:38.0 new: 2006-01-04
13:19:38.0CreatedBy -> old: 0 new: 0
```

You can dynamically change the logging level for any class in the Sterling Multi-Channel Selling Solution through the administration UI: see the *Sterling Multi-Channel Selling Solution Administration Guide* for details. However, if you do this, then the change to the logging level is not persistent, and will be lost if the servlet container is restarted. In addition, the logging is written out to the standard Appender which may not be secure.

You should specify any audit logging by customizing the **log4j.properties** configuration file: this ensures that the auditing will continue to be done even if the servlet container is restarted, and you can specify a custom Appender to process the audit information. For example, you can specify that the Appender posts the logging message to a remote Web server which can be secured independently of the Sterling Multi-Channel Selling Solution.

As an example, the following entries in the **log4j.properties** configuration file ensure that all changes to the UserContact data object are audited:

```
log4j.logger.com.comergent.bean.simple.UserContactBean=info
log4j.appender.com.comergent.bean.simple.UserContactBean=com.comer-
gent.logging.ComergentRollingFileAppender
log4j.appender.com.comergent.bean.simple.UserContactBean.layout =
org.apache.log4j.PatternLayout
```

If you want to specify that a remote log server can connect as a client in order to save audit information from the Sterling Multi-Channel Selling Solution, then you could specify:

```
log4j.appender.com.comergent.bean.simple.UserContact-
Bean=org.apache.log4j.net.SocketHubAppender
log4j.appender.com.comergent.bean.simple.UserContactBean.port=4321
```

This chapter describes the use of the event mechanism provided by the Sterling Multi-Channel Selling Solution. It enables application writers to fire events from an application and to have one or more applications respond to the event.

Overview

Events are a means for applications to signal to other applications when a notable incident has occurred in the Sterling Multi-Channel Selling Solution: examples of events include users logging in, orders being placed, price lists being assigned to partners, leads being assigned to partners, and so on.

Applications fire events by instantiating an *event producer*, using it to create an event, and then invoking the EventBus to fire the event. Applications use *event consumers* to respond to events: the EventBus instantiates event consumers for each type of event. One event can be processed by one or more consumers.

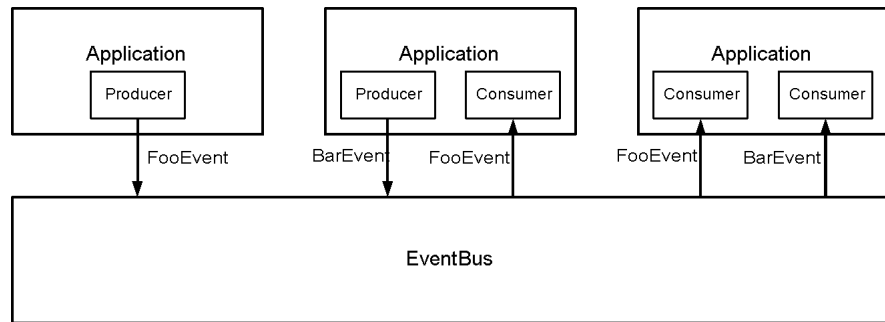


FIGURE 5. Applications and Events

Events are identified by their class: all event classes must implement the `ComergentEvent` interface, but can otherwise be created to suit the needs of the communication between its event producer and its event consumers.

Firing an Event

Application writers can fire events from their application by using the `EventBus` class as follows:

```
ApplicationEventProducer applicationEventProducer =
    new ApplicationEventProducer();
ApplicationEvent applicationEvent =
    applicationEventProducer.createEvent();
EventBus.getInstance().fireEvent(applicationEvent);
```

The event producer class (in this case, `ApplicationEvent Producer`) is created by the application developer: it must implement the `EventProducer` interface, though currently this interface defines no methods. It must have one or more methods to create events: by convention these methods are called *createEvent()*, and they may take zero or more arguments: typically, you pass into the event the information that the event consumers will need to process the event. The application event must implement the `ComergentEvent` interface. In particular, it must implement the *getSource()* method that returns the event producer responsible for creating the event.

Processing an Event

Application writers who want to respond to an event must write an event consumer class that implements the `EventConsumer` interface. This interface declares the *handleEvent(ComergentEvent event)* method. The application writer must register the event consumer by adding it to the **events.xml** configuration file as follows:

```
<event class ="com.comergent.api.apps.application.ApplicationEvent">
  <description>
    This event is used to signal an event in this application.
  </description>
  <consumers-list>
    <consumer>
com.comergent.api.apps.consumingApplication.ApplicationEventConsumer
    </consumer>
    <consumer>
com.comergent.api.apps.consumingApplication2.DifferentEventConsumer
    </consumer>
  </consumers-list>
</event>
```

When an event is fired, each of the registered event consumers for events of this type is instantiated and each processes the event in the order they are declared in **events.xml** in turn until one of the consumers vetoes the event. At that point or when there are no more event consumers to be used, the EventBus returns control to the application that fired the event and the application continues. If no event consumer vetoes the event, then control is returned when the last consumer has completed processing the event.

events.xml DTD

Here is the DTD for the **events.xml** configuration file:

```
<?xml version='1.0' encoding='UTF-8' ?>

<!ELEMENT events ( event* ) >
<!ELEMENT event ( description?, consumers-list ) >
<!ATTLIST event
    class CDATA #REQUIRED
>
<!ELEMENT description (#PCDATA)>
<!ELEMENT consumers-list ( consumer* ) >
<!ELEMENT consumer (#PCDATA)>
```

Events

Every event must implement ComerгентEvent interface and must also implement either the IREvent (for read-only events) or IRWEvent interfaces (for read-write events). Currently, both these interfaces declare no methods.

An event that implements the Vetoable interface is used in situations where you want to allow for the possibility that one event consumer can block other event consumers from processing the event. Once an event consumer has vetoed an event, then no other event consumers can process the event.

Vetoable Interface

This interface declares the following methods:

- `public void veto()`: used by an event consumer to veto an event.
- `public boolean isVetoed()`: used to test whether an event has been vetoed.

Automated Task Creation

Tasks can be created automatically when end-users perform specific actions such as requesting a price negotiation. You can modify the default automated task creation behavior by customizing or making configuration changes to the code for the automatically-generated tasks.

Typically, the automatically-generated tasks are created by state machine event handlers, such as the following sample code from the Order on Credit Hold event.

```
/*
 * Create task for the given Order on Credit hold event
 */
public void createTask()
{
    ResourceBundle rbs = com.comergent.api.il8nbase.ComergentI18N.getBundle("com.comergent.reference.apps.taskMgr.TaskMgrResourceBundle");

    try {
        // Grab the Bean off the event model
        IOrder order = (IOrder)m_event.getObject();
        IRdOrder orderBean = (IRdOrder)order.getDataBean();
        ITaskFactory iTaskFactory = (ITaskFactory)OMWrapper.getObject(ITaskFactory.class);
        Long commerceKey = orderBean.getShoppingCartKey();
        Long partnerKey = orderBean.getPartnerKey();
        Long ownedBy = orderBean.getOwnedBy();
        iTaskFactory.createSystemTask(rbs.getString("CMGT_SYSTEM_GENERATED_ORDER_ON_CREDIT_HOLD_NAME"),
            TaskControllerConstants.SYSTEM_GENERATED_TASK_COMMERCE_FUNCTION,
            commerceKey,
            new Long(IInquiryListTypes.ORDER),
            partnerKey,
            ownedBy);

    } catch (Exception ex) {
        log_0.info(ex.getMessage());
    }
}
```

Since the order state machine generates events for most of the state transitions, you can listen to these events and, in the event handler, send email to the user if a particular event fires.

The Sterling Multi-Channel Selling Solution generates email for the various state transitions of an order. For an example, look at the OrderOnCreditHoldEvent entries in the **WEB-INF/properties/events.xml** and **WEB-INF/emails/OrdersEmails.xml** files. These entries list the actions, tasks, and emails generated as the result of an order moving into the OrderOnCreditHold state. For example, the entry for the OrderOnCreditHoldEvent in the **OrdersEmail.xml** file is as follows:

```
<EmailEvent Name="OrderOnCreditHoldEvent">
  <EmailList>
    <Email>
      <From>@SMTP_SENDER@</From>
      <To>@OWNER@</To>
      <ContentType>text/html</ContentType>
      <Subject Bundle="com.comergent.reference.apps.order-
Mgmt.orders.OrdersResourceBundle">ORDER_ON_CREDIT_HOLD</Subject>
      <Body>OrderEventEmail</Body>
    </Email>
  </EmailList>
</EmailEvent>
```

Example

This section presents a simple example showing how to use events. The DispatchServlet class will produce an event that records the message type of the inbound request. Each such event will be consumed by a class that logs the message type to the log stream.

Event Classes

MessageTypeEvent

```
package com.comergent.dcm.core;

import com.comergent.api.eventbus.*;

public class MessageTypeEvent implements ComergentEvent, IREvent
{
    private MessageTypeEventProducer m_MessageTypeEventProducer;
    private String m_MessageTypeString;

    public MessageTypeEvent(MessageTypeEventProducer mtep, String s)
    {
```

```
        m_MessageTypeEventProducer = mtep;
        m_MessageTypeString = s;
    }

    public String getMessageType()
    {
        return m_MessageTypeString;
    }

    /**
     * Returns the sender of this message.
     */
    public EventProducer getSource()
    {
        return m_MessageTypeEventProducer;
    }
}
```

MessageTypeEventProducer

```
package com.comergent.dcm.core;

import com.comergent.api.eventbus.*;
import com.comergent.dcm.util.*;

public class MessageTypeEventProducer implements EventProducer
{
    public MessageTypeEvent createEvent(ComergentRequest cr)
    {
        String temp_MessageTypeString = null;
        try
        {
            temp_MessageTypeString = cr.getMessageType();
        }
        catch (ICCEException icce)
        {
            //Log the fact that no message type could be retrieved
            temp_MessageTypeString = "NO MESSAGE TYPE RETRIEVED";
        }
        return new MessageTypeEvent(this, temp_MessageTypeString);
    }
}
```

MessageTypeEventConsumer

```
package com.comergent.dcm.core;

import com.comergent.api.eventbus.*;

public class MessageTypeEventConsumer implements EventConsumer
```

```
{
    public boolean handleEvent(ComergentEvent ce)
    {
        String temp_MessageTypeString =
            ((MessageTypeEvent) ce).getMessageType();
        Global.logInfo("Message type is " + temp_MessageTypeString);
        return true;
    }
}
```

DispatchServlet Changes

Add this code to the *executeController()* method of the DispatchServlet class:

```
MessageTypeEventProducer messageTypeEventProducer =
    new MessageTypeEventProducer();
MessageTypeEvent messageTypeEvent =
    messageTypeEventProducer.createEvent(comergentRequest);
EventBus.getInstance().fireEvent((ComergentEvent) messageTypeEvent);
```

The *fireEvent()* method throws an *EventBusException*, so be prepared to catch and handle the exception.

events.xml File

Add this event to the **events.xml** configuration file:

```
<event class ="com.comergent.dcm.core.MessageTypeEvent">
    <description>
        This event is used to record the message type of inbound
        requests.
    </description>
    <consumers-list>
        <consumer>
            com.comergent.dcm.core.MessageTypeEventConsumer
        </consumer>
    </consumers-list>
</event>
```

Testing the Example

Build the Sterling Multi-Channel Selling Solution with these changes. When you start the system and log in, then you should see logging messages for each message type executed by the DispatchServlet.

Sending Email from the Sterling Multi-Channel Selling Solution

This chapter describes how to generate an email message that can be sent from the Sterling Multi-Channel Selling Solution. This functionality can be used to notify users of events such as the creation of a new invoice or to provide them with a confirmation such as the placing of an order.

Framework

Two mechanisms are used to send email messages:

- The `OutOfBandHelper` class is used to generate the body of email messages using JSP pages. See "OutOfBandHelper Class" on page 29 for an example of its use.
- The Event mechanism is used to determine which email is sent out when an event such as a user placing an order occurs. See CHAPTER 9, "Events" for more information on events.

This framework provides support for sending different email messages to users based on their locale. For example, you can use different JSP pages as the email templates for `en_US` and `fr_FR` users.

Typically, this is how these mechanisms are used:

1. An application invokes business logic to process a request. As part of the business logic, you want to send an email from the Sterling Multi-Channel Selling Solution.
2. Define an event that will be used to initiate sending the email and declare it in the **events.xml** file. For example:

```
<event class="com.comergent.api.apps.orderMgmt.orders.-
    OrderPlaceEmailEvent">
    <description>This event is fired when an Order is placed
    </description>
    <consumers-list>
        <consumer>
            com.comergent.reference.apps.orderMgmt.orders.-
                OrderEmailEventHandler
        </consumer>
    </consumers-list>
</event>
```

3. Add code to fire the event from the application. See "Firing an Event" on page 110 for some sample code to do this.
4. Write the event consumer that will receive and process this event from the EventBus. This event consumer will actually send the email using the OutOfBandHelper class. For example, the OrderEmailEventHandler class marshalls data from the event, and then calls:

```
com.comergent.reference.apps.commerce.OutOfBandMailHelper.-
sendMail(from, to, cc, subject, messageType, requestAttributes);
```

The OutOfBandMailHelper class uses the OutOfBandHelper class to generate the body of the email message as follows:

```
ComergentRequest request = ComergentAppEnv.getRequest();
ComergentResponse response = ComergentAppEnv.getResponse();
ByteArrayOutputStream stream = new ByteArrayOutputStream();
// Now create an out of band helper
OutOfBandHelper outOfBandHelper =
    new OutOfBandHelper(request, response, stream);
Set keys = attributeMap.keySet();
Iterator iter = keys.iterator();
while (iter.hasNext())
{
    String key = (String)iter.next();
    Object value = attributeMap.get(key);
    request.setAttribute(key, value);
}
outOfBandHelper.getRequest().setAttribute(
    ComergentRequest.COMERGENT_SESSION_ATTR,
    request.getComergentSession());
```

```
//The message type is mapped to a JSP page using the standard
//message type mapping files.
outOfBandHelper.callJSP(messageType);
```

Current Usage of the Framework

The following files and data configure the system:

- ***Emails.xml**: a number of configuration files are maintained in the **WEB-INF/emails/** directory. These map the email events to the form of the email that should be sent. For example, the **OrdersEmail.xml** configuration file includes the following element:

```
<EmailEvent Name="OrderChangeEvent">
  <EmailList>
    <Email>
      <From>@SMTP_SENDER@</From>
      <To>@OWNER@</To>
      <ContentType>text/html</ContentType>
      <Subject Bundle="com.comergent.reference.apps.order-
Mgmt.orders.OrdersResourceBundle">
        ORDER_CHANGE_SUBMITTED_MSG_SUBJECT
      </Subject>
      <Body>OrderEventEmail</Body>
    </Email>
  </EmailList>
</EmailEvent>
```

This means that when an `OrderChangeEvent` is fired, an email should be sent to the owner of the order and that the subject line should be read from the `OrdersResourceBundle` properties file. Tokens can be used for system properties (such as `SMTP_SENDER`) and for request-specific properties (such as `OWNER`).

- The body of the email will be generated using the JSP page that the `OrderEventEmail` message type maps to:

```
<MessageType Name="OrderEventEmail">
  <JSPMapping>
    ../orderMgmt/Orders/OrderDownload.jsp
  </JSPMapping>
</MessageType>
```

- The JSP page used to render order email messages is **OrderDownload.jsp**.

Generating URLs

URLs included in the email messages are generated by a call to the *constructAppURL()* method of the *ComergentAppEnv* class. For example:

```
protected String getOrderDisplayPage() throws ICCEException
{
    Long cartKey = iro.getShoppingCartKey();
    String orderPage = null;
    try
    {
        orderPage = ComergentAppEnv.-
            constructAppURL(I18NOKayConstants.LOWER_CASE_DIRECT,
                OrdersConstants.ORDER_DISPLAY_PAGE,
                I18NOKayConstants.SHOPPING_CART_KEY + "=" + cartKey);
    }
    catch (Exception e)
    {
        throw new ICCEException(e);
    }
    return orderPage;
}
```

This method generates a string that looks like this:

```
http://<server:port>/Sterling/en/US/direct/matrix?
cmd=OrderDisplayPage&ShoppingCartKey=5
```

The parameters in the *constructAppURL()* method set the "direct", "OrderDisplayPage", and "ShoppingCartKey" sub-strings of the URL. The "Sterling" string is the Web application context which you may have changed as part of your implementation of the Sterling Multi-Channel Selling Solution, and "matrix" is the value of the *DefaultHostedPartner* element in your **Comergent.xml** file.

Example

In this section, we present a simple example of how to use the email template mechanism. It follows the generation of the email used to confirm the placing of an order.

The first method call is invoked by the Java class that is processing the creation of an order. If the order is successfully created, then the class invokes *sendCreateOrderEmail()* to generate and send the email message. For example:

```
public void sendCreateOrderEmail(IOrder ior)
```

The method is called by passing in an `IOrder` object. This object provides the relevant user and order information required to retrieve the To email address and to build up the order details.

sendCreateOrderEmail() invokes:

```
notifyByEmail(ior, OrdersConstants.ORDER_CREATE_EMAIL_FILENAME,
com.comergent.dcm.util.ComergentI18N.getBundle(-
"com.comergent.reference.apps.orderMgmt.orders.-
OrdersResourceBundle").getString("ORDER_CREATE_MSG_SUBJECT"));
```

The *notifyByEmail()* method takes the `IOrder` object, together with the name of the email template to be used for the order creation template and a subject line retrieved from the appropriate resource bundle. Its body (simplified) looks like this:

```
boolean SEND_ORDER_EMAILS =
    Global.getBoolean(OrdersConstants.RULE_SEND_ORDER_EMAILS);
if (!SEND_ORDER_EMAILS)
    return;
String owner_email = ior.getAccOrder().getEmailAddress();
String mail_template = Global.getString(tfile);
String locale_mail_template =
    OrdersUtils.getLocaleSpecificTemplate(mail_template);
try
{
    OrderLocalEmail ole = (OrderLocalEmail)
        OMWrapper.getObject("com.comergent.apps.-
        orderMgmt.orders.bizAPI.OrderLocalEmail");
    String message = ole.formMessage(ior, locale_mail_template);
    String file_ext =
        OrdersUtils.getFileExtension(locale_mail_template);
    if(owner_email != null)
        OrdersUtils.SMTPSend(owner_email, null, subj,
            message, file_ext);
}
catch(Exception e)
{
    if(THROW_EMAIL_EXCEPTION)
        throw new ICCEException("Unable to send email");
}
```

The key method is *formMessage()*. This method does the following:

```
protected String formMessage(IOrder inIor,
    String locale_mail_template) throws ICCEException
{
    ior = inIor;
    iro = ior.getAccOrder();
    email_orderCurrency = iro.getCurrencyLookupCode();
    IPartnerMgrAPI iPartnerMgrAPI = (IPartnerMgrAPI)
```

```
        com.comergent.dcm.util.OMWrapper.getObject(
"com.comergent.api.apps.profileMgr.partnerMgr.IPartnerMgrAPI");
IRdPartnerHelper ph =
    iPartnerMgrAPI.getEnterprisePartnerHelper();
enterprisePartner = ph.getDataBean();
String msg = formEmailMessage(locale_mail_template);
String message = OrdersUtils.formatMessage(msg);
return message;
}
```

The key method is *formEmailMessage()*: it takes only the template as an argument, retrieving other data from the field variables set in the *formMessage()* method:

```
protected String formEmailMessage(String rawPOFileName)
    throws ICCEException
{
    StringBuffer strBuf = new StringBuffer();
    try
    {
        String createFileName =
            ComerгентAppEnv.adjustFileName(rawPOFileName);
        BufferedReader in =
            new BufferedReader(new FileReader(createFileName));
        String s = null;
        while((s = in.readLine()) != null)
        {
            String s1 = processLine(s);
            strBuf.append(s1);
            strBuf.append(I18NOKayConstants.STRING_NEWLINE);
        }
        in.close();
    }
    catch(Exception e)
    {
        OrdersUtils.logVerbose("Unable to form email message - " + e);
    }
    return strBuf.toString();
}
```

The processing work is done in the *processLine()* and *processLine_Repeat()* methods as follows:

```
protected String processLine(String s) throws ICCEException
{
    String ret = s;
    int i = 0;
    while (true)
    {
        String foo = OrdersUtils.getToken(s);
        if (foo == null || foo.length() < 1)
```

```
        {
            return s;
        }
        s = processLine_Repeat(s, foo);
    }
}

protected String processLine_Repeat(String s, String foo)
    throws ICCEException
{
    String ret = s;
    if(foo.equalsIgnoreCase(I18NOkayConstants.-
        STRING_MANUFACTURER_EMAIL))
    {
        String val = enterprisePartner.getEmailAddress();
        ret = OrdersUtils.replaceInstancesInString(s, foo, val);
    }
    else if(foo.equalsIgnoreCase(OrdersI18NOkayConstants.-
        EMAIL_TOKEN_ORDERNUMBER_STRING))
    {
        String email_OrderNumber = iro.getOrderNumber();
        ret = OrdersUtils.replaceInstancesInString(s, foo,
            email_OrderNumber);
    }
    ...
    else if (foo.equalsIgnoreCase(OrdersI18NOkayConstants.-
        EMAIL_TOKEN_ORDERRETRIEVALWEBPAGE_STRING))
    {
        String val = getOrderDisplayPage();
        ret = OrdersUtils.replaceInstancesInString(s, foo, val);
    }
    else
    {
        //Cannot find value for this token
        ret = OrdersUtils.replaceInstancesInString(s, foo,
            I18NOkayConstants.EMAIL_TOKEN_UNKNOWN_TOKEN);
    }
    return ret;
}
```

Note the call to the *getOrderDisplayPage()* method: this builds up the URL to the order. See "Generating URLs" on page 120.

Release 8.0 of the Sterling Multi-Channel Selling Solution has undergone the following architectural changes designed to make implementations easier to customize and upgrade:

- "Modules" on page 126
- "Generated Interfaces" on page 129

These changes are related in that the interfaces are organized by modules and that changes to interfaces may be contained to changes within individual modules.

Overview

The motivation to make these architectural changes are to ensure that customizations are more contained and can be better preserved during upgrade from one release of the Sterling Multi-Channel Selling Solution to another.

By providing a means of delivering functionality in modules and by requiring that modules make calls to other modules only through their external interfaces, the following benefits are achieved:

- It is easier to compartmentalize the functionality of applications.
- It is easier to understand and manage the dependencies between parts of the Sterling Multi-Channel Selling Solution.

- It is easier to contain the customizations to single modules and understand what effect changes made in a module have on the whole system.
- Modules can be more easily upgraded independently of each other, minimizing the effect that an upgrade may have.
- Upgrades to modules that have not been customized will not effect customizations made in other modules.
- New functionality can be delivered in the form of a module that may be dropped into an existing deployment of the Sterling Multi-Channel Selling Solution.

Modules

The Sterling Multi-Channel Selling Solution is developed as a set of interdependent modules that conform to a common organizational structure. In general, each module corresponds to a functional component of the Sterling Multi-Channel Selling Solution such as an application or a component of the Sterling Multi-Channel Selling Solution platform. Some modules may support both a Java API and a user interface whereas other may just support a Java API provided to other modules. Some modules provide a set of “helper” classes, JSP pages, and other files such as Javascript files and images which are used by a number of other modules.

In general, each module has the following structure:

- Java classes: organized into three trees. At build time, the directories for all of the modules are assembled in to a single tree under the `com.comergent` package.
 - external API interfaces: used by other modules to access functionality provided by the module. In general, when one module makes a call to another module’s class, it must do so through the other module’s external API. This is the `com.comergent.api` package for the module.
 - implementation classes: the implementation of the external API interfaces. When another module makes a call to the module’s external API, then the actual classes used are the implementing classes of the module’s interface. The implementation packages may include internal classes: used by the implementation classes, but not exposed to outside world and not part of the supported Javadoc. This is the `com.comergent.apps` or `com.comergent.appservices` package for the module.

- reference components: Controller classes and JSP pages always comprise part of the reference implementation and their source is provided with the Sterling Multi-Channel Selling Solution. Resource bundles are also provided as part of the reference. This is the `com.comergent.reference` package for the module.
- JSP pages: possibly organized into directories depending on the organization of the module. They should always access other modules' classes through the external APIs exposed by the other modules. This ensures that JSP pages can be re-used from release to release provided that the external APIs are supported.
- Resource bundles, Javascript, and static files (such as images and HTML fragments).
- Configuration files specific to the module such as **MessageTypes.xml** files and business rules.

Module Interfaces

Each module must provide an external interface so that all calls to Java classes and interfaces within the module are invoked through the interface. This external interface provides a comprehensive set of Javadoc pages so that writers of other modules can use the external interface reliably and easily.

The external interface for each module will typically be a combination of handcrafted interfaces and automatically-generated interfaces. Most modules provide handcrafted interfaces for presentation beans that enable presentation beans to manipulate data beyond the simple accessor methods of the generated data bean interfaces. The presentation beans usually wrap a data bean and implement the same interfaces, but in addition they implement helper methods and some business logic.

The external interfaces are organized under the following main packages:

- `com.comergent.api`: this package has all the module external APIs. These are organized into:
 - `apps`: these are the application hand-crafted APIs. Typically, these are presentation bean interfaces, utility interfaces, and factory classes.
 - `appservices`: these are the packages provided by the service modules used by other applications.

- dcm: these are the external APIs offered by the Sterling Multi-Channel Selling Solution platform.
- com.comergent.bean.simple: this package has all the automatically-generated bean interfaces and the data bean classes themselves.

The generated interfaces are provided for each of the data objects declared in the XML schema files. These are organized to provide appropriate levels of access to the data fields of the underlying data beans. This helps to ensure that there is a clearer separation between presentation and business logic in the Sterling Multi-Channel Selling Solution. See "Generated Interfaces" on page 129 for more information about the generated interfaces.

Invoking Interfaces

You can invoke an interface from a Java class by casting any object or child interface to the interface and then invoke any method that the interface declares. In the Sterling Multi-Channel Selling Solution, use one of the following techniques to do this:

- "Using the Object Manager" on page 128
- "Using Factory Classes" on page 129

Each module uses one or other of these techniques, but not both. As you work on an existing module or create a new one, be consistent in how you invoke the interfaces. It will make it easier for your colleagues to work on the same module.

In general, you should always try to work with interfaces provided by the com.comergent.api packages: these are the interfaces that the modules will support from one release to the next, even though the underlying implementations of the interfaces may change.

Using the Object Manager

You can use the ObjectManager class to return an appropriate interface as follows. Suppose that you want to retrieve the IAccProduct interface to set the data fields of a product. Then make a call along these lines:

```
IAccProduct temp_IAccProduct =  
    (com.comergent.bean.simple.IAccProduct)  
        com.comergent.dcm.util.OMWrapper.getObject(  
            "com.comergent.bean.simple.IAccProduct");
```

Provided that there is an entry in the **ObjectMap.xml** file that specifies the object to be returned and provided that the object implements the IAccProduct interface,

then this call will succeed and methods on the interface can be invoked. For example, if the **ObjectMap.xml** file contains:

```
<Object ID="com.comergent.bean.simple.IAccProduct">
  <ClassName>com.comergent.bean.simple.ProductBean</ClassName>
```

Then, the `ObjectManager` returns a `com.comergent.bean.simple.ProductBean` object and this can be cast to the `IAccProduct` interface because the `com.comergent.bean.simple.ProductBean` class implements the `com.comergent.bean.simple.IAccProduct` interface.

Using Factory Classes

Calls to an interface can be provided by Factory classes that return an instance of the interface. For example, the package `com.comergent.api.apps.commerce` provides a public interface `IInquiryListFactory`. If another module needs an instance of this Factory interface, then it calls the `CommerceAPI` class's `getFactory(int i)` method. The `int` parameter determines what sort of Factory class is returned. In turn, the calling module can now invoke methods on the `IInquiryListFactory` to return inquiry list interfaces of the appropriate type. For example, `getInquiryList(Long listKey, boolean bFillPrices)` returns an object that implements the `IInquiryList` interface.

Generated Interfaces

When you need to access data on a particular data object, you must use the generated interfaces that each data object provides. These generated interfaces are created and compiled when the SDK `generateBean` target is run as part of the deployment of your Sterling Multi-Channel Selling Solution.

For each data object declared as a `DataObject` within the **DsRecipes.xml** file, and for any parent, reference, or child data objects, the following classes and interfaces are generated and compiled in the `com.comergent.bean.simple` package:

- `<Name>.java`: this is the data bean class. It implements the interfaces listed here. In addition, if the data object extends another data object, then the bean extends the `<Parent>.java` bean.
- `IAcc<Name>.java`: this interface extends the `IRd<Name>.java` by providing the write (set) accessor methods on all of the data fields of the data object. In addition, if the data object extends another data object, then the `IAcc` interface extends the `IAcc<Parent>.java` interface.

- `IData<Name>.java`: this interface extends the `IAcc<Name>.java` by providing `restore()` and `persist()` methods on the data object. In addition, if the data object extends another data object, then the `IData` interface extends the `IData<Parent>.java` interface.
- `IRd<Name>.java`: this interface provides the read-only (get) accessor methods to the data fields of the data object. In addition, if the data object extends another data object, then the `IRd` interface extends the `IRd<Parent>.java` interface.
- In addition, list beans also implement the `IData<Name>List.java` interface. Each list interface extends the `IDataList.java` interface as well as the list interface of any parent object.

In general, you should use the `IRd` interface for any objects to be passed to JSP pages so that the objects are effectively read-only. Only use objects that implement the `IData` interface when you know that you need to either restore or persist the data object.

Example of a Generated Interface

Consider the ACL data object: the `ACL.xml` file reads:

```
<?xml version="1.0"?>
<DataObject Name="ACL" Extends="C3PrimaryRW"
  ExternalName="CMGT_ACLS"
  Access="RWID" Ordinality="1"
  ObjectType="JDBC" Version="5.0">
  <KeyFields>
    <KeyField Name="AccessKey" ExternalName="ACL_KEY"
      KeyGenerator="ACLKey"/>
  </KeyFields>
  <DataFieldList>
    <DataField Name="AccessKey"
      Writable="n" Mandatory="n"
      ExternalFieldName="ACL_KEY"/>
    <DataField Name="ACLName"
      Writable="y" Mandatory="n"
      ExternalFieldName="NAME"/>
  </DataFieldList>
  <ChildDataObject Name="Access" />
</DataObject>
```

Consequently, the `IRdACL.java` class declares:

```
public interface IRdACL extends IRdC3PrimaryRW
```

and exposes the methods:

- `public Long getAccessKey();`
- `public String getACLName();`

The `IAccACL.java` class declares:

```
public interface IAccACL extends IAccC3PrimaryRW, IRdACL
```

and exposes the methods:

- `public void setACLName(String value) throws ICCEException;`
- `public void addAccess(AccessBean bean) throws ICCEException;`

The `IDataACL.java` class declares:

```
public interface IDataACL extends IAccACL, IDataC3PrimaryRW, IData
```

In general, this interface may declare no additional methods beyond those declared in the `IData` interface because all the standard methods to read and write data from external data sources are declared in this interface.

This chapter and the next two chapters present a description of how to implement business logic classes (BLCs) at an implementation of the Sterling Multi-Channel Selling Solution. Before reading this chapter, you must have a working understanding of the basic architecture of the Sterling Multi-Channel Selling Solution and of Java.

Note:	The use of BLCs is deprecated. In general, new applications should use bizlets, controllers, and BizAPIs to implement their business logic.
--------------	---

Key Concepts

To understand fully how the Sterling Multi-Channel Selling Solution works as an application, you must understand its architecture.

An installation of Sterling Multi-Channel Selling Solution processes requests as they are received from users' browsers, and messages from other Sterling Multi-Channel Selling Solutions and from external systems. You must configure the Sterling Multi-Channel Selling Solution to process each type of request and message.

The core of the Sterling Multi-Channel Selling Solution is the Sterling Commerce Manager. This powerful and flexible server is designed to seamlessly integrate a

network of channel partners and the external systems that make up the e-commerce environment of each partner.

Each Sterling Multi-Channel Selling Solution server in the network of sales partners works both as a server in relation to inbound requests from browsers and as a client as it retrieves information from other Sterling Multi-Channel Selling Solution servers and external systems.

To customize the Sterling Multi-Channel Selling Solution in your environment, you need to consider how the system retrieves data from your external systems. In general, you can use the schema and Service classes to retrieve data from a local database source or from another Sterling Multi-Channel Selling Solution server by exchanging messages. However, you have to produce custom BLCs to retrieve information from an external system other than these.

Application Logic Classes

Application logic classes are implemented as bizAPI, business logic , or controller classes.

- bizAPI classes are used to manage the business logic of business objects. Conceptually, each bizAPI class corresponds to a business object and its methods correspond to the actions that can be performed on the business object. For example, the OrderInquiryList bizAPI class provides the following methods: *duplicate()*, *copyLineItem()*, and *changeOwner()* which correspond to actions that can be performed on a product inquiry list. It implements the `com.comergent.api.apps.orderMgmt.oil.IOrderInquiryList` interface.

The bizAPI classes are defined in the `com.comergent.apps.<application>.bizAPI` packages. Typically, they implement an interface declared in the corresponding `com.comergent.api.apps.<application>` package.

For example, the Order bizAPI class is in the `com.comergent.apps.orderMgmt.orders.bizAPI` package. It extends the `OrderInquiryList` class and implements the `com.comergent.api.apps.orderMgmt.orders.IOrder` interface.

- Each BLC is a subclass of the BLC abstract class. This class implements the `ApplicationObject` interface. BLCs perform the business logic of your implementation of the Sterling Multi-Channel Selling Solution. Each BLC contains a table of business objects such as session, user, and shopping

cart for example. In executing the *service()* method of a BLC, it invokes the *persist()* and *restore()* methods of these business objects.

Note:	In general, the use of BLC classes is deprecated. You should use either controllers or bizAPI classes to manage your business logic.
--------------	--

- Some Sterling Multi-Channel Selling Solution use controller classes to perform business logic. These classes are to be found in the `com.comergent.reference.apps.<application>.controller` packages for each application.

The Sterling Multi-Channel Selling Solution comes with a number of standard bizAPI classes, BLCs, controllers, and JSP pages. However, you may need to create new logic classes or modify the existing classes. CHAPTER 13, "Implementing Application Logic Classes" provides guidance on how to do this.

Business Objects

See CHAPTER 6, "Introducing Data Beans and Business Objects" for more information.

XML Schema

The *Sterling Multi-Channel Selling Solution Reference Guide* covers the schema and Service classes in detail. You should manage data access using these features if possible.

Naming Service

To retrieve parameters at runtime, the Sterling Multi-Channel Selling Solution provides a naming service to access either a flat file or a database to recover parameters.

Application logic classes can invoke a naming service by calling the static class NamingManager methods *getInstance()* and *getInstance(int i)*. Both these methods return an object that implements the NamingService interface.

- If no integer argument is provided, then an object of default type is created, either a NamingServiceProperties object or a NamingServiceDatabase object.
- If the integer argument is the constant NamingManager.DATABASE, then a NamingServiceDatabase object is created.
- If the integer argument is the constant NamingManager.PROPERTIES, then a NamingServiceProperties object is created.

- If the integer argument is not one of these two, then an object of default type is created.

In all cases, the Sterling Multi-Channel Selling Solution accesses the **Comergent.xml** file to determine exactly how the NamingService object should be created:

- If a NamingServiceDatabase object is to be created, then the NamingManager.database entries are used to specify the connection to the database.
- If a NamingServiceProperties object is to be created, then the NamingManager.properties entry is used to determine which properties file holds the parameter values.

Once the NamingService object is created, you use the methods listed below to retrieve the parameters as a NamingResult class:

- `public NamingResult get(int key)`
- `public NamingResult get(Long key)`
- `public NamingResult get(String key)`

The key parameter provides a means of retrieving only those parameters whose name begins with the key string.

The NamingResult class provides the *get(String parameter)* method to return the value of the parameter.

NamingService Example

For example the following code fragment recovers the value of the message URL parameter for a distributor referred to by its partner key.

```
NamingService namingService = NamingManager.getInstance();
NamingResult namingResult = namingService.get(partnerKey);
String url = namingResult.get(NamingResult.MESSAGE_URL);
```

Note that by default, the type of NamingService created is a NamingServiceDatabase object because in **Comergent.xml** the NamingManager defaultType element is set to "database".

Implementing Application Logic Classes

This chapter presents a detailed description of how to implement application logic classes at an installation of Sterling Multi-Channel Selling Solution. Before reading this chapter, you must have a working understanding of the basic architecture of the Sterling Multi-Channel Selling Solution and of Java. It covers:

- "bizAPI Classes" on page 137
- "Business Logic Classes" on page 138
- "Controller Classes" on page 138

bizAPI Classes

You can manage the business logic of an application by creating bizAPI classes. They must be invoked from the controller class specified by the message type of the request.

There is no standard interface or abstract class for bizAPI classes. Typically, each bizAPI class corresponds to a business object such as a product inquiry list or a quote. It provides methods that correspond to the actions that you can perform on the business object. It may also provide helper methods to support the business logic such as tax calculations or looking up currency codes.

Business Logic Classes

The use of BLC classes is deprecated in Release 6.4 and later. See "Business Logic Classes" on page 462 if you need to support a legacy use of business logic classes.

Controller Classes

Every inbound request received by the `DispatchServlet` is processed by a controller: the message type determines which controller class is used. There are some lightweight controllers such as `ForwardController` and `SimpleController`. These make use of the **MessageTypes.xml** files to determine the JSP page to which the request is forwarded.

Most requests are handled by a custom controller: the message type determines which controller class is used. Each custom controller must override the *execute()* method declared by the Controller class: it is called by the `DispatchServlet` when the servlet container receives the request. This method executes the business logic required to process the request either by itself or through invoking bizAPI classes.

A typical *execute()* method looks like this:

```
public void execute() throws ControllerException, ICCEException,
    IOException
{
    //Get the cart key
    Long cartKey = getCartKey();
    //If from update update the order
    ShoppingCart updatedCart = (ShoppingCart) updateCart(cartKey);
    Hashtable supersededSKUsFromAdd = getSupersededSKUs();
    //Get order factory
    try
    {
        boolean bShowPromos = true;
        String szShowPromos = ComergentAppEnv.getEnv().-
            getProperty(I18NOKayConstants.SHOW_PROMO_BUSINESS_RULE);
        if ((szShowPromos != null) &&
            (szShowPromos.equalsIgnoreCase(
                I18NOKayConstants.STRING_FALSE)))
        {
            bShowPromos = false;
        }
        ChannelCartPresentationBean cartDisplay =
            (ChannelCartPresentationBean)
                getPresentationBean(cartKey, bShowPromos);
        /*
```

```
        If this is an update message for addSKUs, then fill it
        with vector for bad SKUs
    */
    cartDisplay.setUpdate(isUpdate);
    cartDisplay.setOperation(updateOperation);
    cartDisplay.setAddSKUErrors(vBadSKUs);
    cartDisplay.setSupersededSKUs(supersededSKUsFromAdd);
    //Set the beans for the request
    request.setAttribute("cartPresentation", cartDisplay);
    callJSP();
}
catch( Exception e)
{
    throw new ICCException( e);
}
}
```

You can use the Sterling Multi-Channel Selling Solution Software Development Kit (SDK) to install and customize your implementation of the Sterling Multi-Channel Selling Solution. The HTML documentation provided with each version of the SDK provides an overview of how the SDK works and how to use it to manage projects. This chapter describes the basic structure of a customization project. Follow the guidelines here to organize your project so that it follows the customizations guidelines.

Project Organization

Each project built using the SDK is created on top of a release of the Sterling Multi-Channel Selling Solution. When you create the project using the `newproject` target, the SDK creates a set of project files that are suitable for that release. All of the customizations that you make in the project are made by adding files to the project. Files can be added to the project in these ways:

- Use the `customize` target to copy a file from the release into the project. When you use the `customize` target, the file is automatically copied into the appropriate sub-directory of the project.
- Create the file manually in the appropriate sub-directory of the project.

See "Project File and Directory Locations" on page 142 for information about where files must be located.

Project File and Directory Locations

In this section, we assume that you created a project called *project*, and that you have a project directory called *sdk_home/projects/project/*. Ensure that each of the project files is in the appropriate location under the project directory as follows:

- Java source files: these must be placed under the *project/src/* directory, and follow the package organization for the Sterling Multi-Channel Selling Solution.
- JSP pages: these are organized by module and locale under the *project/WEB-INF/web/* directory.
- Schema files: these comprise the data object files and the supporting data services files. All your customizations should be maintained under the *project/WEB-INF/schema/custom/* directory. Make sure that the `schemaRepositoryExtn` element is set to “WEB-INF/schema/custom”.

Java Source Files

In the *project/src/* directory, follow these guidelines to organize your customizations to the Sterling Multi-Channel Selling Solution:

- Use the `com/comergent/api/` packages to add your extensions to the Sterling Multi-Channel Selling Solution API. In general, you should create new classes that extend the existing API: do not overwrite the release API because that can affect any upgrade.
- Use the `com/comergent/apps/` and `com/comergent/appservices/` packages to add implementation classes: these may be entirely new classes or new classes that extend existing implementation classes.
- Use the `com/comergent/reference/` packages for controller classes. You can customize existing controller classes or create new controller classes.

JSP Pages

In the *project/WEB-INF/web/* directory, follow these guidelines to organize your customizations to the Sterling Multi-Channel Selling Solution:

- Where appropriate, use the existing organization of JSP pages to add new JSP pages or to customize existing ones.
- If you are adding a new functionality module, then create a new directory under the appropriate locale(s) for the module, and follow the same naming convention as you do for Java classes created for the module.

Schema Files

In the *project/WEB-INF/schema/custom/* directory, follow these guidelines to organize your customizations to the Sterling Multi-Channel Selling Solution:

- To add new data objects:
 - Put the XML definition of the data object in *project/WEB-INF/schema/custom/*. For example, create the file *project/WEB-INF/schema/custom/CustComment.xml*
 - Modify *project/WEB-INF/schema/custom/DsBusinessObjects.xml* by adding the new business object. For example:

```
<?xml version="1.0"?>
<Schema Name="project" Description="project Custom Schema"
  Version="6.0">
  <BusinessObject Name="CustComment" Version="6.0"
    Description="CustComment BusinessObject"/>
</Schema>
```

- Modify *project/WEB-INF/schema/custom/DsDataElements.xml* by adding the new data elements for the header and list data objects, together with any new fields declared by the data object. For example:

```
<?xml version="1.0"?>
<Schema Name="project" Description="project Custom Schema"
  Version="6.0">
  <DataElement Name="CustComment" Description="Customer Comment
data object"
    DataType="HEADER"/>
  <DataElement Name="CustCommentList" Description="Customer Com-
ment list data
  object" DataType="HEADER"/>
  <DataElement Name="CustCommentKey" Description="Customer Com-
ment Key"
    DataType="LONG" MaxLength="20"/>
</Schema>
```

- Modify *project/WEB-INF/schema/custom/DsRecipes.xml* by adding a recipe element. For example:

```
<Schema Name="project" Description="project Custom Schema"
  Version="6.0">
  <Recipe Name="CustComment" BusinessObject="CustComment"
    Description="Default Approvals List Recipe" Version="6.0">
    <DataObjectList>
      <DataObject Name="CustComment" Access="RWID"
        DataSourceName="ENTERPRISE" Ordinality="n"
        Version="6.0"/>
    </DataObjectList>
  </Recipe>
</Schema>
```

```
        </DataObjectList>
    </Recipe>
</Schema>
```

- Modify the appropriate key generator file, for example ***project*/WEB-INF/schema/custom/OracleKeyGenerators.xml**, by adding any new keys required:

```
<?xml version="1.0"?>
<Schema Description="project Custom Schema" Name="project"
    Version="6.0">
    <KeyGenerator Name="CustCommentKey" KeyProcedureName="CUSTCOM-
MENTKEY"
        GeneratorType="PROCEDURE" />
</Schema>
```

Tailoring the Sterling Multi-Channel Selling Solution

Overview

Embracing all channels, all selling partners, and all products, the Sterling Multi-Channel Selling Solution enables the most powerful collaborative commerce experience available. With the Sterling Multi-Channel Selling Solution, companies can successfully pursue e-business strategies by seamlessly integrating their existing channel partners into Web commerce, offering vast opportunities for their partners to contribute value-add during the selling process. By guiding customers through the entire sales process, streamlining the selection of complex products and services, allowing purchases to be consummated across channel partners, and providing insight into the effectiveness of commerce activities, Sterling Commerce maximizes e-business sales potential while strengthening relationships with a company's channel partners.

The Sterling Multi-Channel Selling Solution is a complete suite of enterprise-class applications developed using open, standards-based technologies such as Java, XML, and Java 2 Enterprise Edition (J2EE). The Sterling Multi-Channel Selling Solution is not a collection of code stubs or building blocks to help jump-start the custom development of complex e-commerce applications. The Sterling Multi-Channel Selling Solution applications are pre-packaged solutions that are ready to deploy, easy to configure, and easy to administer. The Sterling Multi-Channel

Selling Solution enables companies to rapidly implement technology solutions to business problems and reduce time to market for a competitive advantage.

The Sterling Multi-Channel Selling Solution is deployed as a Java J2EE Web application, using the services provided by commercial Java application servers. This provides an open foundation for the integration of Sterling Multi-Channel Selling Solution with other applications as well as the extension of Sterling Multi-Channel Selling Solution functionality. In addition, the Sterling Multi-Channel Selling Solution application architecture itself has been designed to meet the key goals of extensibility and integration.

A key requirement for any Web-based enterprise application is the ability to configure, customize, and extend the application to meet the needs of the customer. The Sterling Multi-Channel Selling Solution has been designed throughout to support customization, extension, and integration with other applications. This document describes how this is accomplished.

Customization Components

The following components and source code are delivered as part of the SDK installation of the Sterling Multi-Channel Selling Solution to allow for the capability to make specific extensions and customizations:

- **Presentation Layer Components:** JavaServer Pages (JSPs) Template Source Code Files, Cascading Style Sheets (CSSs), Java Resource Bundle Files, Javascript files, Java source code for Controllers (as in the Model/View/Controller paradigm, see "Controllers" on page 151) defining end user page flows.
- **DataServices Layer Components:** Business Object Schema Definition Files, Knowledgebase Database Definition Scripts, Document Type Definition (DTD) Files for all XML messages supported by the system
- **Application and Kernel Configuration Files:** The XML configuration files are used to modify the behavior of the Sterling Multi-Channel Selling Solution platform.
- **API and Developer Documentation:** Developers Guide, Administration Guide, Implementation Guide, and Reference Guide PDF files. The JavaDocs, the industry standard HTML-based documentation format, generated directly from the source code detailing the input/output parameters and usage guidelines for all public and protected methods in all Sterling Commerce packages is provided along with a higher level index tying together Presentation, Logic, and Data Layer components.

Platform Components

The shaded areas in the diagram below represent the internal architectural modules of the Sterling Multi-Channel Selling Solution system. These modules are documented and serve as the platform upon which applications are written.

- **Sterling Multi-Channel Selling Solution Platform:** This module represents the underlying platform-level mechanisms of the Sterling Multi-Channel Selling Solution architecture, including the Data Services module, the system-to-system messaging manager including XSL/XSLT-based conversion services, and the security, authentication and data entitlement system.
- **Sterling Multi-Channel Selling Solution Application Engine:** This module represents the supporting framework for Sterling Multi-Channel Selling Solution applications. It defines the Java Interfaces that must be implemented by the various business logic modules associated with applications, provides the mechanism for interfacing between JSP pages and the underlying business logic, and provides common application services that are used by the application logic.

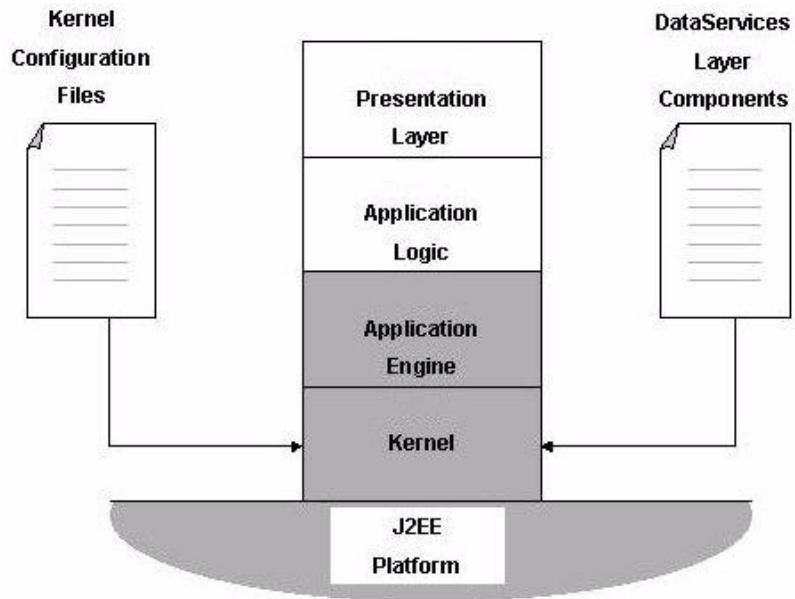


FIGURE 6. Sterling Multi-Channel Selling Solution Architecture

Extensions and Maintenance

This section describes in greater detail the various mechanisms within the Sterling Multi-Channel Selling Solution environment that support the customization and extension of the application suite. The source code and customization components detailed on the previous page are sufficient to extend the application when applied in the following manner:

Extending the Presentation Layer

The Sterling Multi-Channel Selling Solution application suite is deployed as part of the overall Web site of a company and as such must be able to be customized to integrate with the look-and-feel of that site.

Look-and-feel customizations are achieved by making changes to the JSP pages for each application page, by editing the resource string files, and by adjusting the font size and color specifications in the cascading style sheet file.

Page flow customizations are achieved through modification of server-side Java components known as “Controllers” which contain the reference page flow logic.

JSP Pages

All Sterling Multi-Channel Selling Solution applications support a “thin client” user interface based on the HTML Web standard. Users connect to Sterling Multi-Channel Selling Solution applications using a standard Web browser; no special software installation or download is required at the client side. One of the key benefits of HTML is its flexibility. Web-based user interfaces can be created that satisfy a large variety of look and feel requirements. In addition, adhering to the thin-client HTML model of user interface ensures that Sterling Multi-Channel Selling Solution applications can be smoothly integrated into the appearance and functionality standards of any Web site.

The Sterling Multi-Channel Selling Solution user interface is implemented using the Java Server Pages (JSP) standard, defined as part of the overall Java 2 Enterprise Edition (J2EE) standard. Each screen within the Sterling Multi-Channel Selling Solution user interface is defined by a JSP page. JSP pages define a mechanism for interleaving HTML formatting directives with Java source code. This provides a way to support both the dynamic content (for example, an order’s line-item list) and the static content (the site navigation buttons) of the page in a single source file.

All Sterling Multi-Channel Selling Solution applications are implemented using “Model 2” JSP pages, which means that there is a strict separation between the business logic of an application screen and its presentation to the user. The business data and logic are made available to the JSP page through the underlying Sterling Multi-Channel Selling Solution architecture, but the JSP page itself contains only formatting directives and control structure. This provides a very flexible user interface infrastructure, supporting conditional display of text, etc. while still keeping the JSP pages clean and simple. The JSP pages can be customized to any look and feel by administrators who are HTML capable but have little or no Java programming experience.

All Sterling Multi-Channel Selling Solution JSP pages make extensive use of the HTML Cascading Style Sheets (CSS) mechanism. This allows most look-and-feel parameters (font, color, spacing, size, and so on) to be defined in a separate CSS file and referenced by name in the JSP pages themselves. This allows the appearance of the page to be significantly modified via changes to the CSS file, without modifying the JSP pages themselves.

Sterling Commerce supplies source code template files for each Java Server Page as part of any implementation. This allows any customer to control the

look-and-feel of the Sterling Multi-Channel Selling Solution applications at their site, both upon initial implementation and over the life-cycle of the site.

Page Layout and Branding

Overall page layout and appearance, including background colors and branding images, can be modified by editing the JSP page(s) associated with each Web page. The JSP page consists primarily of HTML text that specifies the page layout and structure. Components on the page can be re-sized or rearranged by editing the HTML.

All page image references can be changed to new graphics files containing the appropriate pictures and company logos.

Resource Strings

All text strings defined by the applications, including error message text are defined in resource files that are separated from the application code. These strings can be modified by editing the Java Resource Bundle implementations. Java Resource Bundles are a standard mechanism within the Sun Java Development Kit to support internationalization efforts.

Style Sheets

All aspects of text font style and color are controlled via the HTML Cascading Style Sheets mechanism. The style sheet files define HTML element classes that specify the font, text color and background colors of text displayed within the pages.

A new graphic design can be applied to all the pages simply by editing the style sheet file to assign new font style size and color attributes to the various elements displayed within the page.

Page Flow

It is sometimes desirable to alter the page flow of a Sterling Multi-Channel Selling Solution application or to incorporate the services or capabilities of an outside application into the Sterling Multi-Channel Selling Solution page flow. This can be accomplished in a number of ways.

HTTP Links

The URL linkages between pages can be edited within the JSP template itself. A new button can be created that invokes an alternate application functionality and page flow, or the URL of an existing command button can be edited to reference a different page. In addition, in-line Java code can be inserted in a JSP page that can

include arbitrary Java packages and invoke the incorporated Java code to call out to external systems or provide information to be displayed within the page.

Controllers

Sterling Multi-Channel Selling Solution JSP pages follow the Model 2 standard, implementing the “Model/View/Controller” (MVC) paradigm that helps to cleanly separate business logic from presentation. Controller code is typically responsible for:

- validating and converting HTTP request parameters, usually form posts, to the appropriate data objects on which the Sterling Multi-Channel Selling Solution application logic acts;
- matching application results to specific JSP pages for presentation to the user;
- performing any conditional routing of page flow based on normal or exception results returned or raised by requested application logic.

Controllers are essentially lightweight orchestrators of logic request flows initiated via Web browsers, bridging Web clients to the presentation independent Sterling Multi-Channel Selling Solution application logic.

New controllers can be written as part of a Sterling Multi-Channel Selling Solution installation that can alter the flow between existing Sterling Multi-Channel Selling Solution application pages without modifying any of the underlying business logic implemented by the operations within a page. Further, source code for the Controllers user for end user page flows can be modified appropriately. Controller implementers must limit themselves to documented Sterling Multi-Channel Selling Solution APIs to achieve compatibility with future releases of the Sterling Multi-Channel Selling Solution.

Extending the Data Services Layer

All access to business information or data is mediated through the Sterling Multi-Channel Selling Solution Data Object mechanism. The data object definition mechanism (described in CHAPTER 6, "Introducing Data Beans and Business Objects") can be used to extend these objects to contain additional information.

Data Object Schemas

All business information that is used and managed using Sterling Multi-Channel Selling Solution applications (for example, orders, user profiles, product data) is accessed through a set of data objects defined by the applications. These data

objects define the various readable and writable fields and attributes of business data.

Each data object is defined by an XML schema file that defines the field names and data types of the data object. A data object can be customized through sub-classing or by editing its associated schema file to add new fields and delete or rename existing ones. The sub-classing mechanism isolates customizations in a new XML schema file. This is the most upgrade-friendly approach and, therefore, the recommended one.

The fields of a data object can be accessed by name from within the UI code in a JSP page. This means that changes to a data object can easily be reflected in the UI of a Sterling Multi-Channel Selling Solution application without any Java coding.

Extending a Data Object

An existing Sterling Multi-Channel Selling Solution data object can be extended by editing its XML schema definition file. For example, a new data field can be added to an existing data object by inserting the appropriate XML element(s) in the schema definition file.

The XML schema file is then processed to produce the associated Java class for the data object and to generate the Java bean that can be referenced by JSP pages that interact with that data object.

Presentation code within a JSP page can reference the new data object data field just like any built-in field of the object. The value can be read and displayed or set from a form field, all without requiring any programming outside the XML schema file, controllers, and the JSP page.

Creating a New Data Object

New data objects can be created with the same XML-based mechanism. A new data object's content can be referenced through the automatically-generated Java bean interface by any interested JSP page and Controller pair.

We recommend that when you create a new data object, you create a new database table to store the corresponding data. Name the table with a prefix that reflects the project title rather than the standard CMGT prefix. This ensures that there is no risk of a naming collision when upgrades take place.

Data Source Mapping

The Sterling Multi-Channel Selling Solution Data Services module is responsible for managing all interaction between the Sterling Multi-Channel Selling Solution

applications and various data sources, including relational databases, XML messaging, and data management system APIs.

The Data Services module provides a variety of built-in data interface modules. One provides access to relational databases via the Java JDBC standard. Another provides access to remote data via system-to-system XML messages.

Each data interface module is built using the module API provided by the Data Services mechanism. New data interface modules can be written using this API to access data that is managed by various legacy systems or other mechanisms.

XML Message DataService

The set of XML messages supported by the Sterling Multi-Channel Selling Solution application suite is defined via a message map definition file. The message map file can be edited to define new messages that can be mapped to existing or new business logic.

System-to-System Messages

The Sterling Multi-Channel Selling Solution architecture supports integration with other applications through the exchange of XML messages via the HTTP protocol. Any business logic operation provided by a Sterling Multi-Channel Selling Solution application can be invoked using this XML interface. The specific operation to be performed along with all of its required input parameters are specified as part of the XML structure defined by an XML Document Type Definition (DTD).

Sterling Multi-Channel Selling Solution also defines a set of XML messages to support pre-defined business processes required by the applications. One example is the remote pricing and availability check performed between a manufacturer and a distributor site. Another is a catalog content syndication export. These business messages are defined via a Sterling Multi-Channel Selling Solution-specific XML message that defines all possible aspects of the interaction. These “master messages” can then be converted into different specific XML syntax structures via the use of the XSLT standard that provides for the transformation between XML document structures.

The set of XML operations is defined as part of the Sterling Multi-Channel Selling Solution system configuration in the “message map” file. New messages can be defined and existing messages modified or extended by changing the entries in the message map.

Message Syntax Conversion

Sterling Multi-Channel Selling Solution supports the use of the XML style sheet translation mechanism to convert messages of one XML syntax into an alternate syntax. Thus, all existing Sterling Multi-Channel Selling Solution messages supporting various business processes can be mapped into the specific XML syntax of a variety of XML standards that support those same operations.

Simultaneous Support for Multiple Message Formats

Sterling Multi-Channel Selling Solution can also keep track of which syntax structure or message version is supported by the various business partners of a Sterling Multi-Channel Selling Solution installation and simultaneously exchange different message sets with different partners.

Extending the Application Logic Layer

Occasionally in the course of implementing a Sterling Multi-Channel Selling Solution e-commerce site it is necessary to create a new business logic module for some operation specific to that customer's business. Sterling Multi-Channel Selling Solution supports the definition of new business logic classes and the extension of existing classes using the Java interfaces defined by the application architecture and even through the sub-classing of existing business logic classes.

Application Logic

The Sterling Multi-Channel Selling Solution application suite functionality is implemented via a set of Business Logic Classes defined as Java class objects, known as the Sterling Multi-Channel Selling Solution Application Logic. See CHAPTER 13, "Implementing Application Logic Classes" for more information. The core of the Sterling Multi-Channel Selling Solution is a collection of business logic class implementations that cover a wide variety of operations.

Occasionally in the course of deploying the Sterling Multi-Channel Selling Solution system it is necessary to implement new business logic or modify existing business logic operations. This is easily accomplished by writing new Java code within the overall Sterling Multi-Channel Selling Solution framework.

Code implementing new business logic must be written to conform to the overall set of Java interfaces defined by the Sterling Multi-Channel Selling Solution architecture. These interfaces are documented in the reference documentation for the product. New business logic operations can be invoked from JSP pages or using XML messages, just like the built-in business logic of the applications.

The definition of all the Sterling Multi-Channel Selling Solution Java packages, classes, and methods can be found in the product Javadoc. Javadocs are an industry

standard format, developed by JavaSoft, for displaying the internal input/output parameters and usage guidelines.

There are cases where it may be desirable to modify existing application business logic. This can be accomplished by defining a subclass of an existing business logic class. The subclass can perform additional or alternate operations, invoking the pre-defined business logic operation at the appropriate time. Definitions for understanding how to correctly subclass the existing business logic classes can be found in the Javadoc. The source code for the Application Logic can also be referenced for this purpose as well, if necessary.

Writing New Application Logic

The Sterling Multi-Channel Selling Solution Application Logic class interface defines the execution environment for a new piece of business logic, including the parameter definitions and values (from either a Web page form or a system-to-system XML message), and the session state object. New business logic code can, of course, be completely free-form, doing whatever it wants to within the context of how it is invoked, loading and calling outside Java or non-Java software modules, etc. However, it is more common to define new business logic in the existing Sterling Multi-Channel Selling Solution architectural framework, utilizing new or existing business object definitions and interacting with back-end data stores through the Sterling Multi-Channel Selling Solution Data Services module. In this way new business logic can reap the benefits of the Sterling Multi-Channel Selling Solution architecture, including independence from specific databases or data source types.

Extending Existing Application Logic

It is also possible to extend existing business logic. This is typically done by defining a new Java subclass of an existing business logic class. The new subclass is again free to implement its mission however it sees fit, but it will commonly perform some activity that is complementary to or supervisory of the existing business logic, and invoke the base class to execute that business logic at the appropriate time. In this way it is possible to significantly extend or control existing Sterling Multi-Channel Selling Solution business logic in a way that is external to the definition of that code and is therefore maintainable and can be supported across upgrades of the underlying Sterling Multi-Channel Selling Solution system.

System Configuration Files

Because the source code for the Sterling Multi-Channel Selling Solution Platform is Sterling Commerce proprietary information, it is not provided to the customer. The Sterling Multi-Channel Selling Solution Architecture has instead been

designed to use XML configuration files to specify values for all tunable parameters in the Sterling Multi-Channel Selling Solution platform. The XML configuration files can be edited by hand or, more intuitively, modified through the Sterling Multi-Channel Selling Solution Enterprise Administration interface.

Upgrading the Sterling Multi-Channel Selling Solution

This chapter describes how to plan your approach to upgrading your Sterling Multi-Channel Selling Solution. It covers:

- "Upgrading in General" on page 157
- "Upgrading from Release 7.2 to Release 8.0" on page 160
- "Upgrading from Release 7.0.2 to Release 7.1" on page 160

Upgrading in General

Overview of Upgradability

The Sterling Multi-Channel Selling Solution has been designed from the ground up to meet the dual challenges of providing out-of-the-box application functionality against common business scenarios while providing the necessary flexibility to handle the extensions and customizations that occur in the normal course of deployment.

The software installation includes all the necessary source code, configuration files, data initialization scripts, and other tools necessary to perform the kinds of modifications described in this *Sterling Multi-Channel Selling Solution Developer Guide*. This chapter describes upgrade considerations and process for each

supported customization technique as described in CHAPTER 15, "Tailoring the Sterling Multi-Channel Selling Solution".

The Sterling Multi-Channel Selling Solution System supports a progressive sequence of customization techniques designed to make the most common customizations the easiest to implement initially and to roll forward during an upgrade.

Customer Upgrade Scenarios

This section enumerates and explores the common reasons for upgrading the Sterling Multi-Channel Selling Solution. The motivations for upgrade can directly impact the style and scope of the upgrade activity.

Upgrade Motivations

The following motivations are considered and occasionally referenced in the material which follows:

- Upgrading to obtain stability and performance benefits from the latest release.
- Upgrading to implement a new module which requires the latest Platform version.
- Upgrading to obtain across the board functionality and/or usability enhancements.
- Upgrading to obtain additional platform or standards support.
- Upgrading to implement a specific feature enhancement which involves inter-module communication and interaction.
- Upgrading to obtain inter-enterprise communication enhancements.
- Upgrading to obtain enhanced administration tools.

Upgrade Considerations by Customization Technique

The following categories of customization are supported by the Sterling Multi-Channel Selling Solution architecture.

Upgrading Presentation

Presentation is typically the most extensively customized area. At minimum, the application of custom-branding is generally required during deployment to make the reference UI conform to the customer's Web UI style guidelines and standards.

Re-applying existing customizations to a new version of the Reference UI requires the fairly manual but mechanical process of comparing and merging individual JSP pages and Controller files. In that upgrade scenario, upgrade cost will be directly proportional to the extent of page reorganization and modification.

Alternatively, upgrade may focus on retaining the previously customized UI on the latest server-side APIs with minimal functional modifications to existing pages. This may be the case where upgrade is driven primarily by the desire to implement additional Sterling Multi-Channel Selling Solution modules. In this case, upgrade focuses on backward compatibility of existing, customized JSP pages and Java-based controllers.

Upgrade Considerations for Customized JSP Files

The Model 2 JSP architecture is the foundation of presentation in the Sterling Multi-Channel Selling Solution. This employs a Model/View/Controller, or MVC, design pattern with JSP as the Web page templating language and Java-based Controller classes as the orchestrators of page flow and request routing and processing. JSP pages have dependencies on specific Data and Logic Beans, for example, the Order Detail page depends on the OrderPresentationBean from which it acquires its data for display. The Order detail page itself controls specific layout and display of the order. In this case, the OrderPresentationBean provides both formatting specific logic and access to the underlying order business data.

The following are typical presentation customizations which must be re-applied or otherwise accounted for during upgrade.

- Application of custom branding in the form of images and text styles
- Addition of surrounding page content to the reference UI, for example, adding a site-wide navigation frame and branding header to Sterling Multi-Channel Selling Solution Order Management
- Re-organization of page content
- Page flow modification

Page flow changes are accomplished by modifying or creating new Java Controllers, so typically some degree of Controller customization is performed along with JSP customization.

Administration pages are not intended to be branded or otherwise customized and therefore should not be affected during the upgrade process.

Upgrading from Release 7.2 to Release 8.0

This section describes specific issues to be aware of while upgrading from Release 7.2 to Release 8.0.

API Changes

Release 8.0 does not include the C3 Analyzer, which connected the Knowledgebase to Actuate software for reporting. Therefore the package `com.comergent.api.apps.mktAnalyzer`, which provided access to the C3 Analyzer, has been removed.

Upgrading from Release 7.0.2 to Release 7.1

This section describes specific issues to be aware of while upgrading from Release 7.0.2 to Release 7.1.

API Changes

The modularization of the Sterling Multi-Channel Selling Solution platform has included the creation of new APIs and some reorganization of the existing platform packages and classes. As a result, some of your custom code may need to be changed to match the new APIs. This section describes the changes by listing the Release 7.0.2 packages and classes that have new Release 7.1 equivalents.

The following packages have been renamed.

TABLE 7. Package Changes

Release 7.0.2	Release 7.1
<code>com.comergent.api.dcm.authentication</code>	<code>com.comergent.dcm.core</code>
<code>com.comergent.api.dcm.messageType</code>	<code>com.comergent.api.messageType</code>
<code>com.comergent.dcm.messageType</code>	<code>com.comergent.api.messageType</code>
<code>com.comergent.dcm.space</code>	<code>com.comergent.api.space</code>
<code>com.comergent.dcm.cache.impl.fs</code>	<code>com.comergent.globalcache.fs</code>
<code>com.comergent.dcm.cache.impl.space</code>	<code>com.comergent.globalcache.space</code>
<code>com.comergent.dcm.cache.impl</code>	<code>com.comergent.api.globalcache</code>

The following classes also moved packages.

TABLE 8. Class Changes

Release 7.0.2	Release 7.1
com.comergent.api.dcm.entitlement.EntitlementContext	com.comergent.api.accessPolicy.EntitlementContext
com.comergent.api.dcm.entitlement.PolicyManagerAccessService	com.comergent.api.accessPolicy.PolicyManagerAccessService
com.comergent.api.dcm.entitlement.PolicyManagerConfigurationException	com.comergent.api.accessPolicy.PolicyManagerConfigurationException
com.comergent.api.dcm.entitlement.PolicyManagerInvocationException	com.comergent.api.accessPolicy.PolicyManagerInvocationException
com.comergent.api.dcm.entitlement.PolicyManager	com.comergent.api.accessPolicy.PolicyManager
com.comergent.api.dcm.entitlement.PolicyManagerPrincipalQualifier	com.comergent.api.accessPolicy.PolicyManagerPrincipalQualifier
com.comergent.api.dcm.entitlement.PolicyManagerQueryBuilder	com.comergent.api.accessPolicy.PolicyManagerQueryBuilder
com.comergent.api.dcm.entitlement.PolicyManagerTraceBuffer	com.comergent.api.accessPolicy.PolicyManagerTraceBuffer
com.comergent.api.dcm.entitlement.Principal	com.comergent.api.accessPolicy.Principal
com.comergent.api.dcm.entitlement.PrincipalType	com.comergent.api.accessPolicy.PrincipalType
com.comergent.api.dcm.entitlement.DomainDefinition	com.comergent.api.dispatchAuthorization.DomainDefinition
com.comergent.api.dcm.entitlement.Domain	com.comergent.api.dispatchAuthorization.Domain
com.comergent.api.dcm.entitlement.DomainNameResolver	com.comergent.api.dispatchAuthorization.DomainNameResolver
com.comergent.api.dcm.entitlement.DomainRole	com.comergent.api.dispatchAuthorization.DomainRole
com.comergent.api.dcm.entitlement.EntitlementDomainSyntaxException	com.comergent.api.dispatchAuthorization.EntitlementDomainSyntaxException
com.comergent.api.dcm.entitlement.EntitlementFactory	com.comergent.api.dispatchAuthorization.EntitlementFactory
com.comergent.api.dcm.entitlement.EntitlementRepository	com.comergent.api.dispatchAuthorization.EntitlementRepository
com.comergent.api.dcm.entitlement.FormalRole	com.comergent.api.dispatchAuthorization.FormalRole
com.comergent.api.dcm.entitlement.InvalidRolesException	com.comergent.api.dispatchAuthorization.InvalidRolesException

TABLE 8. Class Changes (Continued)

Release 7.0.2	Release 7.1
com.comergent.api.dcm.entitlement.InvalidUserException	com.comergent.api.dispatchAuthorization.InvalidUserException
com.comergent.api.dcm.entitlement.PartnerType	com.comergent.api.dispatchAuthorization.PartnerType
com.comergent.api.dcm.entitlement.Role	com.comergent.api.dispatchAuthorization.Role
com.comergent.api.dcm.entitlement.UserFunction	com.comergent.api.dispatchAuthorization.UserFunction
com.comergent.api.dcm.entitlement.UserType	com.comergent.api.dispatchAuthorization.UserType
com.comergent.dcm.entitlement.MyErrorHandler	com.comergent.accessPolicy.MyErrorHandler
com.comergent.dcm.entitlement.PMAccessChecker	com.comergent.accessPolicy.PMAccessChecker
com.comergent.dcm.entitlement.PMAccessor	com.comergent.accessPolicy.PMAccessor
com.comergent.dcm.entitlement.PMAccessPolicy	com.comergent.accessPolicy.PMAccessPolicy
com.comergent.dcm.entitlement.PMAccessServiceInitializer	com.comergent.accessPolicy.PMAccessServiceInitializer
com.comergent.dcm.entitlement.PMBinaryOperator	com.comergent.accessPolicy.PMBinaryOperator
com.comergent.dcm.entitlement.PMBooleanExpression	com.comergent.accessPolicy.PMBooleanExpression
com.comergent.dcm.entitlement.PMComparativeExpression	com.comergent.accessPolicy.PMComparativeExpression
com.comergent.dcm.entitlement.PMEntitlementContextImpl	com.comergent.accessPolicy.PMEntitlementContextImpl
com.comergent.dcm.entitlement.PMPrincipalExpression	com.comergent.accessPolicy.PMPrincipalExpression
com.comergent.dcm.entitlement.PMPrincipalImpl	com.comergent.accessPolicy.PMPrincipalImpl
com.comergent.dcm.entitlement.PMPrincipalQualifierInitializer	com.comergent.accessPolicy.PMPrincipalQualifierInitializer
com.comergent.dcm.entitlement.PMPrincipalTypeImpl	com.comergent.accessPolicy.PMPrincipalTypeImpl
com.comergent.dcm.entitlement.PMQueryBuilder	com.comergent.accessPolicy.PMQueryBuilder
com.comergent.dcm.entitlement.PMSetExpression	com.comergent.accessPolicy.PMSetExpression
com.comergent.dcm.entitlement.PMSet	com.comergent.accessPolicy.PMSet
com.comergent.dcm.entitlement.PMSetOperator	com.comergent.accessPolicy.PMSetOperator
com.comergent.dcm.entitlement.PMTerm	com.comergent.accessPolicy.PMTerm
com.comergent.dcm.entitlement.PMTraceBuffer	com.comergent.accessPolicy.PMTraceBuffer
com.comergent.dcm.entitlement.PolicyManagerImpl	com.comergent.accessPolicy.PolicyManagerImpl
com.comergent.dcm.entitlement.PolicyManagerWhereClauseQueryBuilder	com.comergent.accessPolicy.PolicyManagerWhereClauseQueryBuilder

TABLE 8. Class Changes (Continued)

Release 7.0.2	Release 7.1
com.comergent.dcm.entitlement.Utility	com.comergent.accessPolicy.Utility
com.comergent.dcm.entitlement.PolicyManagerSubQueryBuilder	com.comergent.api.accessPolicy.PolicyManagerSubQueryBuilder
com.comergent.dcm.entitlement.DomainDefinitionImpl	com.comergent.dispatchAuthorization.DomainDefinitionImpl
com.comergent.dcm.entitlement.DomainImpl	com.comergent.dispatchAuthorization.DomainImpl
com.comergent.dcm.entitlement.DomainRoleImpl	com.comergent.dispatchAuthorization.DomainRoleImpl
com.comergent.dcm.entitlement.EntitlementRepositoryImpl	com.comergent.dispatchAuthorization.EntitlementRepositoryImpl
com.comergent.dcm.entitlement.EntitlementSAXHandler	com.comergent.dispatchAuthorization.EntitlementSAXHandler
com.comergent.dcm.entitlement.FormalRoleImpl	com.comergent.dispatchAuthorization.FormalRoleImpl
com.comergent.dcm.entitlement.PartnerTypeImpl	com.comergent.dispatchAuthorization.PartnerTypeImpl
com.comergent.dcm.entitlement.PseudoResourceBundle	com.comergent.dispatchAuthorization.PseudoResourceBundle
com.comergent.dcm.entitlement.RoleImpl	com.comergent.dispatchAuthorization.RoleImpl
com.comergent.dcm.entitlement.UserFunctionImpl	com.comergent.dispatchAuthorization.UserFunctionImpl
com.comergent.dcm.entitlement.UserFunctionMap	com.comergent.dispatchAuthorization.UserFunctionMap
com.comergent.dcm.entitlement.UserTypeDefinition	com.comergent.dispatchAuthorization.UserTypeDefinition
com.comergent.dcm.entitlement.UserTypeImpl	com.comergent.dispatchAuthorization.UserTypeImpl
com.comergent.dcm.messaging.rosettanet.Base64	com.comergent.base64.Base64
com.comergent.dcm.bizlet.Converter	com.comergent.api.Converter
com.comergent.dcm.bizlet.ComergentRuntimeException	com.comergent.api.exception.ComergentRuntimeException
com.comergent.dcm.core.DataConverter	com.comergent.dcm.bizlet.DataConverter
com.comergent.dcm.core.JSObjectID	com.comergent.api.messageType.JSObjectID
com.comergent.dcm.caf.blc.BLCErrors	com.comergent.reference.apps.common.blc.BLCErrors
com.comergent.dcm.cache.GlobalCache	com.comergent.api.globalcache.GlobalCache
com.comergent.dcm.util.BeanUtil	com.comergent.api.apps.appUtils.BeanUtil
com.comergent.dcm.util.BrowserSniffer	com.comergent.api.apps.appUtils.BrowserSniffer
com.comergent.dcm.util.DCMSimpleDateFormat	com.comergent.api.apps.appUtils.DCMSimpleDateFormat
com.comergent.dcm.util.FileNameUtil	com.comergent.api.apps.appUtils.FileNameUtil

TABLE 8. Class Changes (Continued)

Release 7.0.2	Release 7.1
com.comergent.dcm.util.FileProcessor	com.comergent.api.apps.appUtils.FileProcessor
com.comergent.dcm.util.I18NUtil	com.comergent.api.appservices.productService.util.I18NUtil
com.comergent.dcm.util.NameResolutionService	com.comergent.api.appservices.productService.util.NameResolutionService
com.comergent.dcm.util.NameResolutionServiceManager	com.comergent.api.appservices.productService.util.NameResolutionServiceManager
com.comergent.dcm.util.NameResolutionServiceUtility	com.comergent.api.appservices.productService.util.NameResolutionServiceUtility
com.comergent.dcm.util.WebI18NUtil	com.comergent.api.appservices.productService.util.WebI18NUtil
com.comergent.dcm.util.SendSMTP	com.comergent.api.email.SendSMTP
com.comergent.dcm.util.ComergentExceptionInterface	com.comergent.api.exception.ComergentExceptionInterface
com.comergent.dcm.util.ComergentException	com.comergent.api.exception.ComergentException
com.comergent.dcm.util.ComergentRuntimeException	com.comergent.api.exception.ComergentRuntimeException
com.comergent.dcm.util.ICCEException	com.comergent.api.exception.ICCEException
com.comergent.dcm.util.HelpFileMap	com.comergent.api.help.HelpFileMap
com.comergent.dcm.util.HelpUtil	com.comergent.api.help.HelpUtil
com.comergent.dcm.util.ComergentI18N	com.comergent.api.i18nbase.ComergentI18N
com.comergent.dcm.util.EncodeUtility	com.comergent.api.i18nbase.EncodeUtility
com.comergent.dcm.util.TranscodeUtility	com.comergent.api.i18nbase.TranscodeUtility
com.comergent.dcm.util.ResourceBundleHelper	com.comergent.api.i18nweb.ResourceBundleHelper
com.comergent.dcm.util.RandomString	com.comergent.apps.orderMgmt.orders.bizAPI.RandomString
com.comergent.dcm.util.FileChangedWriter	com.comergent.apps.visualModeler.translate.FileChangedWriter
com.comergent.dcm.util.RequestTimer	com.comergent.dcm.core.RequestTimer
com.comergent.dcm.util.ResponseSizeStat	com.comergent.dcm.core.ResponseSizeStat
com.comergent.dcm.util.SoftHashMap	com.comergent.dcm.core.SoftHashMap
com.comergent.dcm.util.Timer	com.comergent.dcm.core.Timer
com.comergent.dcm.util.CachedInputStream	com.comergent.dcm.messaging.CachedInputStream

TABLE 8. Class Changes (Continued)

Release 7.0.2	Release 7.1
com.comergent.dcm.util.MultipartParser	com.comergent.dcm.messaging.MultipartParser
com.comergent.dcm.util.MultipartStream	com.comergent.dcm.messaging.MultipartStream
com.comergent.dcm.util.Base64	com.comergent.base64.Base64
com.comergent.dcm.util.MakeGTINPriceList	com.comergent.dcm.messaging.rosettanet.MakeGTINPriceList
com.comergent.dcm.util.SpaceOKProperties	com.comergent.dcm.messaging.rosettanet.SpaceOKProperties
com.comergent.dcm.util.MIME2Java	com.comergent.reference.apps.systemAdmin.common.MIME2Java
com.comergent.dcm.util.ModifiedString	com.comergent.reference.apps.systemAdmin.common.ModifiedString
com.comergent.dcm.xml.dom.Util	com.comergent.api.xml.Util
com.comergent.dcm.xml.dom.Util	com.comergent.api.xml.XMLChar
com.comergent.dcm.xml.dom.FormatPrintVisitor	com.comergent.api.xml.visitor.FormatPrintVisitor
com.comergent.dcm.xml.dom.NOOPVisitor	com.comergent.api.xml.visitor.NOOPVisitor
com.comergent.dcm.xml.dom.ToNextSiblingTraversalException	com.comergent.api.xml.visitor.ToNextSiblingTraversalException
com.comergent.dcm.xml.dom.ToXMLStringVisitor	com.comergent.api.xml.visitor.ToXMLStringVisitor
com.comergent.dcm.xml.dom.TreeTraversalException	com.comergent.api.xml.visitor.TreeTraversalException
com.comergent.dcm.xml.dom.TreeTraversal	com.comergent.api.xml.visitor.TreeTraversal
com.comergent.dcm.xml.dom.Visitee	com.comergent.api.xml.visitor.Visitee
com.comergent.dcm.xml.dom.Visitor	com.comergent.api.xml.visitor.Visitor
com.comergent.dcm.xml.dom.ComergentDocument	org.w3c.dom.Document
com.comergent.dcm.xml.dom.ComergentNode	org.w3c.dom.Node
com.comergent.dcm.xml.dom.ComergentElement	org.w3c.dom.Element
com.comergent.preferences.comergentXML.LegacyPreferences	com.comergent.api.preferences.LegacyPreferences

For further information regarding platform module API changes, please contact Sterling Commerce.

Changes to Reports

The introduction of new storefront functionality in Release 7.1 has included the use of the C3PrimaryStorefrontRW and C3StorefrontRW data objects. Data objects that

extend these are “storefront-aware”: restore and persist operations on them make use of a StorefrontKey field to track on which storefront the object lives. Correspondingly, this has required the addition of a STOREFRONT_KEY column to tables that support these data objects.

Consequently, the out-of-the-box reports have been updated to use the STOREFRONT_KEY columns. Customized reports should be updated to make use of the same columns as appropriate.

This chapter presents detailed descriptions of sample enhancements to the Sterling Multi-Channel Selling Solution. They demonstrate the main steps required to modify the system.

The first examples demonstrate how the look-and-feel of pages can be changed. The last of these is a simple exercise to demonstrate how to re-use existing message types and controllers.

The subsequent examples lead you through more complex steps that show how controllers, data objects, business logic classes, data beans, and JSP pages are used:

- We show how a new data object and data bean are defined and how they are used to save data provided by a user.
- We show how to create a list data object and data bean and use them to display a table of data to users.
- We show how the access control mechanism is used to manage access to data. This example also shows how to create and use a system parameter as a business rule.

Setting up the SDK

To work on the examples, set up the SDK on your system. You can use the SDK to ensure that as you modify your Sterling Multi-Channel Selling Solution, the

changes that you make are all managed in one location. At minimum, you should follow the following steps:

1. Install the SDK on your system.
2. Run the install target to install your release of the Sterling Multi-Channel Selling Solution into the SDK.
3. Run the newproject target to create an SDK project for your work. We will refer to the name of the project as *project* in the following examples.
4. Database targets:
 - a. To run against an Oracle database server, run the installOracle target, then run the env.setDBType target to specify that the project uses an Oracle database.
 - b. To run against a SQL Server database server, run the installMSSQLJDBC target, then run the env.setDBType target to specify that the project uses a SQL Server database.
5. Enter the database connection information in the ***project_dev.properties*** file. This ensures that the connection information is built into the data sources files and the database-specific data objects are used.
6. Run the merge target: this verifies that the basic build process can run in your environment.
7. Run the createDB and loadDB targets: these create the Knowledgebase schema and load the minimal data into it.
8. Run the distWar target: this creates a new version of the **Sterling.war** file. You should be able to verify that you can deploy this WAR file into your servlet container and that it runs successfully.

If you run into difficulties during one of these steps, troubleshoot the problem before continuing with these examples. See CHAPTER 14, "Software Development Kit" for more information.

Presentation

This section provides a number of examples of changing the look-and-feel of pages. All of the JSP pages are organized by locale. All of the instructions below are relative to a locale directory such as ***debs_home/Sterling/WEB-INF/web/en/US/***. If you want the same change to be effective in more than one locale, then you

must change the relevant files for each locale: resources files of JSP and HTML pages.

Headers and Sidebars

As part of the process of branding the Sterling Multi-Channel Selling Solution, you can customize the customer-facing pages. Most of the reference customer-facing pages use two frames:

- a header frame generated from **home/matrix_header.jsp**
- a data frame generated from data JSP pages such as **orderMgmt/Orders/OrderDisplayData.jsp**

You can customize the header frame to brand these pages simply by modifying the **matrix_header.jsp** file or by substituting a different URL in the src attribute of the frame element of the frameset page such as **fs_home.jsp** or **fs_directHome.jsp**.

Using the SDK

In this example, we will change several of the end-user facing pages. We will replace the Matrix branding of the reference pages with branding for a different company called Anderel. For example, to modify the **matrix_header.jsp** file, perform the following steps:

1. Run the customize target as follows:

```
sdk customize matrix_header.jsp
```

This copies the **matrix_header.jsp** page under the **web/** sub-directory of your project folder.

2. Make your modifications to the JSP page file.

- a. For example, change the color of the banner by changing the line:

```
<table bgcolor="#2f4f88" cellpadding="0" cellspacing="0"
      border="0" height="45" width="100%">
```

to:

```
<table bgcolor="#ee9999" cellpadding="0" cellspacing="0"
      border="0" height="45" width="100%">
```

- b. Change the logo by changing the line:

```
<th></th>
```

to:

```
<th></th>
```

Place a GIF image called **anderel_logo.gif** in the **sdk_home/projects/project/en/US/htdocs/manufacturer/** directory.

3. Run the merge target to copy the modified file over to the **build/** directory:

```
sdk merge
```

Customer-facing pages in the reference implementation use two frames arranged vertically using the rows attribute of the frameset element:

```
<FRAMESET rows="50,*" border="0" framespacing="0" frameborder="NO">
```

By using the cols attribute of the frameset element, you can move the navigation bar to the left or right of the data frame. For example, customize the **fs_HomeLoggedIn.jsp** page by changing the frameset as follows:

```
<FRAMESET cols="62,*" border="0" framespacing="0" frameborder="NO">
  <FRAME name="navigation"
    src="<%=link("","MatrixHeaderDisplay") %>"
    marginwidth="0" marginheight="0" scrolling="no">
  <FRAME name="data"
    src="<%=link("","OrderDataDisplay") %>"
    marginwidth="0" marginheight="0" scrolling="Auto">
</FRAMESET>
```

Home Page Widgets

Users who are not administrators or Customer Service Representatives see all home page widgets, such as the Orders, Quotes, Returns, Tasks, Contracts, and Invoices widgets when they log in to your e-commerce Web site. Enterprise users such as Customer Service Representatives and administrators see only the Tasks widget when they log in. If you want your administrators and Customer Service Representatives to see other widgets, you can make a change to the **WEB-INF/web/en/US/enterpriseMgr/home/HomeData.jsp** page.

Using the SDK

To modify the **HomeData.jsp** page, perform the following steps:

1. Run the customize target as follows:

```
sdk customize WEB-INF/web/en/US/enterpriseMgr/home/HomeData.jsp
```

This copies the **HomeData.jsp** page under the **en/US/enterpriseMgr/home/** sub-directory of your project directory.

2. Modify **HomeData.jsp** as follows:

- a. Search for the string `WidgetFlag`. This takes you to the **JSP** widget code. Note that each widget has a Boolean flag, **`enableNameWidgetFlag`**, that is commented out. For example, the `Orders` widget has the following flag:

```
// enableOrdersWidgetFlag = true;
```

- b. For each widget that you want to enable, uncomment the flag.
 - c. Save your changes.
3. Run the merge target to copy the modified file over to the **`builds/project/`** directory:

```
sdk merge
```

Cascading Style Sheets

Use cascading style sheets wherever possible to manage the look-and-feel of Web pages. They provide a mechanism to ensure that your customer-facing pages have a uniform look-and-feel and changes to the page style need be made in only one place rather than on every page.

If you want to make a change to the style of your customer-facing Web pages, then you can make the change to the **`css/ie_main.css`** and **`css/nn_main.css`** cascading style sheets. For example, changing the `table.standardBackgroundColor`, `tr.standardBackgroundColor`, and `td.standardBackgroundColor` elements to `#f2de14` will change the table displays to a yellow from the current pale blue.

Cascading style sheets are maintained separately in each locale. Thus you can maintain different look-and-feels for different locales, but correspondingly if you want the same style change in every locale, then you must make the change in each locale's cascading style sheets.

Using the SDK

For example, to modify the **`ie_main.css`** file, perform the following steps:

1. Run the customize target as follows:

```
sdk customize ie_main.css
```

This copies the **`ie_main.css`** page under the **`en/US/css/`** sub-directory of your project directory.

2. Make your modifications to the CSS file.
3. Run the merge target to copy the modified file over to the **`builds/project/`** directory:

```
sdk merge
```

Modifying Table Columns

In many parts of the customer-facing pages, the Sterling Multi-Channel Selling Solution displays lists of business objects to users. For example, when a direct commerce customer clicks **My Lists**, the **orderMgmt/oil/workspace/WorkspaceActiveOILData.jsp** page displays a list of their current active inquiry lists in the form of a table. It uses a JSP page fragment, **WorkspaceActiveListsDataTable.jspf**, to display the table.

Each row of such tables comprises table cells of the form:

```
<td class="dataTable" align="center"><%=ph(elementString)%></td>
```

where the `elementString` is calculated from an attribute of each data object.

You can change the order in which the columns of the table are displayed simply by editing the JSP page to change the relative position of the table cells in the row. You can remove a column simply by removing the corresponding cell from the row. You can add columns by adding the new table cell to the table row. Make sure that the data bean includes the information you want to display. If it does not, then you will need to modify the data object definition. (See "Extending and Modifying Existing Data Objects" on page 175.)

Note: Note that whenever you make changes to the cells of a table, then you must modify the header rows too.

For example, suppose that you want to change the table of active product inquiry lists to include the status of each inquiry list. Make the following changes to the **orderMgmt/oil/workspace/WorkspaceActiveListsDataTable.jspf** page:

1. Run the customize target as follows:

```
sdk customize WorkspaceActiveListsDataTable.jspf
```

This copies the **WorkspaceActiveListsDataTable.jspf** page under the **WEB-INF/web/** sub-directory of your project folder.

2. Modify the scriptlet that generates the display strings for each inquiry list by adding the line:

```
String status = acart.getCartStatus();
```

3. Add two cells to the header of the table: one for the text, say "List Status" and one for the spacer element to separate it from the next column:

```
<th class="dataTable" align="center">
<cmgt:text id="*">List Status</cmgt:text>
</th>
<th width="-1%"><img src="../images/spacer.gif" width="1"
```



```
height="1" border="0"></th>
```

Note the use of the text tag: this ensures that the table header text can be localized through the use of resource bundles. See CHAPTER 32, "Internationalization" for more information on localizing JSP pages.

4. In the corresponding location in the body row of the table, add two cells:

```
<td class="dataTable" align="center"><%=ph(status)%></td>  
<td width="-1%"></td>
```

5. Run the merge target to copy the modified file over to the **build/** directory:

```
sdk merge
```

Notes

Note that JSP fragments (denoted by ***.jspxf** files) are often used as included fragments of other JSP pages: for example:

```
<%@ include file="../../WorkspaceActiveListsDataTable.jsxpf"%>
```

These fragments may not get automatically re-compiled when the Web application is re-deployed. Take care to check that the pages are re-compiled by the servlet container or force their re-compilation by deleting the compiled classes from the servlet container's working directory.

Note the use of the method *ph(status)* to wrap the displayed text: this is a protection from cross-site scripting attacks. It ensures that any HTML tags in the displayed string are displayed as text rather than interpreted as tags. See "Scriptlets" on page 243 for more information.

Adding a Shortcut Link

Description

In this example, we add a link to the Enterprise Home page that takes an enterprise user directly to their user profile. Do the following:

1. Create a link on the existing Enterprise Home page.
2. Specify a controller to process the request.

We make use of the fact that an appropriate controller already exists. This is not always possible and in the following examples we have to modify existing controllers and write a new Controller class. Similarly, we do not have to create a new JSP page: the UserDetail JSP page already exists: we ensure that the right user bean is passed to the page for display.

Enterprise Home Page

The current Enterprise Home page uses two subsidiary JSP pages to generate the two frame page. The navigation frame is generated using the **enterpriseMgr/home/HomeNav.jsp** page and we shall leave this frame unchanged. The data frame is generated using the **enterpriseMgr/home/HomeData.jsp** page and we will add a link to this page as follows:

1. Run the customize target as follows:

```
sdk customize HomeData.jsp
```

This copies the **HomeData.jspp** page under the **WEB-INF/web/** sub-directory of your project folder.

2. Edit the **HomeData.jsp** by inserting the following:

```
<%
String userKey = user.toString();
String groupKey = user.getGroupKey().toString();
String parameterString = "UserKey=" + userKey + "&GroupKey=" +
    groupKey + "&Command=update";
%>
<TD>
<A TARGET="_top"
    HREF='<%= link("enterpriseMgr","SysUserDetailDisplay",
        parameterString)%>'>
    <cmgt:text id="*">My User Profile</cmgt:text>
</A>
</TD>
```

Note that the User object present in the session is used to retrieve the user key and group key information so that they may be passed as parameters. The *link()* method is used to generate the URL in the correct form. See "Scriptlets" on page 243 for more information about the use of this method.

3. Run the merge target to copy the modified file over to the **build/** directory:

```
sdk merge
```

When a user clicks this link, this is how the Sterling Multi-Channel Selling Solution processes the request:

1. The request is received by the DispatchServlet. It creates a ComerгентRequest object and instantiates a controller by calling *createController(comerгентRequest)*.
2. The createController method retrieves the message type from the request and calls the GeneralObjectFactory to create a controller. In turn, the GeneralObjectFactory uses the **MessageTypes.xml** file to see what controller

class should be created for the command (cmd) “SysUserDetailDisplay”. The message type entry for this message type is:

```
<MessageType Name="SysUserDetailDisplay">
  <JSPMapping>
    ../profileMgr/userContact/SysUserDetailFrame.jsp
  </JSPMapping>
  <ControllerMapping>
    com.comergent.dcm.caf.controller.ForwardController
  </ControllerMapping>
</MessageType>
```

Consequently, the GeneralObjectFactory creates an instance of the ForwardController class.

3. Next, the DispatchServlet initializes the controller and then calls its *execute()* method.

The ForwardController is a very lightweight controller. Its *execute()* method simply calls *callJSP()*. This method retrieves the message type from the request and calls *callJSP(String messageType)*. In turn, this method retrieves the appropriate JSP page from the message type:

```
../profileMgr/userContact/SysUserDetailFrame.jsp
```

Then it creates a Dispatcher using this JSP page and forwards the request.

4. The JSP page, **SysUserDetailFrame.jsp**, is made up of several frames. The source for each is generated from a dynamically generated URL. For example the URL to generate the data frame is generated from:

```
<%= link("partnerMkt", "SysUserDetailData") %>
```

Each of the frame requests is processed along the same lines: the cmd parameter is evaluated and the appropriate business logic class (BLC), controller, and JSP page are used to generate its content.

In this example, the SysUserDetailData message type, has a mapping to the com.comergent.apps.profileMgr.userMgr.controller.-UserContactGetController controller. This controller is invoked in order to populate the request with the GroupBean, PartnerBean, and UserContactBean used in the JSP page to which SysUserDetailData maps: **../profileMgr/userContact/UnifiedSysUserInfoData.jsp**.

Extending and Modifying Existing Data Objects

In many implementations of the Sterling Multi-Channel Selling Solution, you have to make changes to the functionality of the system. In particular, you may find that

you must either extend the functionality of an existing data object or modify its structure. You may need to add or modify an attribute, or store different information with the data object.

For example, an implementation may require that products have an additional attribute such as the associated product manager or that users provide not only their username and password when they log in, but also another piece of data such as the name of their company.

Note that there are essentially two different ways in which you can modify a data object.

- For business objects whose corresponding data object's Version attribute is 5.0 or higher, you can also define a new data object that *extends* the current data object. See the *Sterling Multi-Channel Selling Solution Reference Guide* for more details about extending data objects.
- For business objects whose data object's Version attribute is 4.1 or lower, you can only modify them by modifying the data object element that corresponds to the business object.

In general, you should extend existing data objects rather than modify them: this will ease the process of upgrading the Sterling Multi-Channel Selling Solution from one release to another.

Using the custom Schema Directory

You can manage your customizations to the schema using a special sub-directory of the schema directory as follows:

1. In your project templates directory, make sure that the **DataServices.xml** file declares the **schemaRepositoryExtn** element:

```
<schemaRepositoryExtn controlType="text" runtimeDisplayed="true"
ChangeOnlyAtBootTime="true" visible="true" boxsize="45"
displayQuestion="Schema Repository Directory Location"
defaultChoice="WEB-INF/schema" help="Enter the path of the XML
schema Repository.">WEB-INF/schema/custom</schemaRepositoryExtn>
```

2. Check that your project has a directory called: ***sdk_home/projects/project/WEB-INF/schema/custom/***. It should contain empty copies of the standard **DsBusinessObjects.xml**, **DsDataElements.xml**, and **DsRecipes.xml** files.
3. As you create new data objects or extend existing ones, make sure that the new data object XML files are placed in the **custom/** sub-directory. Update the **DsBusinessObjects.xml**, **DsDataElements.xml**, and **DsRecipes.xml** files in

this directory to add new business objects, data objects, and data elements as you create them.

4. When you build your project by running the merge target, the new data objects are merged in from this sub-directory and beans are generated for each of the new data objects.

Extending a Data Object

This example shows how to extend a data object of the reference implementation to add functionality. We will add a field to the Product data object that can be used to associate a user with the product. For example, this field might be used to associate a product manager with each product.

1. Locate the main schema files under the project directory: they are in the ***sdk_home/projects/project/WEB-INF/schema/*** sub-directory.
2. Create a new business object declaration in the **DsBusinessObjects.xml** file:

```
<BusinessObject Name="MatrixProduct" Version="5.0"
  Description="Matrix product business object"/>
```

3. Create a new recipe in the **DsRecipes.xml** file:

```
<Recipe Name="MatrixProduct" Version="6.0"
  BusinessObject="MatrixProduct"
  Description="Product object for Matrix implementation">
  <DataObjectList>
    <DataObject Name="MatrixProduct" Access="RWID"
      DataSourceName="ENTERPRISE"/>
  </DataObjectList>
</Recipe>
```

4. Create new data elements for MatrixProduct and MatrixProductList in the **DsDataElements.xml** file:

```
<DataElement Name="MatrixProduct"
  Description="Product for Matrix implementation"
  DataType="HEADER"/>
<DataElement Name="MatrixProductList"
  Description="Product list for Matrix implementation"
  DataType="LIST"/>
```

5. Define the new MatrixProduct data object. Create a new file, **MatrixProduct.xml** in the schema directory. The file specifies the data object as follows:

```
<?xml version="1.0"?>
<DataObject Name="MatrixProduct" Extends="Product"
  ExternalName="CMGT_PRODUCT"
```

```
Access="RWID" Ordinality="n"
ObjectType="JDBC" Localized="y"
Version="6.0">
<DataField Name="EnterpriseUser"
  Description="Enterprise user acting as product manager
    for product"
  Writable="y" Mandatory="n"
  ExternalFieldName="ENTERPRISE_USER" />
</DataObject>
```

Notice that that this data object will use the underlying table CMGT_PRODUCT. It extends the Product data object by adding one data field.

6. Create a new data element for EnterpriseUser in the **DsDataElements.xml** file:

```
<DataElement Name="EnterpriseUser" Description="Enterprise user"
  DataType="LONG" MaxLength="20"/>
```

7. Add a column to the CMGT_PRODUCT table:

```
ALTER TABLE CMGT_PRODUCT ADD (ENTERPRISE_USER NUMBER(20))
```

Note: this is the Oracle syntax: it is different for other database servers. If you have existing users in the CMGT_PRODUCT table, then you may manually update their rows to add a non-null value to this column. If you are altering the table before populating the Knowledgebase, then you must modify the **ProductList** XML file by adding the EnterpriseUser element to each Product element before you load the data.

8. Regenerate the DTDs and regenerate the data bean classes and interfaces. You can use the SDK targets provided as part of the Software Development Kit. From the command line, run the SDK script specifying the merge target to generate automatically the new Bean classes as follows.

```
sdk merge
```

This copies over the new schema files to the builds directory and generates the corresponding databean classes and interfaces. See CHAPTER 14, "Software Development Kit" for more details.

9. Modify the **ObjectMap.xml** file so that whenever a product is instantiated using the ObjectManager, then the MatrixProductBean class is used:

```
<Object ID="com.comergent.bean.simple.ProductBean">
  <ClassName>com.comergent.bean.simple.MatrixProductBean
</ClassName>
```

10. Run the merge target to copy the modified files over to the *sdk_home/builds/project/* directory:

```
sdk merge
```

If you now deploy the modified Sterling Multi-Channel Selling Solution, then the system should run as before. No business logic has been changed, but every time a product is accessed the actual class instantiated is now the *MatrixProductBean*.

Note: In this example, note that the product export and import functionality needs to be customized in order to include the new field. You must modify the *ImportHandler* and *ExportHandler* classes to do this.

To use the extended data object, you must determine how a product manager enterprise user can be associated with a product using the Sterling Multi-Channel Selling Solution administrative interface and how this information might be used by applications. For example, when an enterprise administrator creates a new product, you can provide a drop-down list of enterprise users so that one can be selected as the responsible product manager for the product.

- When you are creating or modifying an instance of the extended data object, then you must be able to set a value for this new field. Typically, the object is wrapped in an application bean (see "Application, Entity, and Presentation Beans" on page 71). To set the value, you must modify the controller managing the class so that the field can be accessed along these lines. For example, in the *ProdMgrProdGenController* class, the application bean is an instance of an object implementing the *IBizProduct* interface. This interface provides access to the data bean through its *getIaccProduct()* method. The *IBizProduct* object is referred to as *pb*, and so you can add:

```
String enterpriseUser = request.getParameter("EnterpriseUser");
MatrixProductBean mpb =
    (MatrixProductBean) pb.getIaccProduct();
mpb.setEnterpriseUser(enterpriseUser);
```

- On pages that you want to display the new field, you may find that a presentation bean is being used to provide the data. For example, on the **ProdMgrProdGen.jsp** page, product detail data is displayed using an object that implements the *IPresProduct* interface. This object is referred to as *pb* and is retrieved from the request passed to the JSP page. You can display the new field with code along these lines:

```
ph(((MatrixProductBean) pb.getIRdProduct()).getEnterpriseUser());
```

Similarly, you can customize business logic and JSP pages so that as end users browse products, they have the opportunity to contact the relevant product manager to request more information. For example, you could add a button next to each product in the product catalog, that would initiate an email enquiry directly to the product manager.

Modifying a Data Object

In this example, we add a field to the User data object to ensure that each user identifies the partner organization to which they belong when they log in. This is a mandatory field that must be entered when the user is created and it must be supplied by the user when they enter their login details.

Note that from the viewpoint of upgrading this implementation of the Sterling Multi-Channel Selling Solution, these changes will cause problems in that any changes to the User and UserContact data object made in the next release of the Sterling Multi-Channel Selling Solution will have to be manually introduced into this implementation.

1. Locate the main schema files under the project directory: they are in the ***sdk_home/projects/project/WEB-INF/schema/*** sub-directory.

2. Add a DataField element to the UserContact data object:

```
<DataField Name="Organization" Writable="y" Mandatory="y"
  ExternalFieldName="ORGANIZATION"/>
```

3. Add a DataField element to the User data object:

```
<DataField Name="Organization" Writable="y" Mandatory="y"
  ExternalFieldName="ORGANIZATION"/>
```

4. Add a DataElement for Organization to the **DsDataElements.xml** file:

```
<DataElement Name="Organization" Description="Organization name"
  DataType="STRING" MaxLength="16" />
```

5. Add a column to the CMGT_USER_CONTACTS table:

```
ALTER TABLE CMGT_USER_CONTACTS ADD (ORGANIZATION VARCHAR2(16))
```

Note: this is the Oracle syntax: it is different for other database servers. If you have existing users in the CMGT_USER_CONTACTS table, then you must manually update their rows to add a non-null value to this column. If you are altering the table before populating the Knowledgebase, then you must modify the **UserContact** XML file by adding the Organization element to each UserContact element before you load the data.

6. Regenerate the DTDs using the merge target.

7. Modify the login pages so that there is an additional textfield in which users can enter their organization when they login:

```
<INPUT TYPE="text" NAME="organization" SIZE="16" MAXLENGTH="16">
```

For example, the enterprise use login page is **enterpriseMgr/Login/FullPageLogin.jsp**.

8. Modify the user detail pages used to display user details and used when creating new users. Add an extra mandatory textfield as follows so that is displayed when viewing user details. The field label ("Organization") is wrapped in the text tag for localization.

```
<tr valign=top>
  <td class="Attribute"><cmgt:text id="*">
    Organization
  </cmgt:text></td>
  <td class="Attribute">
    <%if (isWritable){ %>
    <INPUT NAME="Organization" TYPE="Text"
      VALUE="<%=ph(replaceAllWithEmpty(userContact.-
        getOrganization()))%>"
      SIZE="16" MAXLENGTH="16">
    <%}%>
  </td>
</tr>
```

Optionally, you can add to the *checkInput()* Javascript function to verify that an organization has been provided when a user is being created:

```
if (f.Organization.value == "")
{
  alert("<cmgt:text id="*">Please provide organization for this
user.</cmgt:text>")
  return false;
}
```

9. Modify the login authentication logic to add the organization information when the user is authenticated. This requires changes to classes as follows:
 - a. Modify the com.comergent.dcm.authentication.User class to add methods *setOrganization()* and *getOrganization()* that manage the Organization element of the user business object. Create a new form of the *getInstance()* method which takes three String parameters:

```
static public User getInstance(String user, String password,
String organization) throws ICCEException,
InvalidBizobjException
{
  DataManager dm = DataManager.getDataManager();
  BusinessObject userBizobj = dm.getBusinessObject("User");
```

```
DsElement root = userBizobj.expand();
root.expand(userBizobj);
DsElement el = root.getByName("UserLogin");
el.setStringValue(user);
el = root.getByName("UserAuthenticator");
el.setStringValue(password);
el = root.getByName("Organization");
el.setStringValue(organization);
return new User(userBizobj);
}
```

- b. Extend the `com.comergent.dcm.authentication.UserPasswordCredentials` class by creating a `MatrixCredentials` class that has an additional member variable, `m_organization`, and a constructor `MatrixCredentials(String username, String password, String organization)`. Its `verify()` method uses the `User.getInstance(String username, String password, String organization)` method to restore the user business object.
 - c. Extend the `com.comergent.dcm.authentication.LoginController` class by creating a `MatrixLoginController` class. In this class, overwrite the `getCredentials()` method by adding code to retrieve the organization parameter from the request object and return a `MatrixCredentials` object.
10. In the **MessageTypes.xml** files, replace entries of the form:

```
<ControllerMapping>LoginController</ControllerMapping>
```

with:

```
<ControllerMapping>MatrixLoginController</ControllerMapping>
```

11. Run the merge target to copy the modified files over to the *sdk_home/builds/project/* directory:

```
sdk merge
```

Adding Functionality

This example shows how to add functionality to the Sterling Multi-Channel Selling Solution application. We will add the ability to create product warranties.

The general customization steps are:

1. Modify the Database Schema: create the table to contain the information for the new functionality.
2. Create the Data Bean and Supporting Files: create an XML data object for the new functionality and add information to the supporting files:

- DsDataElements.xml
 - DsBusinessObjects.xml
 - DsRecipes.xml
 - The database key generators XML file
3. Create the JSP Pages and Controllers: add a widget for the new functionality to the CatalogMgmtTasksWidgetData.jsp, and create new JSP pages as needed to support the new functionality. Create the controllers that provide the new functionality and implement the interface.
 4. Add Entitlements, Message Types, and Object Mapping: add entitlements to the appropriate roles to allow using the new functionality and create the message types and object mapping required to enable the functionality.
 5. Build and deploy the Sterling Multi-Channel Selling Solution application.
 6. Test the Functionality: navigate to the Sterling Multi-Channel Selling Solution home page and use the new functionality.

As you work through this example, remember the following:

- Work in your sdk project.
- To modify an existing file, enter:

```
sdk customize file_name
```

You then edit the file in the location specified in the instruction.
- If you cut and paste code from this example into your project files, ensure that there are no special characters or extra lines that could cause problems as you build your project.

Modify the Database Schema

Create a new table to contain warranty information.

1. Create a new database table, CMGT_WARRANTY.

You add SQL to already-existing schema files as follows:

- For SQL Server, edit the ***sdk_home/projects/project/WEB-INF/sql/MsSql/setup/mssql_schema_custom.sql*** file and add the following SQL:

```
create table CMGT_WARRANTY(  
  WARRANTY_KEY numeric(20) NOT NULL,  
  SKU_NAME nvarchar(120) NOT NULL,  
  WARRANTY_TERMS nvarchar(240),
```

```
SUPPLIERS nvarchar(120),
WARRANTY_STATE nvarchar(300),
WARRANTY_PURCHASE_DATE datetime,
WARRANTY_EXPIRE_DATE datetime,
UPDATE_DATE datetime,
UPDATED_BY numeric(20) NOT NULL,
CREATION_DATE datetime default current_timestamp,
CREATED_BY numeric(20) NOT NULL,
OWNED_BY numeric(20) NOT NULL,
ACCESS_KEY numeric(20),
ACTIVE_FLAG nvarchar(1) default 'Y',
PRIMARY KEY (WARRANTY_KEY));
```

- For Oracle, edit the *sdk_home/projects/project/WEB-INF/sql/Oracle/setup/oracle_tables_custom.sql* file and add the following SQL:

```
create table CMGT_WARRANTY(
WARRANTY_KEY number(20) NOT NULL,
SKU_NAME varchar2(120) NOT NULL,
WARRANTY_TERMS varchar2(240),
SUPPLIERS nvarchar(120),
WARRANTY_STATE nvarchar(300),
WARRANTY_PURCHASE_DATE date,
WARRANTY_EXPIRE_DATE date,
UPDATE_DATE date,
UPDATED_BY number(20) NOT NULL,
CREATION_DATE date default SYSDATE,
CREATED_BY number(20) NOT NULL,
OWNED_BY number(20) NOT NULL,
ACCESS_KEY number(20),
ACTIVE_FLAG varchar2(1) default 'Y',
PRIMARY KEY (WARRANTY_KEY));
```

2. In a command window, navigate to your *sdk_home* directory and enter:

```
sdk createCustomDB
```

This creates the CMGT_WARRANTY table in the knowledgebase.

Create the Data Bean and Supporting Files

1. Create a new file, *sdk_home/projects/project/WEB-INF/schema/custom/Warranty.xml*, and enter the following code:

```
<?xml version="1.0"?>
<DataObject Name="Warranty" Extends="C3PrimaryRW"
ExternalName="CMGT_WARRANTY" Access="RWID" ObjectType="JDBC"
Version="6.0">

<KeyFields>
```

```
<KeyField Name="WarrantyKey" ExternalName="WARRANTY_KEY"
KeyGenerator="WarrantyKey"/>
</KeyFields>

<DataFieldList>
  <DataField Name="WarrantyKey" Writable="y" Mandatory="y"
    ExternalFieldName="WARRANTY_KEY"/>
  <DataField Name="ProductID" Writable="y" Mandatory="y"
    ExternalFieldName="SKU_NAME"/>
  <DataField Name="WarrantyTerms" Writable="y" Mandatory="y"
    ExternalFieldName="WARRANTY_TERMS"/>
  <DataField ExternalFieldName="WARRANTY_PURCHASE_DATE"
    Mandatory="y" Name="WarrantyStart" Writable="y"/>
  <DataField ExternalFieldName="WARRANTY_EXPIRE_DATE" Mandatory="y"
    Name="WarrantyExpire" Writable="y"/>
  <DataField ExternalFieldName="SUPPLIERS" Mandatory="y"
    Name="WarrantySuppliers" Writable="y"/>
  <DataField ExternalFieldName="WARRANTY_STATE" Mandatory="y"
    Name="WarrantyState" Writable="y"/>
</DataFieldList>

</DataObject>
```

2. Edit the already-existing file *sdk_home/projects/project/WEB-INF/schema/custom/DsDataElements.xml* and add the following elements:

```
<DataElement Name="WarrantyKey" DataType="LONG"
  Description="Warranty Key" MaxLength="20" />
<DataElement Name="Warranty" DataType="HEADER" Description="Access"
  MaxLength="20" />
<DataElement Name="WarrantyTerms" DataType="STRING"
  Description="WarrantyTerms" MaxLength="300"/>
<DataElement Name="WarrantyStart" DataType="DATE"
  Description="Warranty Start Date" MaxLength="20"/>
<DataElement Name="WarrantyExpire" DataType="DATE"
  Description="Warranty Expire Date" MaxLength="20"/>
<DataElement Name="WarrantyList" DataType="LIST"
  Description="WarrantyList" />
<DataElement Name="WarrantySuppliers" DataType="STRING"
  Description="WarrantySuppliers" MaxLength="200"/>
<DataElement Name="WarrantyState" DataType="STRING"
  Description="WarrantyState" MaxLength="300"/>
```

3. Edit the already-existing file *sdk_home/projects/project/WEB-INF/schema/custom/DsBusinessObjects.xml* and add the following elements:

```
<BusinessObject Name="Warranty" Version="6.0"
  Description="Warranty for Product"/>
```

4. Edit the already-existing file *sdk_home/projects/project/WEB-INF/schema/custom/DsRecipes.xml* and add the following elements:

```
<Recipe Name="Warranty" Version="6.0" BusinessObject="Warranty"
  Description="Warranty Recipe">
  <DataObjectList>
    <DataObject Name="Warranty" Access="RWID" Ordinality="n"
      DataSourceName="ENTERPRISE"/>
  </DataObjectList>
</Recipe>
```

5. Modify the database key generators file.

- For SQL Server, create the file *sdk_home/projects/project/WEB-INF/schema/MSSQLJDBCKeyGenerators.xml* and enter the following:

```
<?xml version="1.0"?>
<Schema Name="warranties" Version="6.0" Description="warranties
Schema">
<KeyGenerator Name="WarrantyKey" GeneratorType="MAX_VALUE"/>
</Schema>
```

- For Oracle, perform the following tasks:

- a. Edit the already-existing file, *sdk_home/projects/project/WEB-INF/sql/Oracle/setup/oracle_sequence_procedures_custom.sql*, and enter the following code:

```
CREATE OR REPLACE PROCEDURE WARRANTYKEY(P_KEY OUT NUMBER)
AS
BEGIN
  SELECT WARRANTYKEY_SEQ.NEXTVAL
  INTO P_KEY
  FROM DUAL;
END WARRANTYKEY;

/
```

- b. Edit the existing file, *sdk_home/projects/project/WEB-INF/sql/Oracle/setup/oracle_sequences_custom.sql*, and enter the following code:

```
PROMPT 'ABOUT TO CREATE SEQUENCES'

DECLARE
TREF VARCHAR2(1);
BEGIN
SELECT 'X' INTO TREF FROM USER_SEQUENCES WHERE SEQUENCE_NAME =
'WARRANTYKEY_SEQ';
IF TREF = 'X' THEN
```

```
EXECUTE IMMEDIATE 'DROP SEQUENCE WARRANTYKEY_SEQ';
END IF;
EXCEPTION
  WHEN NO_DATA_FOUND THEN
    DBMS_OUTPUT.PUT_LINE(' ');
END;
/

CREATE SEQUENCE WARRANTYKEY_SEQ START WITH 600005
/
```

- c. Edit *sdk_home/projects/project/WEB-INF/schema/custom/OracleKeyGenerators.xml*, and add the following element:

```
<KeyGenerator Name="WarrantyKey" KeyProcedureName="WARRANTYKEY"
GeneratorType="PROCEDURE"/>
```

Create the JSP Pages and Controllers

This section shows how to modify an existing JSP page and write new JSP pages and controllers that retrieve and display product warranty information.

You work with the following JSP pages:

- **CatalogMgmtTasksWidgetData.jsp:** You modify this JSP page, adding a link called "Product Warranties" that calls the **ProductWarrantyList.jsp**.
- **ProductWarrantyList.jsp:** You create this JSP page, which displays a list of all product warranties. You pass a bean to the page that contains a list of all of the warranties. You use a list data object to do this. the list data bean automatically generated from the Warranty data object definition (its Ordinality attribute is set to "n" in its Recipe element). This file calls **ProductWarrantyListHeader.jsp** to allow the user to add additional warranties using the controller **WarrantyLinkController.java**.
- **ProductWarrantyListHeader.jsp:** You create this JSP page to provide the required fields for creating a new product warranty. Once the new warranty entry is saved, it calls **ProductWarrantyList.jsp** using the controller **CreateWarrantyController.java**.

You use a bizAPI interface, **IWarrantyList**, to retrieve the list of warranties for the specified product. You use the OMWrapper class to instantiate an instance of the class that implements the interface.

Modify and Create Product Warranty JSP Pages

1. Create the execute() method of the Controller class **IWarrantyList.java**. This method forwards requests to **ProductWarrantyListHeader.jsp**.

Create the file **sdk_home/projects/project/src/com/comergent/api/apps/warranty/IWarrantyList.java**. You may have to create the directory hierarchy. Enter the following code:

```
package com.comergent.api.apps.warranty;
import com.comergent.bean.simple.IRdWarrantyList;

import java.util.List;

public interface IWarrantyList {
    public abstract void setSKU(String sku);
    public abstract String getSKU();
    public abstract IRdWarrantyList getDataBean();
    public abstract IRdWarrantyList getWarrantyList(String sku);
}
```

2. Create the execute() method of the Controller class **WarrantyList.java**. This method forwards requests to **ProductWarrantyList.jsp**.

Create the file **sdk_home/projects/project/src/com/comergent/apps/warranty/bizAPI/WarrantyList.java**. You may have to create the directory hierarchy. Enter the following code:

```
package com.comergent.apps.warranty.bizAPI;

import com.comergent.api.apps.warranty.IWarrantyList;
import com.comergent.bean.simple.*;
import com.comergent.dcm.core.Global;
import com.comergent.api.dataservices.*;
import com.comergent.api.objmgr.OMWrapper;
import com.comergent.bean.simple.WarrantyBean;
import com.comergent.bean.simple.IRdWarranty;
import com.comergent.bean.simple.IRdWarrantyList;

public class WarrantyList implements IWarrantyList{

    protected IDataWarrantyList clb;
    protected String sku;

    private static final org.apache.log4j.Logger log =
    org.apache.log4j.Logger.getLogger(WarrantyList.class);

    public WarrantyList()
    {
```



```
        clb = null;
    }

    public IRdWarrantyList getWarrantyList(String sku)
    {
        try
        {
            this.sku = sku;
            clb = (com.comergent.bean.simple.IDataWarrantyList)OMWrap-
per.getObject(com.comergent.bean.simple.IDataWarrantyList.class);
            IDsQuery temp_IDsQuery = QueryHelper.newWhereClause("Pro-
ductID", DsQueryOperators.EQUALS_IGNORE_CASE, sku);
            clb.restore(new DataContext(), temp_IDsQuery);
        }
        catch(Exception e)
        {
            //Global.logInfo(e.toString());
        }
        return (IRdWarrantyList) clb;
    }
    public String getSKU()
    {
        return sku;
    }
    public void setSKU(String sku)
    {
        this.sku = sku;
    }
    public IRdWarrantyList getDataBean()
    {
        return (IRdWarrantyList) clb;
    }
}
```

3. Modify ***sdk_home/projects/project/WEB-INF/web/en/US/enterpriseMgr/widget/CatalogMgmtTasksWidgetData.jsp***. Navigate to your ***sdk_home*** directory and enter:

```
sdk customize CatalogMgmtTasksWidgetData.jsp
```

Edit *CatalogMgmtTasksWidgetData.jsp*: add a link for "Product Warranties" after the link for Product Entitlement as follows:

```
<li>
  <a href="<cmgt:link app="" cmd="ProductWarrantyList"/>">
<cmgt:text id='cmgt_enterpriseMgr/widget/
CatalogMgmtTasksWidgetData_17'
bundle='enterpriseMgr.widget.CatalogMgmtTasksWidgetDataRe-
sources'>Product Warranties</cmgt:text></a>
</li>
```

4. Create ***sdk_home/projects/project/WEB-INF/web/en/US/productWarranty/ProductWarrantyList.jsp***. You must create the **productWarranty** directory. Enter the following code in **ProductWarrantyList.jsp**:

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<%@ page contentType="text/html; charset=UTF-8"
    language="java" errorPage="../error.jsp" %>
<%@ include file="../common/cmgtinclude.jspf"%>
<%@ page import="java.util.List" %>
<%@ page import="java.util.HashMap" %>
<%@ page import="java.util.Iterator" %>
<%@ page import="com.comergent.api.appservices.productService.IBiz-
Product" %>
<%@ page import="com.comergent.api.appservices.productService.IPres-
Product" %>
<%@ page import="com.comergent.bean.simple.*" %>
<%@ page import="com.comergent.api.apps.appUtils.FormattingUtils"%>
<%@ page import="com.comergent.api.apps.appUtils.*" %>
<%@ page import="com.comergent.api.apps.appUtils.util.*" %>
<%

    com.comergent.bean.simple.IRdWarrantyList warrantyListBean =
    (com.comergent.bean.simple.IRdWarrantyList) request.getAt-
tribute("warranty");
%>

<html>
</head>
    <%@ include file="../common/pickStyleSheet.jspf"%>
    <script>
        function createWarranty(){
            document.WarrantyListForm.submit();
        }
    </script>
</head>
<body>
<%
    IPresProduct pb = (IPresProduct) request.getAttribute("product");
%>
<cic:banner renderHeader="true" renderHelp="true" helpTopic="Pric-
ingList">
    <cic:span css="banner float-left" value="Warranty List"/>
    <cic:outputLink href='<%=link("*, "PricingAdminPriceList-
HeaderListBody")%>' css="edit right">
        <cic:span value="<%=localized['Goto']%>"/>
    </cic:outputLink>
</cic:banner>
```

```
<form method="POST" name="WarrantyListForm" action="<%= link("enterpriseMgr", "WarrantyHeaderLink", "productID=" + pb.getProductID()) %>">
<div class="box large no-border">
    <cic:span css="error" value="{warningMessage}"/>
    <cic:span css="instruction" value="All Warranties
shown. "/>
</div>

    <div class="box large no-border display:inline">
        <cic:outputLink css="focus-button focus-button-large
left" href="javascript: createWarranty()"><cic:span value="NewWar-
ranty"/></cic:outputLink>
        <div style="clear:both;"></div>

    </div>

</form>
<%
    ListIterator iter = warrantyListBean.getWarrantyIterator();
    request.setAttribute("warrantyList", iter);
%>
<cic:table datasourceRef="{warrantyList}" var="warranty" showSe-
lect="false" sortAscending="true" labelrowcss="label" rowcss="nor-
mal,alternate" >
    <cic:column width="10%" css="left">
        <cic:columnHeader><cic:span value="Warranty ID"/></cic:column-
Header>
        <cic:span value="{warranty.warrantyKey}"/>
    </cic:column>
    <cic:column width="10%" css="left">
        <cic:columnHeader><cic:span value="ProductId"/></cic:column-
Header>
        <cic:span value="{warranty.productID}"/>
    </cic:column>
    <cic:column width="50%" css="left">
        <cic:columnHeader><cic:span value="Warranty Terms"/></cic:col-
umnHeader>
        <cic:span value="{warranty.warrantyTerms}"/>
    </cic:column>

    <cic:column width="20%" css="left">
        <cic:columnHeader><cic:span value="Suppliers Covered"/>
        </cic:columnHeader>
        <cic:span value="{warranty.warrantySuppliers}"/>
    </cic:column>

    <cic:column width="15%" css="left">
```

```
<cic:columnHeader><cic:span value="Start Date"/></cic:column-Header>
<cic:span value="\${cic:formatDate(warranty.warrantyStart, '
')}}"/>

</cic:column>
<cic:column width="15%" css="left">
<cic:columnHeader><cic:span value="End Date"/></cic:column-Header>
<cic:span value="\${cic:formatDate(warranty.warrantyExpire, '
')}}"/>
</cic:column>
</cic:table>

</body>
</html>
```

5. Create *sdk_home/projects/project/WEB-INF/web/en/US/productWarranty/ProductWarrantyListHeader.jsp*. Enter the following code:

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<%@ page contentType="text/html; charset=UTF-8"
    language="java" errorPage="../error.jsp" %>
<%@ include file="../../common/cmgtinclud.jspf"%>
<%@ page import = "java.text.DateFormatSymbols"%>
<%@ page import="java.util.List" %>
<%@ page import="java.util.HashMap" %>
<%@ page import="java.util.Iterator" %>
<%@ page import="java.sql.Timestamp" %>
<%@ page import="java.util.Date" %>
<%@ page import = "java.util.*"%>
<%@ page import="com.comergent.api.appservices.productService.IBiz-Product" %>
<%@ page import="com.comergent.api.appservices.productService.IPres-Product" %>
<%@ page import="com.comergent.bean.simple.*" %>
<%@ page import = "com.comergent.api.apps.appUtils.util.AppsLook-
upHelper"%>
<%@ page import = "com.comergent.api.apps.appUtils.util.LookupRe-
sult"%>
<%@ page import = "com.comergent.api.apps.appUtils.FormattingUtils"%>
<%@ page import = "com.comergent.dcm.authentication.User"%>
<%@ page import = "com.comergent.api.objmgr.OMWrapper"%>

<%
String datePattern = ComergentI18N.getFourDigitYearLocaleDatePat-
```

```
tern();
int StartYear = -1;
int StartMonth = -1;
int StartDate = -1;
int StartHour = -1;
int EndYear = -1;
int EndMonth = -1;
int EndDate = -1;
int EndHour = -1;
java.util.Date startDate = null;
java.util.Date endDate = null;

ArrayList times = new ArrayList();

for (int i = 0; i < 24; i++)
    times.add(new Integer(i));

request.setAttribute("times", times);
request.setAttribute("datePattern", datePattern);
%>
<html>
<head>
    <%@ include file="../common/pickStyleSheet.jspf"%>
    <script type="text/javascript" language="JavaScript" src="../
js/genericUtil.js"></script>
    <script type="text/javascript" language="JavaScript" src="../
js/com_Main.js"></script>
    <script type="text/javascript" language="JavaScript" src="../
js/CalendarPopup.js"></script>
    <script type="text/javascript" language="JavaScript" src="../
js/date.js"></script>
    <script type="text/javascript" language="JavaScript" src="../
js/PopupWindow.js"></script>
    <script>

// DEFAULT LOCALE (English)
var MONTH_NAMES = new Array('January', 'Febru-
ary', 'March', 'April', 'May', 'June', 'July', 'August', 'September', 'Octobe
r', 'November', 'Decem-
ber', 'Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug', 'Sep', 'Oct', 'Nov
', 'Dec');
var DAYOFWEEK_HEADER_NAMES = new
Array("Su", "Mo", "Tu", "We", "Th", "Fr", "Sa");
var WEEK_START_DAY = 0;

// Create CalendarPopup object
var popupCal = new CalendarPopup();
function checkEmptiness(input)
{
```

```
        if (input == null || input.length == 0)
            return true;
        else
        {
            for (var i = 0; i < input.length; i++)
            {
                if (" "!=input.charAt(i))
                    return false;
            }
        }
        return true;
    }
</script>

<STYLE>
    #textSpan { position: relative; visibility:hidden; display:none;}
</STYLE>

</head>
<body>
<cic:banner renderHeader="true" renderHelp="true" helpTopic="PricingList">
    <cic:span css="banner float-left" value="Create Warranty"/>
    <cic:outputLink href='<%=link("PricingAdminPriceList-HeaderListBody")%>' css="edit right">
        <cic:span value="{localized['Goto']}" />
    </cic:outputLink>
</cic:banner>

<form name="WarrantyHeaderForm" method="POST" action="<%=link("enterpriseMgr", "WarrantyListHeader") %>">
    <div class="box large no-border">
        <cic:span css="error" value="{warningMessage}" />
        <cic:span css="instruction" value="Enter data and click on Create button to create Warranty. " />
    </div>

    <div class="box large no-border display:inline">
        <cic:outputLink css="normal-button normal-button-small right" href='<%=link("enterpriseMgr", "ProductWarrantyList")%>'><cic:span value="Cancel"/></cic:outputLink>
        <cic:outputLink css="focus-button focus-button-small right" href="javascript: createWarranty()"><cic:span value="Create"/></cic:outputLink>
        <div style="clear:both;"></div>
    </div>
</div>
```

```
<div class="box large no-border">
    <BR>
    <cic:span css="instruction right" value="{local-
ized['RequiredFields']}" />
    <div style="clear:both;"></div>
</div>

<div class="box large no-border">
    <div class="panel">
        <div class="header-left"><cic:span value="Create a new War-
ranty" /></div>
        <div class="header-right"></div>
        <div class="body">

<div class="row">
    <span class="label"><cic:span css="message" value="Product Id" /
></span>
    <span class="value">
        <cic:input type="text" tabindex="1" maxlength="90" size="50"
id="Name" value="" />
    </span>
</div>
<div class="row">
    <span class="label"><cic:span css="message" value="Warranty Terms" /
></span>
    <span class="value">
        <textarea name="warrantyDescription" rows="4" cols="80">
        <cmgt:text id="*">Enter Warranty Terms.</cmgt:text>
        </textarea>
    </span>
</div>
<div class="row">
    <span class="label"><cic:span css="message" value="Warranty valid
if product purchased from these listed suppliers only" /></span>
    <span class="value">
        <textarea name="warrantySuppliers" rows="1" cols="80">
        <cmgt:text id="*">Enter valid suppliers.</cmgt:text>
        </textarea>
    </span>
</div>

    <div class="row">
        <span class="label"><cic:span css="message" value="Start Date"
/></span>
        <span class="value">
            <cic:input type="text" id="EffectiveDateField" value=""
tabindex="6" size="15" />
        </span>
    </div>
</div>
</div>
```

```

        <cic:el>
            <a href="javascript:popupCal.showCalendar('anchor1','WarrantyHeaderForm.ExpirationDateField', '${datePattern}') " NAME="anchor1" ID="anchor1"></a>
                <input type="hidden" name="DueDate" value="">
                <input type="hidden" name="DueMonth" value="">
                <input type="hidden" name="DueYear" value="">
            </cic:el>
            <cic:select id="EffectiveHour" name="EffectiveHour">
                <cic:options var="TimeArray" valueRef="${TimeArray}"
labelRef="${cic:concat(TimeArray,':00')}" datasourceRef="${times}" />
            </cic:select>
        </span>
    </div>
    <div class="row">
        <span class="label"><cic:span css="message" value="Expire
Date" /></span>
        <span class="value">
            <cic:input type="text" id="ExpirationDateField" value=""
tabindex="7" size="15" />
            <cic:el>
                <a href="javascript:popupCal.showCalendar('anchor2','WarrantyHeaderForm.ExpirationDateField', '${datePattern}') "
NAME="anchor2" ID="anchor2"></a>
                <input type="hidden" name="DueDate" value="">
                <input type="hidden" name="DueMonth" value="">
                <input type="hidden" name="DueYear" value="">
            </cic:el>
            <cic:select id="ExpirationHour" name="ExpirationHour">
                <cic:options var="TimeArray" valueRef="${TimeArray}"
labelRef="${cic:concat(TimeArray,':00')}" datasourceRef="${times}" />
            </cic:select>
        </span>
    </div>
</div>
</div>
<div style="clear:both;"></div>
<br>
</div>
<div class="footer-left"></div>
<div class="footer-right"></div>
<div class="clear"></div>
</div>
</div>

<INPUT TYPE="hidden" name="EffectiveDate" value="" />
<INPUT TYPE="hidden" name="EffectiveMonth" value="" />
<INPUT TYPE="hidden" name="EffectiveYear" value="" />

```



```
<INPUT TYPE="hidden" name="ExpirationDate" value="" />
<INPUT TYPE="hidden" name="ExpirationMonth" value="" />
<INPUT TYPE="hidden" name="ExpirationYear" value="" />

<script>
function ValidateHeader() {
var name = document.WarrantyHeaderForm.Name.value;
    if (checkEmptiness(name)) {
        alert("Please enter Product Id");
        return false;
    }

    var startDate = extractDateFromDateField("Starting
Date", "WarrantyHeaderForm.Effective", "<%=pj(datePattern)%>", true,
true);

    if (startDate == false) {
        document.WarrantyHeaderForm.EffectiveDate-
Field.focus();
        return false;
    }
    var startHour = document.WarrantyHeaderForm.Effective-
Hour.selectedIndex;
    if (startHour < 0) {
        alert("Please select Starting Hour");
        return false;
    }
    startDate.setHours(startHour);

    var endDate = extractDateFromDateField("Ending Date",
"WarrantyHeaderForm.Expiration", "<%=pj(datePattern)%>", true, true);
    if (endDate == false) {
        document.WarrantyHeaderForm.ExpirationDate-
Field.focus();
        return false;
    }
    var endHour = document.WarrantyHeaderForm.Expiration-
Hour.selectedIndex;
    if (endHour < 0) {
        alert("Please select Ending Hour");
        return false;
    }
    endDate.setHours(endHour);

    // verify start time to be less than end time
    var startTime = startDate.getTime();
    var endTime = endDate.getTime();
    if (startTime > endTime) {
        alert("Warranty Expiry Date must be after the Start-
```

```
ing Date.");
        return false;
    }

    return true;
}

function createWarranty()
{
    if (ValidateHeader()) {
        document.WarrantyHeaderForm.action = "<%=link("enter-
priseMgr", "WarrantyListHeader")%>";
        document.WarrantyHeaderForm.submit();
    }
}

</script>
</form>
</body>
</html>
```

Create the Product Warranty Controllers

1. Create the file ***sdk_home/projects/project/src/com/comergent/reference/apps/productWarranty/controller/ProductWarrantyListController.java***. You may have to create the directory hierarchy. Enter the following code:

```
package com.comergent.reference.apps.productWarranty.controller;

import java.io.IOException;
import java.util.ArrayList;
import java.util.List;
import java.util.ResourceBundle;
import java.util.StringTokenizer;
import java.util.Map;
import javax.servlet.http.HttpServletResponse;
import com.comergent.api.apps.warranty.IWarrantyList;
import com.comergent.api.apps.appUtils.util.AppsLookupHelper;
import com.comergent.api.apps.pricingMgr.APIPriceListAttribute;
import com.comergent.api.appservices.search.SearchTerm;
import com.comergent.api.appservices.search.SessionContext;
import com.comergent.api.appservices.search.configuration.Search-
FieldConfiguration;
import com.comergent.api.appservices.productService.IBizFeatureList;
import com.comergent.api.appservices.productService.IBizFeature;
import com.comergent.api.appservices.productService.IBizFeature-
TypeList;
```

```
import com.comergent.api.appservices.productService.IBizFeatureType;
import com.comergent.api.appservices.productService.IBizProductCategoryList;
import com.comergent.api.appservices.productService.IBizProductCategory;
import com.comergent.api.appservices.uiComponent.IBreadCrumb;
import com.comergent.api.appservices.uiComponent.BreadCrumbs;
import com.comergent.api.dataservices.*;
import com.comergent.api.objmgr.OMWrapper;
import com.comergent.dcm.caf.controller.ForwardController;
import com.comergent.dcm.core.ControllerException;
import com.comergent.dcm.core.ComergentRequest;
import com.comergent.dcm.core.ComergentAppEnv;
//import com.comergent.dcm.util.ComergentException;
import com.comergent.api.exception.ICCEException;
//import com.comergent.preferences.comergentXML.LegacyPreferences;
import com.comergent.bean.simple.WarrantyBean;
import com.comergent.bean.simple.IRdWarranty;
import com.comergent.bean.simple.IRdWarrantyList;

public class ProductWarrantyListController extends ForwardController
{
    public void execute() throws ControllerException, ICCEException,
        IOException
    {
        //String productID = request.getParameter("productID");
        String productID="*";
        // Restore the product and attach it to the request
        com.comergent.appservices.productService.BizProductBean msBean
= (com.comergent.appservices.productService.BizProductBean) OMWrapper
per.getObject(com.comergent.appservices.productService.BizProduct
Bean.class);
        msBean.setProductID(productID);
        msBean.restore();
        msBean.restoreFeatures(true);
        msBean.restoreAssemblyItems();
        msBean.computePrice();
        request.setAttribute("product", msBean);
        IWarrantyList clBean = (IWarrantyList) OMWrapper.getOb
ject(com.comergent.api.apps.warranty.IWarrantyList.class);
        //IRdWarrantyList readCLBean = clBean.getWarrantyList(produc
tID);
        IRdWarrantyList readCLBean = clBean.getWarrantyList("*");
        request.setAttribute("warranty", readCLBean);
        callJSP();
    }
}
```

2. Create the file ***sdk_home/projects/project/src/com/comergent/reference/apps/productWarranty/controller/WarrantyLinkController.java*** and enter the following code:

```
package com.comergent.reference.apps.productWarranty.controller;
import com.comergent.dcm.caf.controller.ForwardController;
import com.comergent.dcm.core.ControllerException;
import com.comergent.api.exception.ICCEException;
import java.io.IOException;
public class WarrantyLinkController extends ForwardController{
    public void execute() throws ControllerException, ICCEException,
        IOException
    {
        callJSP();
    }
}
```

This controller calls the JSP page where a new product warranty can be created.

3. Create the file ***sdk_home/projects/project/src/com/comergent/reference/apps/productWarranty/controller/CreateWarrantyController.java*** and enter the following code:

```
package com.comergent.reference.apps.productWarranty.controller;
import java.io.IOException;
import java.util.ArrayList;
import java.util.List;
import java.util.ResourceBundle;
import java.util.StringTokenizer;
import java.util.Map;
import javax.servlet.http.HttpServletResponse;
import com.comergent.api.apps.warranty.IWarrantyList;
import com.comergent.api.apps.appUtils.util.AppsLookupHelper;
import com.comergent.api.apps.pricingMgr.APIPriceListAttribute;
import com.comergent.api.appservices.search.SearchTerm;
import com.comergent.api.appservices.search.SessionContext;
import com.comergent.api.appservices.search.configuration.Search-
FieldConfiguration;
import com.comergent.api.appservices.productService.IBizFeatureList;
import com.comergent.api.appservices.productService.IBizFeature;
import com.comergent.api.appservices.productService.IBizFeature-
TypeList;
import com.comergent.api.appservices.productService.IBizFeatureType;
import com.comergent.api.appservices.productService.IBizProductCate-
goryList;
import com.comergent.api.appservices.productService.IBizProductCate-
gory;
```

```
import com.comergent.api.appservices.uiComponent.IBreadCrumb;
import com.comergent.api.appservices.uiComponent.BreadCrumbs;
import com.comergent.api.dataservices.*;
import com.comergent.api.objmgr.OMWrapper;
import com.comergent.dcm.caf.controller.ForwardController;
//import com.comergent.dcm.authentication.User;
import com.comergent.api.context.IUser;
import com.comergent.dcm.core.ControllerException;
import com.comergent.dcm.core.ComergentRequest;
import com.comergent.dcm.core.ComergentSession;
import com.comergent.dcm.core.ComergentAppEnv;
//import com.comergent.dcm.util.ComergentException;
import com.comergent.api.exception.ICCEException;

import com.comergent.bean.simple.WarrantyBean;
import com.comergent.bean.simple.IRdWarranty;
import com.comergent.bean.simple.IRdWarrantyList;
import java.sql.Timestamp;
import java.util.GregorianCalendar;
import java.util.Date;

public class CreateWarrantyController extends ForwardController{

    public void execute() throws ControllerException, ICCEException,
    IOException
    {
        //Retrieve request parameter
        // name
        String s = request.getParameter("Name");

        String productID = s;//request.getParameter("ProductID");
        //String productID="100";

        // set Effective date

        int month = (new Integer(request.getParameter("Effective-
Month"))).intValue();
        int day = (new Integer(request.getParameter("Effective-
Date"))).intValue();
        int year = (new Integer(request.getParameter("Effective-
Year"))).intValue();
        int hour = (new Integer(request.getParameter("Effective-
Hour"))).intValue();
        Timestamp startDate = new Timestamp(new GregorianCalendar(
year, month, day, hour, 0, 0).getTime().getTime());

        // set Expiration date
        month = (new Integer(request.getParameter("Expiration-
Month"))).intValue();
```

```
        day = (new Integer(request.getParameter("Expiration-
Date"))).intValue();
        year = (new Integer(request.getParameter("Expiration-
Year"))).intValue();
        hour = (new Integer(request.getParameter("Expiration-
Hour"))).intValue();
        Timestamp endDate = new Timestamp(new GregorianCalendar(year,
month, day, hour, 59, 59).getTime().getTime());

        // create the new warranty data bean
        WarrantyBean newWarranty = getNewWarranty(productID,start-
Date,endDate);
        // set the top level fields
        setWarrantyFirstLevelFields(newWarranty);
        // save the new comment
        DataContext temp_DataContext = new DataContext();
        newWarranty.persist(temp_DataContext);
        // Restore the product and attach it to the request
        com.comergent.appservices.productService.BizProductBean msBean
= (com.comergent.appservices.productService.BizProductBean) OMWrap-
per.getObject(com.comergent.appservices.productService.BizProduct-
Bean.class);
        msBean.setProductID(productID);

        msBean.restore();
        msBean.restoreFeatures(true);
        msBean.restoreAssemblyItems();
        msBean.computePrice();
        request.setAttribute("product", msBean);
        IWarrantyList clBean = (IWarrantyList) OMWrapper.getOb-
ject(com.comergent.api.apps.warranty.IWarrantyList.class);
        IRdWarrantyList readCLBean = clBean.getWarrantyList("");
        request.setAttribute("warranty", readCLBean);
        callJSP();
    }
    protected WarrantyBean getNewWarranty(String s,Timestamp start-
Date,Timestamp endDate) throws ICCEException
    {
        String desc = request.getParameter("warrantyDescription");
        String supplier = request.getParameter("warrantySuppliers");
        String state = createWarrantyState(endDate);
        //Create warranty bean
        WarrantyBean warranty = (WarrantyBean) OMWrapper.getOb-
ject(com.comergent.bean.simple.WarrantyBean.class);
        warranty.setProductID(s);
        warranty.setWarrantyTerms(desc);
        warranty.setWarrantyStart(startDate);
        warranty.setWarrantyExpire(endDate);
```

```
        warranty.setWarrantySuppliers(supplier);
        warranty.setWarrantyState(state);
        return warranty;
    }

    protected void setWarrantyFirstLevelFields(WarrantyBean warranty)
    throws ICCEException
    {
        ComerгентSession session = ComerгентAppEnv.getCurrentSession();
        IUser myUser = session.getUser();
        Long userKey = myUser.getUserKey();
        warranty.setUpdatedBy(userKey);
        warranty.setCreatedBy(userKey);
        warranty.setOwnedBy(userKey);
    }

    protected String createWarrantyState(Timestamp endDate) throws
    ICCEException
    {
        if (endDate.after(new Date())) {
            return "n";
        }
        else return "y";
    }
}
```

The **CreateWarrantyController.java** controller adds the new product warranty to the database and displays the Product Warranty list.

This completes creation of the Data Bean, JSP pages, and Controllers.

Add Entitlements, Message Types, and Object Mapping

In this section, you create the user entitlements and message types that tie everything together.

Add entitlements for the product warranty functionality and assign them to the appropriate roles. You then create a message types file for the product warranty message types. The product warranty message types connect the controllers and JSP's.

1. In a command window, navigate to your *sdk_home* directory and enter the following:

```
sdk customize Entitlements.xml
```

Edit ***sdk_home/projects/project/WEB-INF/properties/Entitlements.xml***.

Add the following Grant statement:

```
<Grant>ProductWarrantyGroup</Grant>
```

To the following <RoleDefinition> elements:

- Enterprise.PricingManager
- Enterprise.ProductManager
- Site.Administrator

2. Create the file ***sdk_home/projects/project/WEB-INF/properties/productWarrantyMessageTypes.xml*** and enter the following code:

```
<?xml version="1.0" encoding="UTF-8" ?>
<!-- $Id: TaskMessageTypes.xml -->
<MessageTypes>
  <MessageGroup Name="ProductWarrantyGroup">
    <Description>Task Management Message types for
      Enterprise User.</Description>
    <GroupDefault Key="enterpriseMgr" Value="ProductWarrantyList" />
    <MessageTypeRef Name="ProductWarrantyList"/>
    <MessageTypeRef Name="WarrantyHeaderLink"/>
    <MessageTypeRef Name="WarrantyListHeader"/>
  </MessageGroup>

  <MessageType Name="ProductWarrantyList">
    <ControllerMapping>
      com.comergent.reference.apps.productWarranty.controller.Product-
WarrantyListController
    </ControllerMapping>
    <JSPMapping>../productWarranty/ProductWarrantyList.jsp</JSPMapping>
  </MessageType>

  <MessageType Name="WarrantyHeaderLink">
    <ControllerMapping>
      com.comergent.reference.apps.productWarranty.controller.Warran-
tyLinkController
    </ControllerMapping>
    <JSPMapping>../productWarranty/ProductWarrantyListHeader.jsp</JSP-
Mapping>
  </MessageType>

  <MessageType Name="WarrantyListHeader">
    <ControllerMapping>
      com.comergent.reference.apps.productWarranty.controller.CreateW-
```



```
arrantyController
    </ControllerMapping>
    <JSPMapping>../productWarranty/ProductWarrantyList.jsp</JSPMapping>
</MessageType>
</MessageTypes>
```

3. Modify ***sdk_home/projects/project/WEB-INF/properties/init.xml***, adding the new message types file name to the existing list. Navigate to your ***sdk_home*** directory and enter:

```
sdk customize init.xml
```

Then edit ***sdk_home/projects/project/WEB-INF/properties/init.xml*** and add the following code to the end of the Module Names definitions.

```
<module name="Warranty">
  <config name="MessageType">WEB-INF/properties/productWarrantyMessageTypes.xml
</config>
</module>
```

4. Modify ***sdk_home/projects/project/WEB-INF/properties/ObjectMap.xml***, adding mapping information for the new warranty DataBean. Navigate to your ***sdk_home*** directory and enter:

```
sdk customize ObjectMap.xml
```

Then add the following code after the ***<ObjectMap Version="1.0">*** reference:

```
<Object ID="com.comergent.bean.simple.IRdWarranty">
  <ClassName>com.comergent.bean.simple.WarrantyBean</ClassName>
</Object>
<Object ID="com.comergent.bean.simple.IAccWarranty">
  <ClassName>com.comergent.bean.simple.WarrantyBean</ClassName>
</Object>
<Object ID="com.comergent.bean.simple.IDataWarranty">
  <ClassName>com.comergent.bean.simple.WarrantyBean</ClassName>
</Object>
<Object ID="com.comergent.bean.simple.IRdWarrantyList">
  <ClassName>com.comergent.bean.simple.WarrantyListBean</ClassName>
</Object>
<Object ID="com.comergent.bean.simple.IAccWarrantyList">
  <ClassName>com.comergent.bean.simple.WarrantyListBean</ClassName>
</Object>
<Object ID="com.comergent.bean.simple.IDataWarrantyList">
  <ClassName>com.comergent.bean.simple.WarrantyListBean</ClassName>
</Object>
<Object ID="com.comergent.api.apps.warranty.IWarrantyList">
  <ClassName>com.comergent.apps.warranty.bizAPI.WarrantyList</
```

```
ClassName>  
</Object>
```

This completes the set-up of entitlements, message types, and object mapping.

Build and Deploy the Extended Sterling Application

1. Merge the changes into your project:

```
sdk merge -clean
```

Problems at this step are most often because of typos, or because of special characters in your project files as a result of cutting and pasting code from this document into your project files. If the merge fails, check the ***sdk_home\builds\project_name\debs.log*** file for details.

2. Build the distribution WAR file:

```
sdk distWar
```

3. Deploy the WAR file as usual. You may need to restart your server.

Test the Functionality

To test that the product warranty functionality works properly, perform the following steps:

1. Navigate to your Sterling Multi-Channel Selling Solution home page.
2. Log in as an enterprise administrator, for example, ajones in the Matrix reference implementation.
3. Click the **Product Warranties** link in the Product and Catalog Administration panel, below the **Product Entitlements** link.
4. Click the **New Warranty** button.
5. Add the warranty information.
6. Click the **Create** button.
7. Verify that your new product warranty is listed.

Pagination

In certain circumstances, restoring a list of data beans may mean that your list has more items than you want to display on a single browser page. To enable users to browse through the complete list, you must use pagination to enable users to view

one page after another. This section sketches briefly one approach to pagination using the example described in the previous sections.

You can make use of the *restoreToCache()* and *restoreFromCache()* methods to manage the restoration of the list data bean. The controllers must be passed in two parameters that enable the controller to calculate what subset of the list data bean to display on any particular page.

1. Modify the *execute()* method of the relevant controller classes as follows:
 - a. Perform a check to see whether the list data bean has already been created using *restoreToCache()*. You can set a flag in the session or even just a request parameter for this purpose. Create a new comment list bean object.
 - If the flag has been set, then the *restoreToCache()* method has already been called and you do not need to call it again.
 - If the flag has not been set, then, using the comment list bean, call *restoreToCache()* using the same Query business object used by the *getCommentList()* method above and specify the number of results per page as an int parameter.
 - b. Retrieve the two parameters that determine which page of results should be displayed next. For example, *PageNumber* (the number of the current page) and *PageCommand* (“None”, “Previous”, or “Next” to specify whether the user wants to move back or forward through the pages).
 - c. Calculate the number of the requested page. For example:
 - If *PageNumber*=7 and *PageCommand*=Next, then the user would like to see Page 8 of the result set.
 - If *PageNumber*=2 and *PageCommand*=Previous, then the user would like to see Page 1 of the result set.
 - d. On the comment list bean created in Step a, call *restoreFromCache(int i)*, passing in the calculated page number from Step c.
 - e. Set the following in the request object:
 - The resulting comment list bean restored in Step d.
 - The new page number as calculated in Step c.
 - As required, set attributes to determine whether there are previous or next pages when the new page is displayed. You can use a *restoreFromCache(int i)* call to check if there should be a next page (use the

value one greater than the calculated page number from Step c): it will return false if there is no more data.

2. Modify the **CatalogProductCommentsPopup.jsp** page to add Previous and Next links. Each of these links should be wrapped with a test to check whether the link should be displayed using the attributes created in Step e above. Each link should provide the following parameters:
 - a. The PageCommand and PageNumber parameters.
 - b. The standard cmd=detail parameter.

Note that the *restoreFromCache()* method restores data using the session and business object type to determine which cached data set to retrieve. Take care that you do not need to maintain two data sets of the same business object type in the same session.

Pagination Controller

You can make use of the *PaginatedListController* class: this provides a number of helper methods to manage paginated lists. It is found in the *com.comergent.reference.apps.common.controller* package. To use it, create a controller class that extends it, and implement the three methods:

- protected abstract *IDataList* *restoreAndCacheList()* throws *ICCEException*
- protected abstract *IDataList* *retrieveListFromCache()*
- protected abstract *String* *getListKey()*

For an example of this usage, see the *PriceListPartnerAssignmentListController* class.

This chapter presents guidelines to help you maintain and customize your Sterling Multi-Channel Selling Solution.

Overview

In working on either customizing your Sterling Multi-Channel Selling Solution implementation or creating a Sterling Multi-Channel Selling Solution application, bear in mind that your work may be tested in a number of different environments: such as on different application servers, against different database servers, and by users using different browsers. This chapter provides some helpful guidelines to ensure that your application works well and is as bug-free as it can be.

The following topics are items that you should keep in mind while developing applications for the Sterling Multi-Channel Selling Solution. They are based on the experience of Sterling Multi-Channel Selling Solution developers and a summary of types of bugs found in the releases of the Sterling Multi-Channel Selling Solution.

Apart from the feature you are developing, you should also code and test to get coverage on these types of issues. Users of your Sterling Multi-Channel Selling Solution or application may work with a combination of one or more of the following items and could potentially find a bug. When you are done with developing your application, you should review your code against this checklist.

Platform Variations

Browsers

If your Sterling Multi-Channel Selling Solution application provides a Web-based user interface, ensure that your application works properly and equally well in supported versions of the Netscape Navigator and Internet Explorer browsers.

Testing your application using only one browser version may miss problems that using a different browser version may expose. These include HTML variations such as <DIV> that are supported by only one type of browser or Javascript methods that assume a browser-specific document object model (DOM).

See "Browser Usage" on page 214 for further issues relating to users working with a browser interface.

Databases

The Sterling Multi-Channel Selling Solution supports the Microsoft SQL Server and Oracle Server database server platforms. Make sure that you test your work against the supported database server platforms while you work, and then you will ensure that once you deliver your application, it will run safely in any supported database platform environment.

Application Servers

In your development environment, you may make use of only one application server, such as JRun or Tomcat. Our experience has been that people work in one environment until the feature works, and then assume that it is going to work similarly with other application server. We have found variations between different application servers and so you should make sure that your application runs properly in other application server environments too.

Operating Systems

In principle, application servers written to conform to the J2EE standard insulate application developers from the operating system environment. In practice however, there are differences between the way in which application servers behave from one operating system to another. Consequently, you should test your application on different machines running different applications. At minimum, these should include a version of Windows and a version of UNIX.

Security

Control access to your application's functionality and business objects to avoid exposing sensitive information and to prevent unauthorized modification of data. The principal means to do this are:

- Access Policies
- Roles

Access Policies

Access policies protect access to data objects. See "Managing Access to Data Objects Using Access Policies" on page 94 for more information.

Note:	The use of access control lists (ACL's) is deprecated. See "Managing Access to Data Objects Using ACL's" on page 468 for information about ACL's.
--------------	---

Roles

Your application may need to be run by users with different roles. Some applications change behavior depending on the roles assigned to users and others do not. Typically you should develop and test your application with different users and roles in mind. However, it is very important that you consider all type of roles of users who can potentially access your application and make sure that it behaves as expected.

For example, testing using the reference data often means that you log in as ajones to run internal applications. Since ajones has both the enterprise user and enterprise administrator roles, your application may work as anticipated. What happens when you log in as djones who is only an enterprise user? Similarly you should cover issues such as reading, writing, updating, and deleting objects created by users of different roles. For example, a customer support representative can read orders created by anonymous, registered, and direct commerce partner users: what privileges should such a user have on orders?

Be sure to test your work by logging as different users and stepping through the application functionality to verify that each user can perform what you intend they should be able to.

Encoding Data in JSP Pages

If you are writing JSP pages to develop the user interface of your application, then you need to take care to use the *ph()*, *pj()*, and *pu()* methods to address some security issues. For example, malicious users can enter scripting commands into

data fields that execute when the data is next displayed. Make sure that you use the static methods provided to appropriately encode data strings in HTML pages. See CHAPTER 20, "JSP Pages" for more information.

General Application Issues

XML Messages

Your application has business logic and presentation layers. The business logic layer can be executed by posting XML messages into a Sterling Multi-Channel Selling Solution, just as an HTTP request can be posted to the system. These XML messages are another aspect of your application, and they could become the APIs for your application, and mode of integration with other systems. Hence, it is very important that you ask yourself if there is a need to develop and test these XML messages.

Assembly and Configurations

If your application deals with products, then it is very important that you test it with products that are assemblies or which are configurable. For example, if you allow editing of sub-line items, then you should consider how the feature differs between assemblies and configurable products. You should be careful about display and editing of these.

You should also consider sending and receiving assemblies and configurations in XML messages. How will third-party software components deal with them, for example ERP systems, or Ariba and CommerceOne sites? If you allow editing of major line items, then should you allow editing of minor line items? How do you calculate prices for these types of products? These are all issues to consider for these types of products.

Internationalization

Resource Bundles

The following considerations are important to internationalize your Sterling Multi-Channel Selling Solution implementation and to prepare for localization:

- Ensure that all user-visible pages behave correctly according to the locale of each user.

- Consider all data fields of business objects to determine whether they should be localized. Make sure that strings used to track the status of objects or that are displayed in drop-down lists are localized suitably.

See CHAPTER 32, "Localization", for more details.

Locales

Users can choose to work in a preferred locale as they interact with the Sterling Multi-Channel Selling Solution. You should test your application with at least two locales, for example, the en_EN locale and fr_FR locales. Test the locales as early as possible in the development cycle: any problems that you find may require changes to business objects and lookup tables.

Retrieving Locales

You can retrieve a user's current locale using one of these calls:

```
Locale current_Locale = session.getLocale();  
Locale current_Locale = ComergentI18N.getComergentLocale();
```

JSP Pages

Pay attention to character encoding. This is set in a meta element of JSP pages. It is commonly set to:

```
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
```

If you change this to accommodate a particular localization effort, then you must do it across all of the relevant pages.

Data

In general, you should test your application using both the scenarios in which only the minimal data has been installed and in which the reference data has been installed. In particular, take care to determine whether your application will require any additions or modifications to the minimal data: that is, must some data be present for your application to work which cannot be created using the Sterling Multi-Channel Selling Solution?

Minimal Data

The minimal data set is designed to provide the absolute minimum of data that will enable a Sterling Multi-Channel Selling Solution implementation to be started up and for users to create the full implementation using the Web user interface. During your development phase, you should consider whether your application requires any data that cannot be entered through the Web user interface. If this data is

required for your application to run successfully, then this should be added to the minimal data set.

Currently, the minimal data set includes root nodes of business object hierarchies. In addition, it contains the basic partner and group business objects, and defines the enterprise master price list.

Reference Data

You are responsible to maintain and test the reference data that should be used to test your application as part of a deployment of our reference system. Make sure that your testing allows for edge cases as part of the reference data and you should review it for consistency with the rest of the reference data set.

In Release 8.0 and higher, the reference data is designed to be applied as a layer on top of the minimal data set. You should review your reference data to verify that it makes the right separation between minimal and reference data. See "Minimal Data" on page 213 for more information about the minimal data set.

Sorting and Searching

If you are developing an application that provides a Web interface, then review it to check for places where users can do sorting or initiate a search. Check that the sort and search functionality works correctly and that it treats non-ASCII characters correctly.

Browser Usage

In general, Sterling Multi-Channel Selling Solution applications are designed to work in a browser. Consequently, in writing your applications, you should take care to consider typical patterns of browser usage as described below:

- Cookies
- Enter Key
- Back and Forward Buttons
- Session Timeout
- Refresh Button
- Field Types and Lengths

Cookies

Users of your application can set up their browsers with cookies either on or off. Your application should function equally well with either setting. Take care to encode every URL to include session information, and take care not to store information in browser-side cookies. Nonetheless, you cannot assume that you have caught every potential pitfall, and so you should continue to test your applications with both cookies on and off.

Enter Key

If a user hits the Enter key while working in a form on the browser page, then the browser will submit the form. This is functionality that users expect and expect it to work like other applications on their desktop. If you have a user interface component containing form fields, then make sure that hitting the Enter key does not break anything. To fix problems with the Enter key is not trivial, and cannot be fixed in one place for all applications. Your form parameter validation and verification has to be designed with this kind of usage in mind. Make sure you address this when you design your user interface.

Back and Forward Buttons

Users are used to using the browser Back and Forward buttons as part of their navigation through a Web-based application. When these buttons are used, the browser may repost a request or reload a page from its memory. You should consider what effect this can have on your application's business logic.

In particular, there can be a number of issues when the Back button is used to navigate. Applications fail to function properly or at least confuse the user by not behaving as they expect. Consider this when developing your application.

Session Timeout

Browser users may also let their session timeout, either deliberately or accidentally. For example, a user is working with your application, but decides to go for lunch in the middle of completing a task. They come back to continue working with your application and their session has timed out. Now what? How should your application behave here? Typically, the user has to be routed to a suitable login page and then brought back to the application again.

Refresh Button

This is another area of concern for Web-based application developers. Users may use the **Refresh** button either because they are not sure that a particular action completed or has been successful or because they are impatient to see the results of

their action. Web applications are also vulnerable to attacks that repeatedly post the same request to the application server.

You should ask yourself: If a user clicks the **Refresh** button, then what should happen? What would a user expect to happen? If a user sees something unexpected happen, then can they undo that effect? Make sure your application behaves the way user expects here.

Field Types and Lengths

Forms are the means by which users enter data into the Sterling Multi-Channel Selling Solution. The data is saved into the Knowledgebase by inserting or updating records in the database tables. You should ensure that users are guided as much as possible to enter data of the correct form into each form field. However, your application must also handle situations in which users either accidentally or maliciously enter invalid data. These include: entering a negative number where only positive ones make sense; entering non-integers where only integers are expected; entering alphabetical characters instead of numeric characters.

As far as possible, you should apply client-side validation to form field entries so that bad data is caught as quickly as possible: it is better for the user and saves a server hit as well. However, you should also apply server-side checks and catch bad data gracefully to provide constructive feedback to users.

In particular, when using forms, make sure that you control the maximum length of form field entries in order that users do not enter more data into a field than your application can hold. On the server-side pay particular attention to cases where users might be able to “attack” your application by entering massively long strings as field values.

Developer Testing

Database Requests and User Operation

When you are done developing your application, use the Sterling Multi-Channel Selling Solution logging capabilities to assess your application’s performance. The application server log can show you how long it takes your application to service each user request, and what resource usage it takes.

For example, you can use the log viewer tool to check how many database operations your application is making for each request. This is important. This test allows you to verify that the database access is as you expect or makes you aware of how the application interacts unexpectedly with the database server. Developers

sometimes find that an apparently simple persist or restore operation gives rise to a database-intensive operation such as a very time-consuming query.

API and Exceptions

As part of your application development you may develop some APIs for other modules to use. It is important that you consider possible error conditions and that your application throws appropriate exceptions. See CHAPTER 33, "Exceptions" for general information about recommended exception policies.

Take care to consider also that the reference data you create is largely used to test the successful running of your application. You should also consider designing for error conditions that are not present in the minimal and reference data sets, but which may arise if data is loaded from some external source.

Javadoc

If you are developing APIs, then it is very important that you provide reasonable Javadoc comments for use by client applications. Do not forget to add package-level documentation using **Package.html** files in each package directory.

HTML Validation

HTML validator tools can check that the HTML produced by your JSP pages are in conformance to the HTML 4.0 standard. It is possible that the HTML produced by your application is not conformant. You should check for this and fix problems. It will also improve the performance of your application.

Threads

In some situations, you may want to initiate a process as a separate thread. For example, typically, a user may execute a request that initiates a long-running process such as index generation. In these situations, you may want to handle this by creating a new thread that executes the task while the original request is completed and a response is returned to the user.

When you do this, the new thread process can continue to run even when the main servlet container process is terminated. To prevent this, you should always call the *setDaemon(true)* method after creating a thread. For example:

```
Thread t = new Thread(...);  
t.setDaemon(true);
```

This ensures that these threads will be terminated at the same time as the servlet container is shut down.

File Uploads

You may need to enable the upload of files into the Sterling Multi-Channel Selling Solution: typically, this is how partner users will create templates and logos in the Sterling Multi-Channel Selling Solution, and it can also be used to upload data such as campaign mailing lists and leads.

You must consider the following:

Forms for File Upload

Use the standard file upload HTML elements to create a file upload form:

```
<FORM ACTION="" METHOD="POST" NAME="UploadLeadForm"
      onSubmit = "return uploadFile()">
<INPUT TYPE="hidden" NAME="cmd" VALUE="LeadUploadStatus">
<INPUT TYPE="hidden" NAME="leadFile" VALUE="">
<INPUT TYPE="file" NAME="leadFileName" VALUE="">
<A HREF="javascript:uploadFile()"><IMG ALIGN="TOP"
    SRC="../../htdocs/shared_images/uploadUglyButton1.gif"
    WIDTH=81 HEIGHT=22 ALT="Upload" BORDER="0">
</A>
</FORM>
```

Note the use of a Javascript method *uploadFile()* in the form: it is referenced twice to manage both the case when a user clicks the Upload button and when they hit enter in the file field.

In the JSP page, the *uploadFile()* method looks like this:

```
function uploadFile()
{
    if (trim(document.UploadLeadForm.leadFileName.value) != '')
    {
        document.UploadLeadForm.encoding="multipart/form-data";
        document.UploadLeadForm.leadFile.value=
            document.UploadLeadForm.leadFileName.value;
        document.UploadLeadForm.leadFile.action="<cmgt:link
            app='*'"></cmgt:link>"
        document.UploadLeadForm.submit();
        return true;
    }
    else
    {
        alert("You must enter a file name.");
        setFocus();
    }
}
```

The important thing to notice is that the encoding is set to “multipart/form-data”. When this request is submitted to the Sterling Multi-Channel Selling Solution, some pre-processing is performed on the the request before passing it to the controller used to process the request. The controller can retrieve the uploaded file by calling the `FileUploadCache` class: this class provide methods to retrieve the uploaded file as an `InputStream` or `InputStreamReader` object. For example, this code fragment retrieves the file uploaded from the form described above:

```
String FileID = request.getParameter("leadFile");
InputStream is = FileUploadCache.getInputStream(FileID);
```

From this point on, the controller can determine what to do with the uploaded file as your business logic requires.

Saving Files on the Sterling Multi-Channel Selling Solution

Bear in mind that when you save a file in the Sterling Multi-Channel Selling Solution, you must bear in mind how the file will need to be accessed in the future. For example:

- If the file is a GIF file, then is it to be displayed to users?
- Is it a data file that can be discarded once it has been processed?
- Will it need to be maintained in a versioned manner?

In general, you should use the `adjustFileName()` method of the `ComergentAppEnv` class to save files to the file system. This method provides standard ways to specify what sort of file you are saving and this determines where the file is saved. See "ComergentAppEnv Class" on page 27 for more details.

File Processing

Bear in mind that file processing can be both processor-intensive and error-prone. You need to consider the possibility of offloading the file processing task to a separate thread and what to do if errors occur that mean some or all of the file data is invalid.

One technique to offload processing to a separate thread is to attach the file to message and post it back into the Sterling Multi-Channel Selling Solution so that it is processed as a separate request. For example, the following code does this for uploaded lead files:

```
LeadCreateListResultBean result =
    postComergentXMLMessage(is, format);
processResult(result);
```

Here, the *postComergentXMLMessage()* method is used to post the message to the Sterling Multi-Channel Selling Solution and to return a result.

```
private LeadCreateListResultBean postComergentXMLMessage(
    InputStream is, String format) throws Exception
{
    ConverterFactory cf = ConverterFactory.getConverterFactory();
    Converter converter =
        cf.getIncomingConverter("LeadCreateListRequest", format);
    converter.setSource(is); // pass the stream that you have read
    ByteArrayOutputStream out = new ByteArrayOutputStream();
    converter.setTarget(out);
    converter.convert();
    String tmp = out.toString();
    String msgURL = CronManagerHelper.getCronMessageURL();
    LocalPost iccPost = new LocalPost(msgURL, null);
    ComergentDocument replyDoc = iccPost.postString(tmp);
    XMLResponseAccessor xmlAccessor = new
        XMLResponseAccessor(ConverterFactory.getNativeMessageCategory());
    BizObjTable retBusObjTable =
        xmlAccessor.xmlReplyToBeans(null, replyDoc);
    LeadCreateListResultBean bean = (LeadCreateListResultBean)
        retBusObjTable.getBean(LeadCreateListResultBean.class);
    return bean;
}
```

Summary

The application development in Sterling Multi-Channel Selling Solution involves a number of considerations apart from the actual feature development of your application. By using the topics described above as a checklist, you will be able to meet many of the issues before your customers do!

Overview

As you work on tailoring the Sterling Multi-Channel Selling Solution or on developing a new Sterling Multi-Channel Selling Solution application, bear in mind that your work should be consistent with the overall look-and-feel of the Sterling Multi-Channel Selling Solution user interface. This chapter provides a summary of the guidelines used by all of the current applications. If you use these to guide your work, then your customizations to existing applications and new applications will be immediately familiar to users and enable them to quickly become comfortable using them.

This chapter also covers the use of the following UI components:

- calendar widget: a flexible, re-usable UI component to support locale-specific date selection and entry. See "Using the Calendar Widget" on page 227.
- tree viewer: a flexible, re-usable UI component to display tree structures of data objects. See "Using the Tree Viewer" on page 230.
- entity picker: a flexible, re-usable UI component to display sets of entities from which selections can be made. See "Using the Entity Picker" on page 232.

Tables and Data Lists

General

When you display a list of business objects to a user, be consistent in how the list behaves:

- If a user creates a new object, then by default the newly-created item should appear at the top of the list.
- If a list is displayed that has no items on it (such as a search that matches no objects), then display a message that makes it explicit that the list has zero items.

Columns

In general, you should use the following left-to-right display order for the table columns:

- Check boxes (if any): if the user can act on the list of business objects by checking or unchecking a check box against each item on the list, then these check boxes should appear as the far left column. As far as the user is concerned, the action is performed on all checked rows of the table simultaneously.

The action buttons should be displayed at both the top and bottom of the table, preferably above and below the check boxes column. Provide buttons for “Select All” and “Deselect All”.

Examples: Assigning price lists to partners, copying product inquiry lists.

- Name: The first text column should be the “primary name or key” column. Entries in this column must uniquely identify each business object: if the user is able to navigate to the detail of the business object, then this column should provide the link to the detail page.

Examples: Partner name on the Partner Profile List page, product ID on the Product Catalog page, price list name on the Price List List page.

- Additional information columns: provide other informational columns as required by the application to the right of the Name column. In general, you should make the columns sortable so that the user can sort and group the items by useful attributes.

Examples: Type, Level, and Category on the Partner Profile List page, Full Names, Roles on the User List page.

- Action buttons: If actions can be performed on individual items, then there should be an action button for each possible action on each row, and these should all be in the far right column of the table. Note that if there is only one relevant action, then you can also display the action as a link: for example, **Delete**. The title of the column should be “Actions”.

A legend to identify the action buttons should be displayed at the top of the page, immediately above the table and preferably above the Actions column. If there is no space at the top of the page, then place the legend at the foot of the table.

Examples: **Duplicate Promotion** and **Delete Promotion** on the Promotion List page, **Delete Product** and **Assign Rules** on the Price List Detail page.

- Text alignment in columns. Follow these rules where possible:
 - Left justify names, product IDs and other unique identifiers, and text that may vary in length such as description fields.
Examples: Partner on the Partner Profile List page, Name and Description on the Price List List page.
 - Center fields whose values do not vary in length or which come from a fixed set of values (typically determined at the time of implementation).
Examples: Level and Type on the Partner Profile List page, Currency and Type on the Price List List page.
 - Right justify fields whose values are numbers and prices. Use a fixed-width font for such fields.
- Sorting by columns: Sort order is indicated by an up or down arrow next to the table heading text. Clicking the table heading text should have the effect of sorting the table by ascending values of that column. If the table is already sorted by the column (as indicated by the arrow), then clicking on either the heading text or the arrow should toggle the sort order between ascending and descending.

In general, all columns that contain text or status information should be sortable. The field used to sort a column should always be visible.

Formatting

Use the standard text format for names, descriptions, and other text attributes for each column. Names of people should be displayed as Family name (Last name), Given name (First name) and sorting by the column should sort by Family name.

Dates should be displayed in the numerical format (for example, 10/23/2002, not October 23rd, 2002) determined by the user's current locale.

Buttons

Use a consistent convention between buttons and their resulting actions. These are the standard buttons: use these wherever possible.

- **Apply**
- **Assign**
- **Cancel**
- **Delete**
- **Details**
- **Done**
- **Edit**
- **OK**
- **Remove**
- **Save**
- **Update**

Forms

HTML forms are the chief means by which users will add or modify information in the Sterling Multi-Channel Selling Solution. Make sure that your forms are clear and well-designed so that a user can enter the information easily. The more guidance you can provide users so that they enter correct and valid information in each field, the better the application works.

In particular, where possible:

- Provide a clear label for each text field and other input components such as drop-down lists, list boxes, radio buttons, and check boxes. Provide explanatory text where appropriate.
- If a field may only take one of a certain number of values, then provide the values as a drop-down list. In general, consider whether the values are to be defined in the JSP page or as the result of a database query: there may be localization issues to address in either case.

- Clearly mark required fields with an asterisk (“*”) and provide a legend that reads “* Required Fields”.

Text Fields

When a user is creating a new business object, then fields should be blank unless a default value will be used if none is provided by the user. If a default value will be used, then display the default value at the time the user is viewing the form. Validate each text field to determine that the user-entered value is appropriate. Constrain text fields so that users are not permitted to enter more characters than allowed by the business object definition.

If there is space, then provide additional information to help the user enter correct information: for example, “Enter a number with no more than two decimal places.” or “Enter the telephone number in the form (xxx) yyy zzzz.”.

Drop-Down Lists and List Boxes

Drop-down list and list box values should not be provided in a random order. Users should see the same list of values in the same order each time they visit the page. Where possible, sort values in a drop-down list or list box so that the user can easily find values. For example, order values by alphabetical order (such as US states) or by some well-understood ordering (Gold, Silver, Bronze). Pay attention to internationalization issues that may mean that values are displayed in a different order for a different locale.

Where a drop-down list or list box values provide additional information as part of the text string, then use a fixed-width font. For example:

```
MOD:    Workstation
MOD:    Server
MG:     Computers
OCSA:   Monitor
```

If no default value is provided, then use the text “-- Select --” (or “--” for short values) to indicate to a user that they must select a value from a drop-down list. If the field is optional, then display a blank entry rather than an optional value.

Workflow Conventions

In general, create an object when a user clicks **Add** or **New**. Display the new object with pre-filled fields and then allow the user to edit the object.

Users should specify an assignment of one object to others and then click **Assign**; they should not have to click a button simply to be taken to a page on which they perform the assignment.

If a user wants to modify an object, then typically they should click **Edit** to view the object details. Once they have changed values of fields, they should click **Update** to apply the changes.

Popup Windows

Popup windows are used to enable users to enter information in situations where you do not want to disrupt the main page flow. Follow these guidelines:

- Popup windows should have titles that describe the purpose of the window. For example: “Change Locale”.
- Action buttons should be displayed in the lower right of the window.
- Do not use the windows “Popup” or “Dialog” in the text or title of these windows.

Search and Find Windows

When displaying the results of a search, display the search criteria at the top of the page. For example: “Search result for the product ID: MXWS-7550”. Include all the search criteria used such as Partner Name and Partner Type.

Registration Pages

Make sure that you enable users to enter their registration information naturally using clearly understood fields. For example:

- Address1
- Address2
- City
- State/Province
- Postal Code

Telephone numbers should be left justified and followed localizable formats. Types (Business, Fax, Cell, and so on) should appear in a separate column or as a drop-down list.

Using the Calendar Widget

The calendar widget is a UI component which can be used to enable users to specify dates. By providing a simple point-and-click component, users can select the desired date from a calendar. The format of the calendar matches the user's chosen locale preferences and automatically validates their selection to prevent them from selecting dates such as March 43rd. It also provides the usability cues that help users to select the correct date using information such as days of the week.

The calendar widget should be used instead of the three drop-down lists currently used to input the date. The calendar widget can also replace any current text fields used to input a date.

There are two supported components to the calendar widget:

- A calendar popup that allows the user to graphically select a date from a calendar: most of the code is in **calendarPopup.js**
- Date formatting and verification of the date entered into the date text field: the code is in **date.js**.

To Use the Calendar Widget

1. Include these JavaScript files in your JSP page.

```
<SCRIPT LANGUAGE="JavaScript" SRC="../../js/PopupWindow.js">
</SCRIPT>
<SCRIPT LANGUAGE="JavaScript" SRC="../../js/CalendarPopup.js">
</SCRIPT>
<SCRIPT LANGUAGE="JavaScript" SRC="../../js/date.js">
</SCRIPT>
<SCRIPT LANGUAGE="JavaScript" SRC="../../js/I18N.js">
</SCRIPT>
```

2. Add an input text field and anchored image as follows:

```
<INPUT type="text" size="10" name="<Name of field>" value="" > <A
href="javascript:popupCal.showCalendar('anchor1',
'<Name of form>.<Name of field>', '<%=ComergentI18N.getLocaleDate-
Pattern()%>')" NAME="anchor1" ID="anchor1">
</A>
```

The name of the input text field must match the name specified in the *showCalendar()* method so that the user's selection is set correctly in this field once it is picked.

3. Define three hidden form elements with the following names.

```
<INPUT TYPE="HIDDEN" NAME="<Name of field>Date" VALUE="">
<INPUT TYPE="HIDDEN" NAME="<Name of field>Month" VALUE="">
<INPUT TYPE="HIDDEN" NAME="<Name of field>Year" VALUE="">
```

4. Add an `onsubmit=processDate()` call to the FORM element. The `onSubmit` function `processDate()` must at minimum invoke the `extractDateFromDateField()` function provided in the **date.js** Javascript package. This function converts the data from the text field and populates the three hidden input fields. In addition, you can add other processing to the date field such as comparing it to the system date.
5. When processing the form, you retrieve the values of the selected day, month, and year by calling:
 - `request.getParameter("<Name of field>Date")`: as an integer between 1 and 31.
 - `request.getParameter("<Name of field>Month")`: as an integer between 0 and 11.
 - `request.getParameter("<Name of field>Year")`: as an integer, say "2003".

To Replace Three Drop-down Lists

Some current Sterling Multi-Channel Selling Solution applications use three text fields in forms to enable users to enter and modify dates. In general, you should work to replace these text fields with an instance of the calendar widget as follows:

1. Include these JavaScript files in your JSP page.

```
<SCRIPT LANGUAGE="JavaScript" SRC="../js/PopupWindow.js">
</SCRIPT>
<SCRIPT LANGUAGE="JavaScript" SRC="../js/CalendarPopup.js">
</SCRIPT>
<SCRIPT LANGUAGE="JavaScript" SRC="../js/date.js"></SCRIPT>
<SCRIPT LANGUAGE="JavaScript" SRC="../js/I18N.js"></SCRIPT>
```

2. Comment out the three drop-down lists and replace them with a text field and a calendar widget icon. Here is the example code. The "anchor1" anchor is used to position the popup calendar near the text field.

```
<INPUT type="text" size="10" name="CreateStartDateField" value="">
<A href="javascript:popupCal.showCalendar('anchor1','query-
Form.CreateStartDateField','<%=ComergentI18N.getLocaleDatePat-
tern()%>')" NAME="anchor1" ID="anchor1">
</A>
```

The text field in this case is named `CreateStartDateField`.

3. Define the three hidden form elements with the names of the three drop-down lists that are being replaced.

```
<INPUT TYPE="HIDDEN" NAME="CreateStartDate" VALUE="">
<INPUT TYPE="HIDDEN" NAME="CreateStartMonth" VALUE="">
<INPUT TYPE="HIDDEN" NAME="CreateStartYear" VALUE="">
```

4. Populate these three form fields from the date text field defined in Step 3.

Note: It is important to note that the *extractDateFromDateField()* function requires the field names follow the following naming convention. The primary design goal of the *extractDateFromDateField()* function is to reduce the amount of code needed to verify and set the three date variables to one Javascript function call.

```
function verifyDateField()
{
    var theDate;
    theDate = extractDateFromDateField("Creation Start Date",
        "queryForm.CreateStart",
        "<%=ComergentI18N.getLocaleDatePattern()%>",
        false, true);
    if (theDate == false) return false;
}

Name = <dateForm>
Text field = <dateForm> + "DateField"
Year value = <dateForm> + "Year"
Month value = <dateForm> + "Month"
Date value = <dateForm> + "Date"
```

Naming Example

If Name is ‘CreateStart’, then the name of the text field is “CreateStartDateField”, and *extractDateFromDateField()* will extract the date and set the following hidden fields: CreateStartDate, CreateStartMonth, and CreateStartYear.

To Replace a Text Field by the Calendar Widget

Some current Sterling Multi-Channel Selling Solution applications use a single text field in forms to enable users to enter and modify dates. In general, you should work to replace each such text field with an instance of the calendar widget as follows:

1. Include these JavaScript files in your JSP page.

```
<SCRIPT LANGUAGE="JavaScript" SRC="../js/PopupWindow.js">
</SCRIPT>
<SCRIPT LANGUAGE="JavaScript" SRC="../js/CalendarPopup.js">
</SCRIPT>
<SCRIPT LANGUAGE="JavaScript" SRC="../js/date.js"></SCRIPT>
```

```
<SCRIPT LANGUAGE="JavaScript" SRC="../js/I18N.js"></SCRIPT>
Comment out the text field and replace them by a text field and a
calendar icon.
<INPUT type="text" size="10" name="CreateStartDateField" value="">
<A href="javascript:popupCal.showCalendar('anchor1','query-
Form.CreateStartDateField','<%=ComergentI18N.getLocaleDatePat-
tern()%>')" NAME="anchor1" ID="anchor1">
</A>
```

The text field in this case is named as ‘CreateStartDateField’, which is the name of the original text field.

Notes

The call to *showCalendar()* takes these arguments:

1. The Anchor: the position where the calendar will pop up.
2. The Form element: the calendar widget reads the date from this element and opens the calendar to show the current date. If there is no value in this form element, then it opens the calendar with the current date; otherwise the current displayed date is shown as selected. Also on selecting a date by clicking on the calendar this field is populated from the calendar.
3. The Format String: the calendar expects a date format and returns the date in the form field in the same format.

Using the Tree Viewer

A useful UI component provided with the Sterling Multi-Channel Selling Solution is a tree viewer component. It provides a means to display complex hierarchical information in the form of a tree of expandable and collapsible nodes. You can use the tree viewer to display hierarchies such as the product catalog and the model group hierarchy. Different object types can be displayed in the hierarchy which can be represented by different icons and which execute different message types when selected.

You must implement the tree view as a frame. The frame must be populated using a message type that is processed by a controller that extends the *TreeViewController* class as described in Step 2 below.

Follow these steps to create a tree view for your hierarchy:

1. Create a tree view class that implements the *TreeViewEntity* interface. This interface extends the *PresentationEntity* interface and among the methods you must implement are the main “tree” methods:

- *getID()*
 - *getName()*
 - *getDisplayName()*
 - *getType()*
 - *getChildren()*
 - *getTopLevelEntities()*
2. Create a controller that will process the request to populate the frame used to display the tree. This controller must extend the abstract *TreeViewController* class and you must implement the *newTreeViewEntity(String s)* method. This method must return an instance of the tree view class created in Step 1. The String parameter may not be used: this will depend on your implementing class.

The *execute()* method of the *TreeViewController* class invokes the *init()* method which returns as a String the *TreeViewEntity* returned by the *newTreeViewEntity()* method. The String rendering is set as the value of a request attribute named “TreeView.CodeBody”.

3. Create the JSP page used to display the tree within a browser page. The tree must be created within a frame on the JSP page. The frame should be populated using the *TreeView* message type. For example:

```
<FRAME src='<%= link("productMgr", "TreeView",  
"TreeView.ParamFile=../js/cmgtProdMgrTreeViewParam.js&Tree-  
View.MsgType=productMgr&TreeView.Cmd=ProdMgrPCHierarchy") %>'  
name="TreeView" FRAMEBORDER='no' NORESIZE SCROLLING="no">
```

Note that the *link()* method passes a standard message type, *TreeView*, whose definition is:

```
<MessageType Name="TreeView">  
  <JSPMapping>  
    ../uiComponent/TreeViewFrameSet.jsp  
  </JSPMapping>  
  <ControllerMapping>  
    com.comergent.dcm.caf.controller.ForwardController  
  </ControllerMapping>
```

```
</MessageType>
```

You must pass as parameters the name of the parameter Javascript file **cmgtProdMgrTreeViewParam.js** and the name of the message type defined in Step 5 as the `TreeView.Cmd` parameter. The parameter file defines the mapping between node types and the icons used to represent them.

You must ensure that the parent page defines a *Dispatch*((*modName*, *msg*, *val*) Javascript method. This method defines the module name, message type, and a value (of the selected tree node). This method is invoked when users select nodes in the tree: typically, it is used to populate a detail frame that displays information about the selected node.

4. Create a JSP page that will be used to render the tree view. This JSP page must have the following scriptlet:

```
<%= (String) pu(request.getAttribute("TreeView.CodeBody")) %>
```

This scriptlet retrieves the `TreeViewEntity` in the form of the String created in Step 2. It places a hidden frame of content in the tree view frame and is accessed to retrieve the tree model data.

5. Create a message type that specifies the controller created in Step 2 and the JSP page created in Step 4. For example:

```
<MessageType Name="ProdMgrPCHierarchy">
  <JSPMapping>
    ../uiComponent/TreeViewCode.jsp
  </JSPMapping>
  <ControllerMapping>
    com.comergent.appservices.productService.controller.-
      TVProductCategoryController
  </ControllerMapping>
</MessageType>
```

Using the Entity Picker

The entity picker provides a UI component that can be used to help users of the Sterling Multi-Channel Selling Solution select data objects from a number of possibilities. It supports these views:

- Hierarchy: navigate the object hierarchy to make selections
- Search: perform a search using specified criteria
- Flat list: select from a list of all of the objects, using pagination to move through a long list

For any particular task, you should decide which of the views you want to support: your picker can support one or more of them, but need not offer them all.

Follow these steps to create an hierarchy entity picker for your needs:

1. Create a tree view class that implements the `TreeViewEntity` interface. This interface extends the `PresentationEntity` interface and among the methods you must implement are the main “tree” methods:
 - `getID()`
 - `getName()`
 - `getDisplayName()`
 - `getType()`
 - `getChildren()`
 - `getTopLevelEntities()`
2. Create a controller class that extends the `EntityPickerHierarchyViewController` class. You must implement the `newTreeViewEntity(String s)` method. This method must return an instance of the tree view class created in Step 1. The `String` parameter may not be used: this will depend on your implementing class.
3. Create a message type that is to be used to display the `EntityPicker` window. Typically, this is part of a URL that is the `HREF` attribute of a **Browse...** button. For example, you might define the following message type:

```
<MessageType Name="EPMainFrame">
  <JSPMapping>
    ../uiComponent/EntityPickerFrame.jsp
  </JSPMapping>
  <ControllerMapping>
    com.comergent.dcm.caf.controller.ForwardController
  </ControllerMapping>
</MessageType>
```

Use this in conjunction with a form such as:

```
<FORM name="picker" method="post"
  action='<%=link("productMgr", "EPMainFrame")%>'>
  <INPUT type="hidden" name="EPModule" value="visualModeler">
  <INPUT type="hidden" name="EPHierarchyView"
    value="DisplayMyHierarchyObjectPicker">
  <INPUT type="hidden" name="EPPParam"
    value="../js/cmgtVM_MGMPPParam.js">
  <INPUT type="hidden" name="SingleSelect" value="true">
```

</FORM>

The form must define the EPModule, EPHierarchyView, and SingleSelect parameters.

4. Create the message type specified by the EPHierarchyView parameter of Step 3. This message type must map to the controller class created in Step 2 and to the JSP page to be used to render the hierarchy: for example, **EntityPickerHierarchyFrame.jsp**.

```
<MessageType Name="DisplayMyHierarchyObjectPicker">
  <JSPMapping>
    ../uiComponent/EntityPickerHierarchyFrame.jsp
  </JSPMapping>
  <ControllerMapping>
    com.comergent.apps.productMgr.controller.-
      MyHierarchyPickController
  </ControllerMapping>
</MessageType>
```

Follow these steps to create a search entity picker for your needs:

1. Create a search controller to process the search. The search controller must extend the EntityPickerController and implement the following methods:

- *newPresentationEntity()*
- *constructQuery()*
- *getDataContext()*
- *getSortFields()*
- *getAscending()*

These methods are used to determine the presentation entity to be used, together with the form of the query that will retrieve the objects.

2. Use the **EntityPickerSearchFrame.jsp** to display your Search frame. In passing the request to this JSP page, specify the following parameters:
- EPParam parameter to specify the parameters Javascript file to be used by the page. This sets the icon images to be used by the page.
 - EPModule parameter specifies the application module.
 - EPSearchConsole specifies the message type to be used to display the search console. The search console is the frame that specifies the search criteria and search values.

- EPSearchView specifies the message type to be used to display the search results.
3. Create message types for the search console and search view message types defined in Step 2. For example:

```
<MessageType Name="EPProdSearchView">
  <JSPMapping>
    ../uiComponent/EntityPickerListView.jsp
  </JSPMapping>
  <ControllerMapping>
    com.comergent.appservices.productService.controller.-
    EPProductSearchViewController
  </ControllerMapping>
</MessageType>
<MessageType Name="EPProdSearchConsole">
  <JSPMapping>
    ../productMgr/ProdMgrEPProdSearchConsole.jsp
  </JSPMapping>
  <ControllerMapping>
    com.comergent.dcm.caf.controller.ForwardController
  </ControllerMapping>
</MessageType>
```

Use search controller created in Step 1 as the controller in the search view message type.

4. Create the JSP pages declared in Step 3. The search console must provide the search criteria you support to search on the objects (such as name, ID, and so on).

Follow these steps to create a flat list entity picker:

1. Create a controller that extends the EntityPickerController. You must implement the following methods:
 - *newPresentationEntity()*
 - *constructQuery()*
 - *getDataContext()*
 - *getSortFields()*
 - *getAscending()*

These methods are used to determine the presentation entity to be used, together with the form of the query that will retrieve the objects.

2. Create a message type that maps to the controller created in Step 1 and a JSP page that supports pagination. For example:

```
<MessageType Name="EPProdListView">
  <JSPMapping>
    ../uiComponent/EntityPickerListView.jsp</JSPMapping>
  <ControllerMapping>
    com.comergent.appservices.productService.controller.-
      EPProductListViewController
  </ControllerMapping>
</MessageType>
```

Images

Templates for images used in the administration pages are provided as Photoshop template (*.psd) files.

This chapter presents a detailed description of the JSP pages of the Sterling Multi-Channel Selling Solution and how they may be customized. It covers:

- "JSP Page Location" on page 238
- "Page Structure" on page 238
- "Using the Session Context" on page 242
- "Scriptlets" on page 243
- "Javascript" on page 245
- "Forms" on page 245
- "Frames" on page 247
- "Cascading Style Sheets" on page 248
- "Buttons" on page 250
- "Securing JSP Pages from Cross-Scripting Attacks" on page 251
- "JSP Fragments" on page 252
- "Debugging JSP Pages" on page 252
- "JSP Page Naming Conventions" on page 252
- "Resources" on page 253

- "Wait JSP Pages" on page 254
- "Redirecting to Full Page Access" on page 255

JSP Page Location

The JSP pages are installed into the *debs_home*/Sterling/ directory and subdirectories that correspond to the Sterling Multi-Channel Selling Solution applications. Each supported locale has its own directory structure which replicates the application subdirectories.

For example, the JSP pages used by the Partner Manager application in the English-United States locale are installed in the *debs_home*/Sterling/WEB-INF/web/en/US/partnerMgr/ directory.

Page Structure

Almost all of the JSP pages reflect the same basic structure:

- Standard file comment template: optional for external page development, but helpful if you are programming in the Sterling Multi-Channel Selling Solution. Start each page with the following DOCTYPE declaration:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
```

- Page directives: this should include the JSP pages described in "Included JSP Pages" on page 241. Any custom tag libraries must be referenced in this section. You should include the following on every JSP page:

```
<%@ page contentType="text/simple; charset=UTF-8" %>
```

- Import statements: Try to import only those packages and classes that are needed. Imported packages should be ordered from the most fundamental to more specific ones.

Use the page directive as follows to import packages:

```
<% page import="com.comergent.package.*" %>
```

- Attribute parameters declaration: This section should include all the attributes and parameters that the JSP page is expecting. The name, class, type, and scope should be specified. This section should serve as documentation for the JSP page. JSP pages that do not expect attributes should include an empty section.

```
<%--
```

```
    ** Request Attributes
    InventoryCollectionBean inventoryCollectionList
    Vector of InventoryCollectionListBean$InventoryCollectionBean
        inventoryCollectionVector
    BigDecimal key
    String name
    ** Request Parameter
    ** Session Attributes
    ** Applications Attributes
--%>
```

- **Bean referencing section:** This section contains the actual definition of the beans used in the JSP page. The section should be delimited by comments that mark the beginning and end of the section as follows:

```
<%-- $$BEGIN USE BEAN --%>
<%
MyBean myBean =
    (MyBean) session.getAttribute("myBean");
%>
<%-- $$END USE BEAN --%>
```

- **Scriptlet declaration:** This is an optional section for declarations to define variables and methods at the class-scope level of the generated JSP servlet. Declarations made between these tags are accessible from other declarations and scriptlets in your JSP page and from other servlets. You should avoid declaring member variables in JSP pages.

This section should be delimited with comments to mark the beginning and end as follows:

```
<%-- $$BEGIN DECLARATIONS --%>
<%!
    int numOfRequests=0;
%>
<%-- $$END DECLARATIONS --%>
```

Attention: Remember that objects are shared among multiple threads being executed in the same instance of a servlet. To guard against sharing violations, synchronize objects where necessary.

- **General scriptlet section:** In this section, all the calculations that could be performed up front should be done. The results to be displayed should be assigned to variables:

```
<%
storefrontOrderStateMachine =
    StorefrontAPI.getFactory().getStorefrontOrderStateMachine();
Vector transitions =
```

```
storefrontOrderStateMachine.getValidStateTransitionsForLine(  
    orderStatus, lineStatus);  
int noTransitions = transitions.size();  
%>
```

- **HTML section:** This section comprises the mixture of HTML and JSP scriptlets that together generate the Web page. This section should be written in compliance with the XHTML Transient DTD, which can be summarized as follows:

All tag and attribute names should be in lower case (for example <html>, <head>, <body>, and so on). All attributes values should be inside quotes (for example, color="red", width="1", and so on). Tags should be nested correctly as follows:

```
<p> This <b> is </p> </b> #wrong  
<p> This <b> is </b> </p> #correct
```

All tags must have a matching closing tag or be closed. Almost all HTML tags have closing tags except for tags such as the br, hr, and input tags. The Sterling Commerce-recommended way to handle those tags are:

The br tag should be written as follows:

```
<br/> #wrong: this will cause Netscape trouble.  
<br /> #correct: note the space between the 'br' and the slash
```

Input tags should be as follows:

```
<input name="user" type="text" />
```

- **Head section:** this section must include any meta information and declare the cascading style sheet to be used.
- **Javascript section:** try to use the standard Javascript libraries provided by the Sterling Multi-Channel Selling Solution. See "Javascript" on page 245.
- **Body section:** JSP scriptlets in the body section should be reduced to a minimum, which includes code that cannot be calculated in the declaration or general scriptlet sections. The following are the suggestions for different points:

Loops: Normal Java looping instructions (for, while do, and do while) should be used for loops, the tag cmgt:list is now deprecated due to performance problems. An optional section should follow the loop

instruction where the values are calculated for that iteration and assigned to variables. Those variables are referenced in the loop body using expressions.

Conditionals: the Java if statement should be used for conditionals, inline conditionals could be used if it will improve readability.

Expressions: expressions should be reduced to variable referencing or inline conditionals.

Tags: The tags `cmgt:encode`, `cmgt:link`, `cmgt:list`, `cmgt:if`, `cmgt:getProperty`, `jsp:getProperty`, and `jsp:setProperty` are deprecated. These tags are replaced by Java utility methods. See "Scriptlets" on page 243.

HTML attributes values: if tags or expressions are used to calculate HTML tags attributes values, then XML quotes should be used as follows:

Wrong way:

```
<input name="InvCollection.<%=partnerKey %>" type="checkbox"
      value="<%= (partnerKey==1) ? "checked" : "" %>" />
```

Correct way:

```
<input name="InvCollection.<%=partnerKey %>" type="checkbox"
      value='<%= (partnerKey==1) ? "checked" : "" %>' />
```

- Comments: in general, you should use the JSP comment tag:

```
<!-- jsp:useBean id="pgno" type="String" scope="page" -->
```

This comment is visible to readers of the JSP page, but does not generate HTML visible to readers of the generated Web page. Use the standard HTML comment tags to embed comments in the HTML page.

Avoid using comments of the form:

```
<!-- jsp:useBean id="tempBean"/ -->
```

Some servlet containers misinterpret this syntax.

Included JSP Pages

Sterling Multi-Channel Selling Solution JSP pages declare the same error page and an included JSP page:

- Error page: On installation, the standard error page, **error.jsp**, is installed in *debs_home*/Sterling/WEB-INF/web/en/US/. It provides a brief error message together with the error stack trace. The stack trace is printed

within HTML comment tags `<!--` and `-->` so that it is not visible to the user.

- The included JSP page, **cmgtinclude.jspf**, is installed in **debs_home/Sterling/WEB-INF/web/en/US/common/**. It is used to declare the ComergentSession and ComergentRequest objects and to provide standard scriptlet methods. See "Scriptlets" on page 243. It also declares the Comergent tag library. If you include **cmgtinclude.jspf**, then do not declare the tag library anywhere else in your page.

You can use a flag in the **cmgtinclude.jspf** JSP page to generate useful debugging information in each generated HTML page. In the *writeDebugInfo()* method, set the `doDebug` variable to true. This causes a comment block to be generated at the top of each HTML page along these lines:

```
<!-- START_OF_WRITE_DEBUG_INFO
    controller=com.comergent.apps.catalog.AdvisorController
    jsp=null
    uri=/Sterling/en/US/catalog/ProductAdvisor.jsp
    request's params
        sortCriteria=default
        OP=
        cmd=advisorWizard
        pathIndex=0
        advisorCmd=continue
END_OF_WRITE_DEBUG_INFO -->
```

Note that for security reasons you should set this flag to false in any production system. Note also that included JSP pages do not necessarily get re-compiled. You may have to delete the compiled servlet from the servlet container's working directory to be sure that the debugging information stops being generated.

See "JSP Fragments" on page 252 for information about including JSP fragments.

Using the Session Context

The Sterling Multi-Channel Selling Solution manages session information when it is interacting with external systems. To do this, a ComergentSession object is used to wrap the servlet container's session object. Consequently, the standard use of the session context in the `jsp:useBean` tag is deprecated.

Instead of using:

```
<jsp:useBean name="myBean" type="com.comergent.bean.MyBean"
    scope="session" />
```

You must use:

```
<%
    com.comergent.bean.MyBean myBean =
        (com.comergent.bean.MyBean) session.getAttribute ("myBean");
%>
```

You can continue to use:

```
<jsp:useBean name="myBean" type="com.comergent.bean.MyBean"
    scope="request" />
```

and

```
<jsp:useBean name="myBean" type="com.comergent.bean.MyBean"
    scope="application" />
```

If you do use the `<jsp:useBean>` tag, then make sure that the Bean class satisfies these conditions:

- it must have a default public constructor
- it must provide accessor methods for all of its class variables

Scriptlets

You use scriptlets to manage the dynamic generation of the HTML in the JSP pages:

- to transform Strings
- to provide looping and conditional logic
- to provide standard macros

The JSP page, **cmgtinclude.jspf**, provides several standard methods that almost all JSP pages use. You should always include this page in any JSP pages that you modify or create. It provides:

- *cmgtText()*: this method is used to localize text used in scriptlets. Use it to return a localized string as follows:

```
cmgtText(textID, textString)
```

The textID is used to retrieve the corresponding text string from the appropriate resource bundle. The textString parameter is returned if no matching id is found in the resource bundle. It is also used as the default value of the ***_en_US.properties** file if the tool provided by Sterling Commerce is used to generate the properties file. For example:

```
<%
```

```
... out.println(cmgtText("My text"));
...
%>
```

A second form of the method takes an additional array argument:

```
cmgtText(textID, textString, objectArray)
```

Use this form when a text string uses a number of values which may be re-arranged from one locale to another. For example:

```
<%
...
String[] values = new String[2];
values[0] = userBean.getFirstName();
values[1] = userBean.getLastName();
out.println(cmgtText("My first name is {0} and my second
name is {1}", values));
...
%>
```

The default value of this property is “My first name is {0} and my second is {1}”, but a different locale may re-arrange this to use, say in French, “Mon nom de famille est {1} et je m’appelle {0}”.

- *cmgtTextBundle()*: this method is used in the same way as *cmgtText()*, but an extra parameter enables you to specify the name of the resource bundle to be used.

```
cmgtTextBundle(textID, textString, bundle)
cmgtTextBundle(textID, textString, objectArray, bundle)
```

- *formatPrice()*: this method is used to display currency information.
- *link()*: this method is used to generate URLs in the generated Web pages. There are several different forms of this method, the most common of which is:

```
link(String app, String cmd, String param)
```

In this form, the first String parameter sets the application, the second the cmd parameter, and the third defines any parameters to be set in the URL. For example:

```
link("advisor", "addProduct", "productKey=12");
```

will generate:

```
http://<server>:<port>/Sterling/advisor?cmd=addProduct&
productKey=12
```

- *ph()*: use this method to convert HTML characters into their escape sequence (for example, “<” to “<”). Use this method to encode all dynamically-created text in the body of a JSP page.

- *pj()*: use this method to convert Javascript characters to their escape sequence (for example, “ ” to “%20”). Use this method to encode all dynamically-created text used in Javascript scripts.
- *pu()*: use this method to present Java objects without encoding.

Implicit Objects

Take care not to use the names of the implicit objects in your scriptlets. In particular, do not use *exception* as the name of an *Exception* object.

Javascript

Some standard Sterling Multi-Channel Selling Solution Javascript functions are provided in Javascript files in the *debs_home/Sterling/en/US/js/* library directory. Note that each supported locale (*la_CO*) must have a corresponding *la_CO/js/* sub-directory under *debs_home/Sterling/*.

You can include these Javascript functions in a JSP page using elements along these lines:

```
<script language="JavaScript" type="text/javascript"
    src="../js/genericUtil.js"></script>
```

Note that the Javascript file **com_Main.js** defines most of the widely used Javascript functions, and in particular is the one that invokes the *pickStyleSheet()* function. See "Cascading Style Sheets" on page 248 for more information about cascading style sheets.

Forms

A CSS, **form.css**, should be used to display HTML forms. This ensures that all the Sterling Multi-Channel Selling Solution forms present a consistent look-and-feel. A form is built up of a number of `<div>` elements, one for each row, each of which has the class "row". Individual rows will typically have two `` elements: one for the label (whose class is "label") and one for the value input field (whose class is "value").

If the value input field is a drop-down list or list box, then you can populate the field using `<div>` elements within the value `` element. You can use the `cic:select` and `cic:options` tags to create a drop-down list, and the `rendered` attribute to control what fields get displayed.

Use the fieldset element to draw a border around the form: this helps to group the form elements visually.

Example

The following fragment of a JSP page provides an example of the use of these styles and tags. Note the use of the `cic:options` tag to populate a drop-down list of values from a `LookupResult` array. In this example, the array has been populated like this:

```
LookupResult[] currencyList =  
    CommerceUtils.getListOfValidCurrencyLookupResults(partnerKey);
```

The “faded” class is used to make text fainter.

```
<form name="newList" method="post" target=""  
    action="<%=link(" ", comergentRequest.getMessageType())%>">  
<fieldset class="userinfoBox">  
  <div class="row">  
    <span class="label"><span class="faded">  
      <cmgt:text id='cmgt_commerce/UserInfoBox_9'  
        bundle='commerce.UserInfoBoxResources'>Customer Type:  
      </cmgt:text></span>  
    </span>  
    <span class="value">  
      <div id="showVertical">  
        <span><%=ph(currentVertical)%></span>  
      </div>  
      <div id="editVertical" style="display:none;">  
        <cic:span rendered="{empty verticalList}"  
          value="{localizedUserInfoBox['NA']}" />  
        <cic:select rendered="{not empty verticalList}"  
          name="verticalMarkets">  
          <cic:options var="vertical" valueRef="{vertical.code}"  
            labelRef="{vertical.string}"  
            datasourceRef="{verticalList}"  
            selectedValue="{currentVerticalCode}" />  
        </cic:select>  
      </div>  
    </span>  
  </div>  
  <div class="row">  
    <span class="label"><span class="faded">  
      <cmgt:text id='cmgt_commerce/UserInfoBox_10'  
        bundle='commerce.UserInfoBoxResources'>Currency:</cmgt:text>  
      </span>  
    </span>  
    <span class="value">  
      <div id="showCurrency">
```

```
<%=ph(currentCurrency)%>
</div>
<div id="editCurrency" style="display:none;">
  <cic:span rendered="{empty currencyList}"
    value="{localizedUserInfoBox['NA']}" />
  <cic:select rendered="{not empty currencyList}"
    name="currencyList">
    <cic:options var="currency" valueRef="{currency.code}"
      labelRef="{currency.string}" datasourceRef="{currencyList}"
      selectedValue="{currentCurrencyCode}" />
  </cic:select>
</div>
</span>
</div>
<div class="row">
  <span class="label">
    <span class="faded"><cmgt:text id='cmgt_commerce/UserInfoBox_11'
      bundle='commerce.UserInfoBoxResources'>Last Modified:</cmgt:text>
    </span></span>
    <span class="value">
      <span><%=ph(updatedDate)%></span>
    </span>
  </div>
</fieldset>
<input type="hidden" name="Operation" value="Edit">
</form>
```

Form Submits

Make sure that you use Javascript correctly to handle the processing of form data. If you write the Javascript incorrectly, then it is possible for form data to be submitted twice.

Users may initiate a form *submit()* call either by clicking a submit button or by hitting **Enter** while in the form. If you include an *onSubmit=function()* call in your form definition, then either make sure that the function itself does not include a *submit()* call, or if it does, then make sure that you return false immediately after the submission. The form of the onSubmit attribute should follow this form:

```
<form ... onSubmit="return myEventHandler()" ... >
```

In general, write the function so that it must explicitly return true or false whatever path of execution is taken.

Frames

In general, the Sterling Multi-Channel Selling Solution deprecates the use of frames in its pages. JSP pages should be written with the assumption that the pages may be

displayed within a frameset displayed by a Web server or other application. Consequently, when you specify navigation links from one page of the Sterling Multi-Channel Selling Solution to another, you should use “_self” or “” in setting the target. For example:

```
<cic:outputLink target=""
    href="${cic:link('*', 'ApprovalDataDisplay',
    cic:concat('ShoppingCartKey=',
    approval.dataBean.shoppingCartKey), false)}">
```

The Sterling Multi-Channel Selling Solution can be run in two modes controlled by the `InFrameEnvironment` system property:

- If you set the value of this property to “false” (the default value), then the Sterling Multi-Channel Selling Solution runs in the whole browser window and it provides the top-level navigation bar.
- If you set the value of this property to “true”, then the Sterling Multi-Channel Selling Solution can run in one frame of a frameset, and the top-level navigation bar is suppressed.

However, if you use frames, then bear in mind that the child frames should be populated by using URLs that point to the Sterling Multi-Channel Selling Solution.

For example, suppose that you wish to generate a Web page by using two frames. Each frame must be generated by a JSP page:

```
<FRAMESET rows="100,*" border="0" framespacing="0" frameborder="NO">
    <FRAME name="navigation"
        src="<%= link("enterpriseMgr", "HomeNavDisplay") %>"
        MARGINWIDTH="0" MARGINHEIGHT="0" scrolling="no">
    <FRAME name="data"
        src="<%= link("enterpriseMgr", "HomeDataDisplay") %>"
        MARGINWIDTH="10" MARGINHEIGHT="0" scrolling="Auto">
</FRAMESET>
```

The `link()` method is used to generate dynamically the URLs that populate the frames. The application and command parameter ensure that the right path and parameters are generated as parts of each URL.

Cascading Style Sheets

The Sterling Multi-Channel Selling Solution makes extensive use of cascading style sheets (CSS) to ensure a uniform look-and-feel user interface across applications. You should use CSS for the following reasons:

- CSS is a standard layout language for the Web. It provides a powerful mechanism to manage a constant look-and-feel for a Web site across many pages.
- It is easy to author by hand.
- Using CSS reduces bandwidth usage because a single style sheet can specify styles for multiple pages. Once a browser has cached the style sheet it does not need to be downloaded each time a reference is made to it.
- It helps to separate style from content.

The main cascading style sheets are incorporated into JSP and HTML pages using the Javascript function *pickStyleSheet()* provided in the **com_Main.js** Javascript file.

If you want to make changes to the look-and-feel of Sterling Multi-Channel Selling Solution Web pages, then you should take care to modify the appropriate cascading style sheet rather than making changes on individual JSP or HTML pages. Do not specify styles within individual elements: this will make it very difficult to maintain a consistent look-and-feel.

If you need to introduce a new CSS for an application, then create a directory for the application under *debs_home/Sterling/en/US/css/application/*, and place your new style sheets in this location. References to the style sheets should take this form:

```
<link rel="stylesheet" href="../../css/application/custom.css"
      type="text/css">
```

By modifying the cascading style sheet for a particular locale, you can customize the user experience for the locale.

Sterling Multi-Channel Selling Solution Style Sheets

The following stylesheets are provided out-of-the-box:

- **basestylesheet.css**: provides generic styles for the basic HTML elements such as HTML, BODY, and so on.
- **buttons.css**: provides the styles for buttons. See "Buttons" on page 250 for more information.
- **calendar.css**: used to display calendars in forms.

- **color-csr.css** and **color-customer.css**: used to render colors for pages that are viewed by both customer users and enterprise customer service representatives.
- **data-table.css**: used to render tables displayed to users.
- **form.css**: used to display forms to users. See "Forms" on page 245 for more information.
- **widget.css**: used to display widgets to users.

In addition, there are the following legacy style sheets maintained to support compatibility with previous releases of the Sterling Multi-Channel Selling Solution:

- **ie_main.css**
- **internal.css**
- **nn_main.css**

In general, you should avoid customizing these style sheets because their use is deprecated.

Buttons

In general, you can use a combination of CSS and JSP tags to display buttons so that they are consistently and efficiently displayed in the Sterling Multi-Channel Selling Solution. Each button can be displayed by specifying its class and its display text.

A CSS, **buttons.css**, provides styles for the following types of buttons commonly used in the Sterling Multi-Channel Selling Solution:

TABLE 9. Button Styles

Button	Style	Background Image
Normal	normal-button	images/btn_normal_x.gif
Thin	thin-normal-button	images/btn_thin_normal_x.gif
Focus	focus-button	images/btn_focus_x.gif
Thin Focus	thin-focus-button	images/btn_thin_focus_x.gif
Mini	mini-button	images/btn_mini_resolve.gif

For example:

```
<a class="normal-button-small"
href="<%=link("*", "WorkspaceDataDisplay")%>">
<%=ph((String) localized.get("Cancel"))%>
</a>
```

or, using the `cic:output` tag:

```
<cic:outputLink rendered="${!(isCSR)}"
css="normal-button normal-button-small right"
href="javascript:changeQuantities();" >
<cic:span value="${localized['Update']}" />
</cic:outputLink>
```

Depending on the text for the button, you should select the appropriate width for the button. Except for the mini-button style, each style of button supports the following sizes:

- small: width 54px
- medium: 71px
- large: 120px
- jumbo: 150px

Tables

Tables of data should be displayed using a combination of the JSP tags and CSS stylesheets to ensure a common look-and-feel of tables across the Sterling Multi-Channel Selling Solution. See "cic:table Tag" on page 399 for a description of the `cic:table` tag.

The tag makes use of some pre-defined styles, notably the data-table style for the general table class, and the "normal" and "alternate" classes to manage the display of rows in tables.

Securing JSP Pages from Cross-Scripting Attacks

Bear in mind the possibility of a cross-scripting attack by a malicious user in which the user enters a scripting command through a text field on one of your Web pages. To protect against this sort of attack, you must use the methods provided to encode user-entered data before it is displayed in the browser's Web page.

In scriptlets, use the `ph()`, `pj()`, and `pu()` methods described in "Scriptlets" on page 243. In tags, use the encode tag (`<cmgt:encode>`) described in "encode Tag" on page 365.

JSP Fragments

If you create a re-usable JSP page fragment that can be used in several places in different JSP pages, then you can use a static include. However, note that in Release 7.0 and higher, the use of static includes is deprecated: instead, consider using dynamic includes using the `<jsp:include tag>`.

Note:	If there are no child elements of the <code>jsp:include</code> tag, then use the single tag form of the <code>jsp:include</code> tag: <code><jsp:include ... /></code> . Using the closing tag can cause problems for some servlet containers such as Tomcat 5.5.x.
--------------	---

If you do use a static include, then follow these guidelines:

- the naming convention is to give these files the `jspxf` file suffix (for example, **PopupEditDetailsjspxf**). See "JSP Page Naming Conventions" on page 252 for further information.
- Make sure that these fragments do not include the **cmgtincludejspxf** page.
- Include in the JSP pages at the appropriate position:

```
<%@ include file="../../includes/PopupEditDetailsjspxf" %>
```

Debugging JSP Pages

While creating new JSP pages or modifying existing JSP pages, you may find it helpful to insert the following at the head of the JSP page:

```
<%@ page buffer="1024kb" %>
```

The `buffer` attribute helps you to make full use of the `errorPage` attribute of the `page` directive, so that you can forward the output to a user-friendly page for debugging.

You should remove this tag before deploying the JSP pages into a production environment.

JSP Page Naming Conventions

JSP page file names should follow the following format. This file naming convention scheme requires that the containing directory encode the “application name”. For example, for those JSP pages belonging to Lead Management, the JSP page files are in the **leadMgmt/** directory or a sub-directory. Optionally, the application name can be prepended to the page name. File names should be mixed case, with the first letter of the file name capitalized.

Standard Naming Convention

Where possible, you should follow the following naming convention for your JSP pages. Each JSP page should be named: PageName + [FrameName] + (".jsp" or ".jspx") where:

- PageName = Descriptive name of the page (e.g. "LeadAssignments", "Assignments", and so on)
- FrameName = Description of the frame that this page represents (for example, "Frameset", "Body", "Header", "Popup", and so on)
- Use the suffix .jsp for JSP pages that are used to generate complete HTML pages or frames. Use thejspx suffix for JSP pages that are to be used as re-usable fragments of other pages.

Note the following guidelines:

- Prepend the word "Common" for files used across multiple applications.
- Use "Frameset" as the FrameName for the parent frame.
- Use "Popup" as the FrameName for popup windows and dialogs.

Examples

The following table provides some examples of JSP page names.

TABLE 10. JSP Page Names

JSP Page	Description
LeadAssignmentsFrameset.jsp	Lead Assignments main frame
LeadAssignmentsBody.jsp	Lead Assignments body frame
LeadCommonHeader.jsp	Common Leads header frame
LeadPartnerAdminList.jsp	Single frame page
LeadPartnerNotes.jsp	Single frame page
CloseLeadPopup.jsp	Popup single frame page

Resources

Many entities in the Sterling Multi-Channel Selling Solution can have resources associated with them: examples include products, features, and questions in Advisor. To access these, you can use a scriptlet along these lines:

```
PresFeatureEntryBean feb = (PresFeatureEntryBean) fEntries.get(m);
```

```
<%
    if (feb.getResourceValue("image") != null)
    {
%>
">
<%
    }
%>
```

The parameter for *getResourceValue()* is the name of the resource type.

Wait JSP Pages

There are times when a user initiates a process that takes a few seconds to complete, and you may want to provide a page that displays a waiting message to indicate that the Sterling Multi-Channel Selling Solution is processing the request.

You can create a page to be displayed as follows:

1. Create a message type along these lines:

```
<MessageType Name="WaitPageDisplay">
    <JSPMapping>
        ../common/WaitPageDisplay.jsp
    </JSPMapping>
    <ControllerMapping>
        com.comergent.dcm.caf.controller.ForwardController
    </ControllerMapping>
</MessageType>
```

2. Create a **WaitPageDisplay.jsp** JSP page in the **debs_home/Sterling/WEB-INF/web/en/US/common/** directory like this:

```
<%@ page contentType="text/html; charset=UTF-8" language="java"
    errorPage="../error.jsp" %>
<%@ include file="../common/cmgtinclude.jspf"%>
<%
    String appToRun = request.getParameter("appToRun");
    String cmdToRun = request.getParameter("cmdToRun");
    String originalRequest = "true";
    if (request.getParameter("originalRequest")!=null &&
        request.getParameter("originalRequest").trim().
        equalsIgnoreCase("true"))
    {
        originalRequest = "false";
    }
%>
<html>
<head>
```

```
<title>Please Wait</title>
<script type="text/javascript" language="JavaScript"
    src="../js/com_Main.js"></script>
<script type="text/javascript" language="JavaScript">
<!--
<%@ include file="../common/pickStyleSheet.jsp"%>
//-->
</script>
<script>
<!--//
function init()
{
    document.location="<%=link(appToRun, cmdToRun,
        "originalRequest="+originalRequest, true)%>";
}
//-->
</script>
</head>
<body topmargin="0" leftmargin="0" marginheight="0"
    marginwidth="0" bottommargin="0" rightmargin="0"
    onLoad="javascript:init();">
<center>
<font color="red">
    Please wait ...
</font>
</center>
</body>
</html>
```

3. Change the URL that executes the initial request from:

```
<%=link("application", "command")%>

to:
<%=link("application", "WaitPageDisplay",
    "appToRun=application&cmdToRun=command", true)%>
```

Redirecting to Full Page Access

The Sterling Multi-Channel Selling Solution makes use of frames as it displays pages to users of the system. In certain circumstances, a user may let their session expire, but then click a link or button in a frame. If this happens, then the Sterling Multi-Channel Selling Solution must redirect the user to an appropriate login page, but this must be displayed as a full browser page rather than just in the frame containing the clicked element.

To handle this situation, the Sterling Multi-Channel Selling Solution makes use of the **FullPageLoader.jsp** JSP page. This page is designed to resubmit the user's request as if it came from the top level of the browser rather than from a frame.

When the user's request is received by the server, the `DispatchServlet` recognizes an error condition (because the user's session has expired), and so invokes the `sendError()` method of the `ComergentResponse` class. This method determines if the requested message type is for a full page or for a frame, and if it is for a frame, then it invokes the `sendErrorInFrame()` method of the `ComergentResponse` class. This method calls the `localRedirect()` method and specifies the `PageLoader` message type. The `PageLoader` message type is associated with the **FullPageLoader.jsp** JSP page, and so the request is forwarded to this page.

This page makes use of a form whose action element is:

```
<FORM NAME="LoaderForm" ACTION="<%=link(appName)%>"  
      METHOD="Post" TARGET="_top">  
...  
</FORM>
```

When the page is loaded by the browser, the form is automatically submitted and so the browser now regards the response from the form submission as being for the whole browser page. Hidden parameters within the form provide values for the parameters associated with the user's original request, and so the server now executes the request: typically by forwarding the request to the appropriate login page.

This chapter presents a detailed description of the framework used to provide Online Help for the Sterling Multi-Channel Selling Solution.

Architecture

The Online Help system is built using the JavaHelp 2.0 framework developed for Web-based applications. See the *JavaHelp 2.0 System User's Guide* for a basic overview of the framework and its API.

When a user points their browser to the Sterling Multi-Channel Selling Solution and logs in, they are presented pages that provide them with access to all of the functionality supported by your implementation of the Sterling Multi-Channel Selling Solution. At any time, the intention is to provide access to the Online Help through the **Help** button.

When users click the **Help** button, a Javascript function *showHelp()* opens a secondary window known as the Help window. The Help window is populated using a URL that points to a JSP page, **help.jsp**. The typical form of this URL is:

```
http://server:port/Sterling/en/US/help.jsp?id=introduc_htm_196006
```

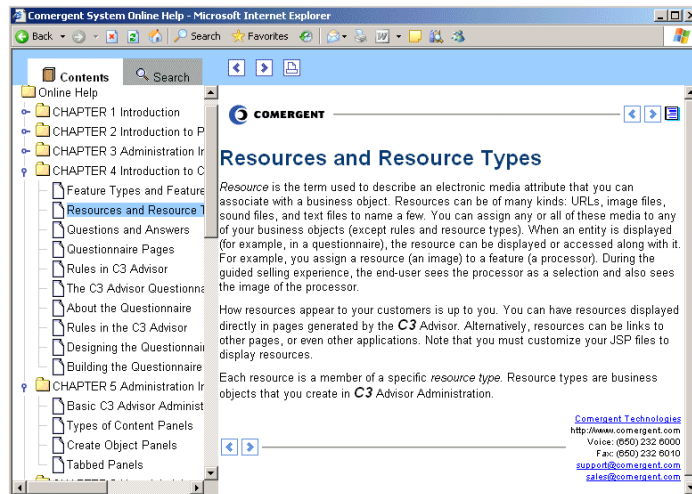


FIGURE 7. Help Window

The Help window comprises a Navigation panel on the left and a Content panel on the right. Typically, if a user click a folder or page icon in the Navigation panel, then the appropriate page is displayed in the Content panel. The Navigation panel can provide one or more views (such as a Table of Contents view and a Search view): each view is supported by a JSP page and an XML configuration file.

The locale information of the user is reflected in the *la/CO/* part of the path of the URL. See "Localization" on page 263 for information on how to localize Online Help. The id parameter of the URL is used to determine what HTML page is used to populate the Content pane of the Help window.

When the user first accesses the Help window, a `ComergentHelpBroker` object is instantiated and added to their session. This object determines what content page is displayed when the user clicks a link in the Navigation panel, and keeps track of the user's actions so that if the user closes the Help window and then returns to it, the user's current view and content page is re-displayed. The `ComergentHelpBroker` uses a `HelpSet` object to determine what views and content is provided by the Online Help system, and the `HelpSet` object is initialized using a Help Set file: **Administration.hs**.

The content of the Help window is determined by a set of configuration files as described in "Configuration Files" on page 259.

Configuration Files

The **HelpTopicsMap.xml** configuration file maintains the basic mapping between the page that the user sees and which topic ID should be used to invoke the Online help. It provides mappings in this form:

```
<Topic>
  <Page>PricingDetail</Page>
  <URL>pricinga_htm_180685</URL>
</Topic>
```

Typically, the JSP page will specify the value of the Page element, and then a call to the HelpUtil class *getID()* method will return the value of the topic ID:

```
String helpTopicID =
    com.comergent.dcm.util.HelpUtil.getID(helpTopicPage);
```

For example:

```
String helpTopicID =
    com.comergent.dcm.util.HelpUtil.getID("PricingDetail");
```

With the exception of the **HelpTopicsMap.xml** configuration file, all of the Online Help configuration and content files are stored in the **Sterling/en/US/htdocs/help/** directory and its sub-directories. The starting point for the Online Help system is its HelpSet file: this is an XML file that describes the help set: the mapping between IDs and content pages and what views are provided. The default HelpSet file is **Administration.hs**.

The HelpSet file can be loaded by the HelpSet class from any URL: if you use a standard HTTP URL, then you can use the URL as the “base” URL to retrieve the content files; if you use a file URL, then you must resolve the location of the content files relative to the URL used to access the **help.jsp** page.

HelpSet File

A standard HS file looks like this:

```
<?xml version='1.0' encoding='ISO-8859-1' ?>
<!DOCTYPE helpset
    PUBLIC "-//Sun Microsystems Inc.//DTD JavaHelp HelpSet Version
    1.0//EN"
    "http://java.sun.com/products/javahelp/helpset_1_0.dtd">

<helpset version="1.0">
  <title>Administration</title>
  <maps>
    <homeID>introduc_htm_196006</homeID>
    <mapref location="Administration.jhm" />
```

```
</maps>
<view>
  <name>Contents</name>
  <label>Administration</label>
  <type>javax.help.TOCView</type>
  <data>administ.xml</data>
</view>
<view>
  <name>Search</name>
  <label>Search</label>
  <type>javax.help.SearchView</type>
  <data engine="com.sun.java.help.search.DefaultSearchEngine">
    JavaHelpSearch
  </data>
</view>
</helpset>
```

The `maps` element specifies the location of the mapping file (in this case, **Administration.jhm**) that maps topic IDs to content HTML files. Each `type` element specifies the JSP page that will be used to display its view together with a `data` element that specifies how the data for the JSP page is to be retrieved.

Mapping File

The mapping file determines the relationship between the help IDs and the content pages:

```
<?xml version='1.0' encoding='ISO-8859-1' ?>
<!DOCTYPE map
PUBLIC "-//Sun Microsystems Inc.//DTD JavaHelp Map Version 1.0//EN"
"http://java.sun.com/products/javahelp/map_1_0.dtd">

<map version="1.0">
  <mapID target="defaultID" url="default.htm" />
  <mapID target="menu_open" url="images/menu_folder_open.gif" />
  <mapID target="introduc_htm_196006" url="introduc.htm" />
  <mapID target="introda2_htm_211183" url="introda2.htm" />
  ...
</map>
```

Table of Contents File

The table of contents view is controlled by the **administ.xml** configuration file.

```
<?xml version='1.0' encoding='ISO-8859-1' ?>
<!DOCTYPE toc
PUBLIC "-//Sun Microsystems Inc.//DTD JavaHelp TOC Version 1.0//EN"
"http://java.sun.com/products/javahelp/toc_1_0.dtd">
```



```
<toc version="1.0" categoryclosedimage="menu_closed"
      categoryopenimage="menu_open" topicimage="topic" >
  <tocitem text="Online Help">
    <tocitem target="introduc_htm_196006"
      text="CHAPTER 1 Introduction" expand="false">
      <tocitem target="introda2_htm_211183"
        text="Managing the Sales Channel" expand="false"/>
      <tocitem target="introda3_htm_218019"
        text="Using C3 Partner.com" expand="false"/>
    ...
  </toc>
```

The toc element contains a nested set of tocitem elements that can be organized hierarchically to provide the Table of Contents elements. Each tocitem's target attribute provides the target ID for its content and a text attribute whose value is displayed in the Table of Contents view.

Search Files

The configuration files used to provide the Search functionality are contained in the **JavaHelpSearch/** sub-directory. Typically, these are generated files using a utility such as the jhindexer utility that comes with JavaHelp 2.0.

Tag Library

A small tag library is used to help render the Navigation panel: this is provided by the **jh.jar** library file and specified by the **jhlib.tld** tag library descriptor file.

Customizing Online Help

You can customize the Online Help for your implementation of the Sterling Multi-Channel Selling Solution in different ways. This section describes some of these in ascending order of complexity.

Page Format

You can change the look-and-feel of the Online Help pages by making modifications to the **help.css** cascading style sheet file.

Screen Shots

If you have changed the look-and-feel of the Sterling Multi-Channel Selling Solution pages, then you can take new screen shots of the new pages, and overwrite the corresponding GIF files provided by the out-of-the-box Online Help. These are all located in the **images/** sub-directory under the **help/** directory.

Content Pages

If your implementation has made changes to Sterling Multi-Channel Selling Solution that go beyond the look-and-feel of the pages, such as adding new fields on administration pages, then you can update the corresponding HTML files and merge them into the deployed WAR file.

For example, suppose that you want to change the description of the *To Assign an Account to an Enterprise Node* task which is covered in the **account3.htm** content file. Simply use the customize target of the SDK to extract this file into your project, and edit the file as required. When you next build your project, the modified file will be built into the Online Help.

Adding Content Files

If your changes to the Sterling Multi-Channel Selling Solution mean that you need to make greater changes to the Online Help, then you may need to create new HTML content pages. When you do so, you should bear in mind the following factors:

- Where in the overall flow of the Online Help do you want to insert the new content? New pages will need to be added to the TOC file (**administ.xml**) and you may need to fix the **Next** and **Previous** links of pages on either side so that users clicking through pages will get the right sequence of pages.
- What topic IDs should be used to point to the new content? Edit the JHM file to add these topic IDs and their corresponding references.
- Re-run the Search utility (such as `jhindexer`) to ensure that the new content is searchable.

Adding Views

It is possible to add new views to the Navigation panel. For example, you might want to provide access to the Index through a view, or you may want to provide a view that lists all the tasks supported by the Sterling Multi-Channel Selling Solution or frequently asked questions.

To add a view, you must add a new view element to the **Administration.hs** HelpSet file, and provide the corresponding JSP page used to render the view. For example, you can use the following view element to add an Index view:

```
<view>
  <name>Index</name>
  <label>Index</label>
  <type>javax.help.IndexView</type>
```

```
<data>adminind.xml</data>
</view>
```

The **adminind.xml** file would provide the list of index entries. Its standard format is:

```
<?xml version='1.0' encoding='ISO-8859-1' ?>
<!DOCTYPE index
PUBLIC "-//Sun Microsystems Inc.//DTD JavaHelp Index Version 1.0//EN"
"http://java.sun.com/products/javahelp/index_1_0.dtd">

<index version="1.0">
  </indexitem>
  <indexitem text="$">
    <indexitem target="advvisu2_htm_232095"
      text="notation in models"/>
    <indexitem target="pricing6_htm_202726"
      text="used to denote shared price lists"/>
  ...
</index>
```

The **javax.help.Indexview.jsp** page can be used to render this view.

Bear in mind that custom views will require new JSP pages and often new tag classes to render the content of the new view. You must also consider how to create the content for the new view or how to link to existing content from the new view.

Localization

You can provide Online Help for as many as different locales as your implementation of the Sterling Multi-Channel Selling Solution supports. To add support for a new locale, say *la_CO*, follow these steps:

1. As part of the addition of the new locale to the Sterling Multi-Channel Selling Solution, you should have already created a new directory structure for the new locale under the **Sterling/** directory: say, **Sterling/la/CO/**, and copied over all of the static content (including the Online Help files) from the **Sterling/en/US/** directory.
2. In the **Sterling/la/CO/htdocs/help/** directory, modify the **administ.xml** file by translating the text attribute of each tocitem.
3. Translate each HTML file in **Sterling/la/CO/htdocs/help/** for your new locale.
4. Make other changes as appropriate to the HTML pages as described in "Customizing Online Help" on page 261.

Note that the current content for the Online Help system is generated automatically using WebWorks Publisher from the FrameMaker files that are used to create the *Sterling Multi-Channel Selling Solution Administration Guide*. If your translation project is intended to re-create the entirety of the Online Help system for a new language, then it will be more efficient to translate the source FrameMaker files, and then use WebWorks to re-generate the Online Help for the new language.

This chapter covers a number of topics related to the use of the data services layer of the Sterling Multi-Channel Selling Solution:

- "How to Specify a Query" on page 265
- "Using UpdateHelper and DsUpdate" on page 276
- "Oracle Hints" on page 279
- "Stored Procedures" on page 280
- "Pagination" on page 284
- "Performance Optimization" on page 285
- "Join Types" on page 288
- "Transactions" on page 291
- "Detailed Commit Functionality Description" on page 294

How to Specify a Query

This section describes the use of the DsQuery and QueryHelper classes to create and modify complex SQL queries that can be used in *restore()* operations. Data beans and the IData interfaces support *restore()* methods that take a DsQuery object

as a parameter. These parameters enable you to specify a more complex SQL query to be used to retrieve data from the data source.

DsQuery classes are intended to replace the use of the `com.comergent.dcm.qbe.Query` class which is now deprecated. In general, you should exclusively use the DsQuery class to create complex queries.

For example, using the QueryHelper to build a DsQuery, you can specify that only data objects whose values of a particular data field match specified values should be returned, or you can specify the sort order in which data objects should be returned.

A new QueryHelper class exists to support the creation of custom search queries. It contains a number of methods that return DsQuery instances. These methods can either create new WHERE clauses, or combine existing ones. The resulting DsQuery tree is passed as a parameter to the DataBean *restore()* method.

The following methods are provided by the QueryHelper class:

- `newWhereClause` Methods
- `newSubQuery` Method
- `joinWhereClauses` Method
- `addWhereClause` Method
- `addSubQuery` Method
- `freeQuery` Method

The following methods are provided by the DsQuery class:

- `debugPrintTree` Method

DataBean classes provide the following method to help you debug problems with restore and persist calls.

- `debugPrintSql` Method

QueryHelper Methods

The QueryHelper class supports the following methods:

***newWhereClause* Methods**

```
public static DsQuery newWhereClause(String elementName,  
    int comparisonOperator,  
    Object value)
```

This method creates a WHERE clause element of the form:

```
(element comparisonOperator value)
```

Using an ArrayList of Values

```
public static DsQuery newWhereClause(String elementName,  
    int comparisonOperator,  
    ArrayList values)
```

This method will create a WHERE clause of the form:

```
((element comparisonOperator value1) OR (element comparisonsOperator  
value2) OR ...)
```

This may be transformed to:

```
(element IN (value1, value2...))
```

newSubQuery Method

```
public static DsQuery newSubQuery(String elemName,  
    String subqueryDataObjNm  
    DsQuery subquery)
```

This method creates a WHERE clause element of the form:

```
(element IN (SELECT...))
```

It uses the first key of the DataObject as output from the subquery.

```
public static DsQuery newSubQuery(String elemName,  
    String subqueryDataObjNm,  
    String returnElemName,  
    DsQuery subquery)
```

This method differs in that it allows the application to specify which element value to return from the sub-query Data Object.

```
public static newSubQuery(String elementName,  
    String subqueryDataObjName,  
    String returnElement,  
    DsQuery subquery)
```

This method enables you to specify the return element name from a sub-query as opposed to the other forms of this method which return the first key element.

joinWhereClauses Method

```
public static DsQuery joinWhereClauses(DsQuery left,  
    int logicalOperator,  
    DsQuery right)
```

This method applies a logical operator to two previously created DsQuery elements. If you have created the following:

```
q1 = QueryHelper.newWhereClause("CartKey", DsQueryOperators.EQUALS,
    new Long(1));
q2 = QueryHelper.newWhereClause("CartName", DsQueryOperators.EQUALS,
    "My Cart");
```

then

```
query = QueryHelper.joinWhereClauses(q1, DsQueryOperators.OR, q2);
```

will generate a SQL WHERE clause of the form:

```
((CART_KEY = 1) OR (CART_NAME = 'My Cart'))
```

Joining a List of WHERE Clauses

You can provide a list of DsQuery objects and these will be joined using the specified operator as follows:

```
public static DsQuery joinWhereClauses(int logicalOperator,
    ArrayList nodes)
```

This method applies a logical operator to an ArrayList of previously created DsQuery elements. If you have created the following:

```
q1 = QueryHelper.newWhereClause("CartKey", DsQueryOperators.EQUALS,
    new Long(1));
q2 = QueryHelper.newWhereClause("CartKey", DsQueryOperators.EQUALS,
    new Long(2));
q3 = QueryHelper.newWhereClause("CartKey", DsQueryOperators.EQUALS,
    new Long(3));
nodeArrayList.add(q1);
nodeArrayList.add(q2);
nodeArrayList.add(q3);
```

then

```
query = QueryHelper.joinWhereClauses(DsQueryOperators.OR,
    nodeArrayList);
```

will generate a SQL WHERE clause of the form:

```
((CART_KEY = 1) OR ((CART_KEY = 2) OR (CART_KEY = 3)))
```

addWhereClause Method

You can add to WHERE clauses as follows:

```
public static DsQuery addWhereClause(DsQuery query,
    int logicalOperator,
    String elementName,
    int comparisonOperator,
    Object value)
```

This is a helper method, equivalent to:


```
q1 = QueryHelper.newWhereClause(oldQuery, element,
    comparisonOperator, value);
query = QueryHelper.joinWhereClauses(oldQuery, logicalOperator, q1);
```

This method adds a WHERE clause element of the form:

```
(oldQuery) logicalOperator (element comparisonOperator value)
```

addSubQuery Method

```
public static DsQuery addSubquery(DsQuery query,
    int logicalOperator,
    String element,
    String subqueryDataObjNm,
    DsQuery subquery)
```

This is a helper method, equivalent to:

```
q1 = QueryHelper.newSubquery(element, subqueryDataObjName, subquery);
q2 = QueryHelper.joinWhereClauses(oldQuery, logicalOperator, q1);
```

This method adds a subquery of the form:

```
(oldQuery) logicalOperator (element IN (SELECT...))
```

It uses the first key of the DataObject as output from the subquery.

```
public static DsQuery addSubquery(DsQuery query, int logicalOperator,
    String elementName,
    String subqueryDataObjName,
    String returnElement,
    DsQuery subquery)
```

This form of the method enables you to specify the returned element as opposed to the first key element.

freeQuery Method

```
public void freeQuery(DsQuery query)
```

This method releases all nodes of a DsQuery tree to the pool for reuse.

Attention: It is important that the application invoke this method when the query is no longer needed.

DsQuery Methods

The following methods are provided by the DsQuery class.

debugPrintTree Method

```
public void debugPrintTree(String heading, PrintStream stream)
```

This method is for debugging. It prints a formatted dump of the DsQuery tree. The heading parameter is a mandatory text string that will prefix all printed lines.

DataBean Methods

The following method is available on the DataBean class.

debugPrintSql Method

```
public void debugPrintSql(DataContext context,
    DsQuery query,
    String heading,
    PrintStream stream)
```

This method is for debugging. It generates the resulting SQL query and writes a formatted version to the PrintStream. The heading parameter is a mandatory text string that will prefix all printed lines. This method has to be on the DataBean in order to have appropriate context to generate the SQL.

Using LIKE Calls

There is no explicit LIKE operator. You can use EQUALS or EQUALS_IGNORE_CASE and transform to the equivalent of a LIKE clause using wild card characters.

For example, suppose that you have a case where the data in the Knowledgebase is in mixed case, and the condition you want in the WHERE clause is ‘toupper(PartnerName) like "%ABC%"’. In this case, you use the EQUALS_IGNORE_CASE operator: for example:

```
DsQuery temp_DsQuery =
    QueryHelper.newWhereClause("PartnerName",
        DsQueryOperators.EQUALS_IGNORE_CASE, "*ABC*");
```

If you use “*”, then you can also use other wildcard characters that the database server will understand: such as “_” and “%” with Oracle and “_” with SQL Server.

Note that using * to the left of a String in the value parameter to indicate that you want to match occurrences of a string with any preceding string can significantly impact the performance of the query and hence of the application.

Examples

Example 1: Simple Search Query

Search for Partner Name containing “micro” in any case.

```
DataContext context = new DataContext();
PartnerBean partner = new PartnerBean();
```

```
DsQuery qry = QueryHelper.newWhereClause("PartnerName",
    DsQueryOperators.EQUALS_IGNORE_CASE, "*micro*");
partner.restore(context, qry);
qry.free();
```

During the restore operation, this will generate:

```
SELECT CMGT_PARTNERS.PARTNER_KEY...
FROM CMGT_PARTNERS
WHERE UPPER(CMGT_PARTNERS.PARTNER_NAME) LIKE '%MICRO%';
```

Example 2: Search Query with Three Values

Search for Partner in Territory 1, 2, or 3.

```
DataContext context = new DataContext();
Integer i1 = new Integer(1);
Integer i2 = new Integer(2);
Integer i3 = new Integer(3);
ArrayList values = new ArrayList (3);
values.add(i1);
values.add(i2);
values.add(i3);
PartnerBean partner = new PartnerBean();
DsQuery qry = QueryHelper.newWhereClause("TerritoryKey",
    DsQueryOperators.EQUALS, values);
partner.restore(context, qry);
qry.free();
```

During the restore, this will generate:

```
SELECT CMGT_PARTNERS.PARTNER_KEY...
FROM CMGT_PARTNERS
WHERE CMGT_PARTNERS.TERRITORY_KEY IN (1, 2, 3);
```

Example 3: Sub-query with Two Values

Search for Partners in State “CA” and in City “San Francisco”.

```
DataContext context = new DataContext();
DsQuery query;
PartnerBean partner = new PartnerBean();
// match the State
query = QueryHelper.newWhereClause("State",
    DsQueryOperators.EQUALS, "CA");
// Add a match on City
query = QueryHelper.addWhereClause (query, DsQueryOperators.AND,
    "City", DsQueryOperators.EQUALS, "San Francisco");
// Convert it to a subquery of PartnerAddress
query = QueryHelper.addSubQuery("AddressKey",
    "PartnerAddress", query);
partner.restore(context, query);
```

```
query.free();
```

During the restore operation, this will generate:

```
SELECT CMGT_PARTNERS.PARTNER_KEY...
FROM CMGT_PARTNERS
WHERE CMGT_PARTNERS.ADDRESS_KEY IN
(SELECT CMGT_ADDRESSES.ADDRESS_KEY
FROM CMGT_ADDRESSES
WHERE CMGT_ADDRESSES.STATE = 'CA'
AND CMGT_ADDRESSES.CITY = 'San Francisco');
```

Example 4: INTERSECT with Two Values

Find products for two different features.

Attention: The INTERSECT operator can only be applied to subqueries, and those subqueries must return identical result columns.

```
DataContext context = new DataContext();
DsQuery q1, q2, finalQuery;
ProductBean product = new ProductBean();
// specify the first Feature and convert it to a subquery
q1 = QueryHelper.newWhereClause("FeatureKey",
    DsQueryOperators.EQUALS, fKey1);
q1 = QueryHelper.newSubQuery("ProductId",
    "ProductXFeature", q1);
// specify the second Feature and convert it to a subquery
q2 = QueryHelper.newWhereClause("FeatureKey",
    DsQueryOperators.EQUALS, fKey2);
q2 = partner.newSubQuery("ProductId",
    "ProductXFeature", q2);
// INTERSECT the 2 subqueries
finalQuery = QueryHelper.joinWhereClauses(q1,
    DsQueryOperators.INTERSECT, q2);
product.restore(context, query);
finalQuery.free();
```

During the restore, this will generate:

```
SELECT CMGT_PRODUCTS.PRODUCT_ID...
FROM CMGT_PRODUCTS
WHERE CMGT_PRODUCTS.PRODUCT_ID IN
INTERSECT
((SELECT CMGT_PRODUCT_X_FEATURE.PRODUCT_ID
FROM CMGT_PRODUCT_X_FEATURE
WHERE CMGT_PRODUCT_X_FEATURE.FEATURE_KEY = ?)
INTERSECT
((SELECT CMGT_PRODUCT_X_FEATURE.PRODUCT_ID
FROM CMGT_PRODUCT_X_FEATURE
```

```
WHERE CMGT_PRODUCT_X_FEATURE.FEATURE_KEY = ?)
```

Example 5: Using Two Sub-queries

Assume that we have a Partner data object which has an Address child data object and a Vertical child data object. If we want to find all Partners which have Partner.type = “XYZ” and Address.city = “Boston” and Vertical.name = “Government”:

```
DataContext context = new DataContext();
DsQuery query, subq1, subq2;
PartnerBean partner = new PartnerBean();
// Specify the Partner.type
q1 = QueryHelper.newWhereClause("Type",
    DsQueryOperators.EQUALS, "XYZ");
// Specify the Address.city
subq1 = QueryHelper.newWhereClause("City",
    DsQueryOperators.EQUALS, "Boston");
// Tell it to use the "Address" DataObject for the subquery
subq1 = QueryHelper.newSubQuery("AddressKey",
    "Address", subq1);
// Join the 1st where clause with the subquery
query = QueryHelper.joinWhereClauses(query,
    DsQueryOperators.AND, subq1);
// Specify the Vertical.Name
subq2 = QueryHelper.newWhereClause("Name",
    DsQueryOperators.EQUALS, "Government");
// Tell it to use the "Vertical" DataObject for the subquery
subq2 = QueryHelper.newSubQuery("VerticalKey",
    "Vertical", subq1);
// Add this new subquery to the existing one.
query = QueryHelper.joinWhereClauses(query,
    DsQueryOperators.AND, subq2);
partner.restore(context, query);
finalQuery.free();
```

During the restore, this generates:

```
SELECT CMGT_PARTNERS.PARTNER_KEY...
FROM CMGT_PARTNERS
WHERE CMGT_PARTNERS.TYPE = 'XYZ'
AND CMGT_PARTNERS.ADDRESS_KEY IN
(SELECT CMGT_ADDRESSES.ADDRESS_KEY
FROM CMGT_ADDRESSES
WHERE CMGT_ADDRESSES.CITY = 'Boston')
(SELECT CMGT_VERTICALS.VERTICAL_KEY
FROM CMGT_VERTICALS
WHERE CMGT_VERTICALS.NAME = 'Government');
```

Note: This works even if the Partner Business Object does not have Vertical or Address data objects included as children. The new query mechanism is capable of generating subqueries from DataObjects that are not referenced in the data object.

Example 6: Subquery Using the Child of a Child

Assume that you have an Order data object which has a LineItem child data object which itself has a SerialItem child data object. If we want to find all Orders which have SerialItem.type = “XYZ”, then code along these lines will work:

```
DataContext context = new DataContext();
DsQuery query;
OrderBean order = new OrderBean();
// Specify the Partner.type
query = QueryHelper.newWhereClause("Type", DsQueryOperators.EQUALS,
    "XYZ");
// Tell it to use the new WHERE clause in a subquery of the
// "Vertical" DataObject
query = QueryHelper.newSubQuery("LineItemKey", "SerialItem", subq1);
// Tell it to use the subquery results in a subquery of the
// "LineItem" DataObject
query = QueryHelper.newSubQuery("OrderKey", "LineItem", query);
order.restore(context, query);
```

During the restore, this will generate:

```
SELECT CMGT_ORDERS.ORDER_KEY...
FROM CMGT_ORDERS
WHERE CMGT_ORDERS.ORDER_KEY IN
    (SELECT CMGT_ORDER_LINES.ORDER_KEY
     FROM CMGT_ORDER_LINES
     WHERE CMGT_ORDER_LINES.LINE_ITEM_KEY IN
        (SELECT CMGT_ORDER_SERIAL_ITEMS.LINE_ITEM_KEY
         FROM CMGT_ORDER_SERIAL_ITEMS
         WHERE CMGT_ORDER_SERIAL_ITEMS.TYPE = 'XYZ'));
```

How to Specify Sort Order

The following methods are available on the DataBean class:

- addSort Method
- insertSort Method
- clearSort Method

They provide a simple interface for adding sort criteria, or modifying existing criteria. The sort criteria are preserved following a restore operation. This allows an existing sort to be qualified by adding or inserting additional criteria. If this is not desired, then the clearSort method can be used to drop the existing criteria.

addSort Method

```
public void addSort(String sortBy, boolean ascending)
```

This method appends to the sort order.

insertSort Method

```
public void insertSort(String sortBy, boolean ascending)
```

This method inserts into the sort order. This is setting the high order sort entry.

clearSort Method

```
public void clearSort()
```

This method clears all current sort settings.

Example 1: Sort on One Element Ascending

```
AddressListBean addrList = new AddressListBean();
AddrList.addSort("State", DsConstants.ASCENDING);
AddrList.restore(contetx, null);
```

Example 2: Sort on One Element Ascending, One Element Descending

```
AddressListBean addrList = new AddressListBean();
AddrList.addSort("State", DsConstants.ASCENDING);
AddrList.addSort("City", DsConstants.DECENDING);
AddrList.restore(contetx, null);
```

Example 3: Add New High Order Sort

```
AddressListBean addrList = new AddressListBean();
AddrList.addSort("City", DsConstants.DECENDING);
AddressList.restore();
// Now modify it to first sort on "State"
AddrList.insertSort("State", DsConstants.ASCENDING);
AddrList.restore(contetx, null);
```

Query Constants***DsQueryOperators***

The DsQueryOperators interface defines string constants for both logical and comparison operators specified in a DsQuery.

```
package com.comergent.dcm.dataservices;
```

```
public interface DsQueryOperators
{
    public static final int NOT_SET = -1;
    public static final int AND = 0;
    public static final int OR = 1;
```

```
public static final int INTERSECT = 2;
public static final int MAX_LOGICAL_OP = 2;
public static final int MIN_COMPARISON_OP = 3;
public static final int EQUALS = 3;
public static final int EQUALS_IGNORE_CASE = 4;
public static final int NOT_EQUALS = 5;
public static final int GT = 6;
public static final int GE = 7;
public static final int LT = 8;
public static final int LE = 9;
public static final int LIKE = 10;
public static final int CONTAINS = 11;
public static final int SUBQUERY = 12;
public static final int NOT_IN_SUBQUERY = 13;
public static final int LEFT_OUTER_EQUALS = 14;
public static final int INVALID = 15;
}
```

DsConstants

The *DsConstants* interface defines string constants for use by Data Services clients. This class extends *DsQueryOperators* in order to provide a single source, but not break existing code.

```
package com.comergent.dcm.dataservices;

public interface DsConstants extends DsQueryOperators
{
    public static final boolean ASCENDING = true;
    public static final boolean DESCENDING = false;
    public static final int NO_LIMIT = -1;
    public static final String NULL = "NULL";
}
```

Using UpdateHelper and DsUpdate

There are times when you need to update multiple data objects with the same change. The *DsUpdate* class provides a mechanism to do this as described in this section. In general, you should use the *UpdateHelper* class to work with *DsUpdate* because it provides a number of methods that help construct *DsUpdate* objects.

You use an instance of the *DsUpdate* class in conjunction with the *DataContext* class. You use the *addFieldUpdate()* method of a *DsUpdate* object to specify which field should be updated and with what value. Each field to be updated is represented by a *DsUpdateField* object. When *persist()* is invoked on a data bean, and the associated *DataContext* has a specified *DsUpdate* object, then the fields of the databean are updated with the values as specified by the *DsUpdateField* objects.

The UpdateHelper class provides three methods that return IDsUpdate interfaces. These methods can be used to request an Update, Delete (logical delete), or Erase (database delete) operation.

The following steps are required to issue a request:

1. Use the QueryHelper to create a DsQuery that specifies the WHERE clause for the request.
2. Obtain an instance of the DataBean for which the update operation is to be performed.
3. Use one of the methods on the UpdateHelper to specify the desired type of operation and obtain an IDsUpdate interface.
4. Optionally specify additional SET statements (for updates only) using the IDsUpdate interface.
5. Invoke *persist()* on the IDsUpdate.

Note the following:

- All UpdateHelper methods are static. The UpdateHelper does not need to be directly instantiated.
- The IDsUpdate interfaces cannot currently be enlisted in a Transaction or ActiveTransaction.

For a detailed examples of how to create complex WHERE clauses, please refer to "DsQuery Methods" on page 269.

UpdateHelper Methods

newDelete Method

```
public static IDsUpdate newDelete(IData bean, IDsQuery query)
```

This method creates a MARK INACTIVE request of the form:

```
UPDATE TABLE SET ACTIVE_FLAG = 'N' WHERE where clause from query
```

newErase Method

```
public static IDsUpdate newErase(IData bean, IDsQuery query)
```

This method creates a DELETE request of the form:

```
DELETE FROM TABLE WHERE where clause from query
```

newUpdate Method

```
public static IDsUpdate newUpdate(IData bean, String elementName,
```

```
int updateOperator, Object value, DsQuery query)
```

This method will create an UPDATE request of the form:

```
UPDATE TABLE SET COLUMN = COLUMN UPDATEOPERATOR VALUE WHERE where  
clause from query
```

Or for an assignment operator:

```
UPDATE TABLE SET COLUMN = VALUE WHERE where clause from query
```

IDsUpdate Methods

addFieldUpdate Method

```
public void addFieldUpdate(String elementName, int updateOperator,  
    Object value)
```

This method adds a “SET” clause to the request. This must be invoked once for each additional Element to be updated.

persist Method

```
public void persist() throws ICCEException
```

This method persists and commits the request.

debugPrint Method

```
public void debugPrint(String heading, PrintStream stream)
```

This method performs a formatted dump of the internal DsUpdate and DsQuery structures.

debugPrintSql Method

```
public void debugPrintSql(String heading, PrintStream stream)  
    throws ICCEException
```

This method dumps the SQL that would be generated by the specified DsUpdate request.

Operators

You can use the following operators in the update operation:

- ASSIGN
- ADD
- SUBTRACT
- MULTIPLY
- DIVIDE

Example

Suppose that you want to update all partner profiles for partners whose name includes the string “micro” by setting their partner type to “2”.

```
PartnerBean partner = new PartnerBean();
DsQuery query = QueryHelper.newWhereClause("PartnerName",
    DsQueryOperators.EQUALS_IGNORE_CASE,
    "*micro*");
IDsUpdate update = UpdateHelper.newUpdate(partner, PartnerType,
    DsUpdateOperators.ASSIGN, new Long(2), query);
update.persist();
```

During the persist operation, this will generate the following SQL:

```
UPDATE CMGT_PARTNERS
SET PARTNER_TYPE = 2
WHERE UPPER(PARTNER_NAME) LIKE '%MICRO%';
```

Oracle Hints

If your Knowledgebase is running on an Oracle database server, then you can take advantage of Oracle Hints to improve the performance of your system. This section describes how to use Oracle Hints. It covers:

- What are Oracle Hints?
- What support is available for Oracle Hints?
- When should I use Oracle Hints?
- How do I specify an Oracle Hint for the primary query?
- How do I specify an Oracle Hint for a sub-query?
- What is the Oracle Hints syntax?

What are Oracle Hints?

The Oracle database server provides a "Hints" mechanism that is used to provide information to the Oracle Query Optimizer on how best to execute a SQL request. These "Hints" are embedded directly in the SQL to be executed.

What support is available for Oracle Hints?

Beginning in Release 6.3, the Sterling Multi-Channel Selling Solution has added support for “Hints” in both the primary query and in sub-queries specified using the DsQuery mechanism.

When should I use Oracle Hints?

Oracle Hints should be used if there are performance issues with a specific database query. The Oracle Query Optimizer can be used to evaluate execution plans and estimated costs for a query. The query execution plan can then be fine-tuned using the hints mechanism and the appropriate hint can then be provided at execution time.

How do I specify an Oracle Hint for the primary query?

The DataBean and IData interface now provide the following method to specify an Oracle Hint:

```
public void setQueryHint(String queryHint)
```

This method is available on all generated Bean classes and all generated IData interfaces. It adds the specified queryHint to the SQL statement immediately following the SELECT keyword.

How do I specify an Oracle Hint for a sub-query?

The Sterling Multi-Channel Selling Solution added an overload of the *newSubQuery()* method to the QueryHelper class that includes a Hint parameter. The full method signature is:

```
public static DsQuery newSubQuery(String elementName,  
    String subqueryDataObjName, String returnElement,  
    DsQuery subquery, boolean showInactive, String queryHint)
```

The queryHint is inserted immediately following the SELECT keyword for the specified subquery.

What is the Oracle Hints syntax?

For detailed information on the Oracle Hints syntax, please refer to the version-specific Oracle documentation. Since the Sterling Multi-Channel Selling Solution directly inserts the provided string into the SELECT statement, we can support all possible hints.

Stored Procedures

This section describes the use of stored procedures in data objects.

- What support is available for Stored Procedures in Release 6.0?
- What Stored Procedure support has been added in Release 6.3?
- What are the limitations on Stored Procedure support?

- How do I map a data object to a database stored procedure?
- Examples
 - Sample DataObject using Output Parameters
 - Sample DataObject using Result Parameters
 - Sample Oracle Stored Procedure returning a Result Set

What support is available for Stored Procedures in Release 6.0?

- Only Oracle stored procedures are supported.
- Input and Output parameters are supported.
- IN/OUT parameters and result sets are not supported.

What Stored Procedure support has been added in Release 6.3?

In Release 6.3 and later, the Sterling Multi-Channel Selling Solution has added support for the following:

- Microsoft SQL Server stored procedures are now supported.
- The Sterling Multi-Channel Selling Solution supports returning result sets from stored procedures.

What are the limitations on Stored Procedure support?

The Sterling Multi-Channel Selling Solution does not support IN/OUT parameters. These are not available in all supported database servers. The Sterling Multi-Channel Selling Solution does not support the use of output parameters and result sets within the same data object. It is possible for a data object to specify a child data object that also references a stored procedure. The Sterling Multi-Channel Selling Solution does not support Collection-based parameters such as Oracle's support of Vectors of values.

Database stored procedures do not support variable parameter lists. This imposes some limitations on qualifying what data will be returned by a stored procedure. Data objects can only be mapped to a single database stored procedure. This means that it is not possible to use one stored procedure for retrieval of data and a different stored procedure for persistence. Non-result set based stored procedures can be written so that a parameter indicates the type of operation to be performed, but this significantly complicates the logic of the stored procedure.

Due to the limitations of database stored procedures, it is not possible to persist changes to data retrieved using the stored procedure result set mechanism.

Database stored procedures do not support variable parameter lists. This imposes some limitations on qualifying what data will be returned by a stored procedure.

How do I map a data object to a database stored procedure?

Tying a data object to a stored procedure can be accomplished as follows. In the XML data object definition file for the data object:

1. Specify the stored procedure name in the ExternalName attribute of the DataObject. For Oracle, the stored procedure name should be prefixed by its package name.
2. Specify the SourceType attribute for the data object and assign it a value of "2".
3. Specify all input parameters as data fields with a ParameterType attribute value of "IN".
4. Ensure all input parameters are also specified as key fields.
5. Specify all output parameters as data fields with a ParameterType attribute value of "OUT". You must also specify an ExternalFieldName attribute for these fields. This is not used and so you can set any value for the attribute.
6. Specify all result parameters as data fields with a ParameterType attribute value of "RESULT". Note that the result set is returned directly by the procedure call. The result parameters correspond to the columns that comprise the result set.

Examples

Sample DataObject using Output Parameters

```
<DataObject Name="SampleProcedure"
  ExternalName="SAMPLE_PROCEDURE.SEARCH_BY_DESC"
  Access="RWID" Ordinality="n" ObjectType="JDBC" SourceType="2"
  Version="6.3">
  <KeyFields>
    <KeyField Name="ProductID"/>
  </KeyFields>
  <DataFieldList>
    <DataField Name="ProductID" Writable="y" Mandatory="n"
      ParameterType="IN"/>
    <DataField Name="Name" Writable="n" Mandatory="n"
      ParameterType="OUT" ExternalFieldName="placeholder" />
    <DataField Name="Description" Writable="n" Mandatory="n"
      ParameterType="OUT" ExternalFieldName="placeholder" />
  </DataFieldList>
</DataObject>
```

Sample DataObject using Result Parameters

```
<?xml version="1.0"?>
<DataObject Name="SampleProcedure"
  ExternalName="SAMPLE_PROCEDURE.SEARCH_BY_DESC" Access="RWID"
  Ordinality="n" ObjectType="JDBC" SourceType="2" Version="6.3">
  <KeyFields>
    <KeyField ExternalName="DESCRIPTION"/>
    <KeyField ExternalName="ROWNUM"/>
  </KeyFields>
  <DataFieldList>
    <DataField Name="SearchString" Writable="y" Mandatory="n"
      ParameterType="IN"/>
    <DataField Name="MaxRowCount" Writable="y" Mandatory="n"
      ParameterType="IN"/>
    <DataField Name="ProductID" Writable="n" Mandatory="n"
      ParameterType="RESULT"/>
    <DataField Name="Name" Writable="n" Mandatory="n"
      ParameterType="RESULT"/>
    <DataField Name="Description" Writable="n" Mandatory="n"
      ParameterType="RESULT"/>
  </DataFieldList>
</DataObject>
```

Sample Oracle Stored Procedure returning a Result Set

```
CREATE OR REPLACE PACKAGE
sample_procedure AS
TYPE search_rec IS RECORD(
sku_name cmgt_product.sku_name%TYPE,
NAME cmgt_product_locale.NAME%TYPE,
DESCRIPTION cmgt_product_locale.DESCRPTION%TYPE);
TYPE search_result
IS REF CURSOR RETURN search_rec;
FUNCTION
search_by_desc(desc_str in varchar2, max_row_count in number) RETURN
search_result;
END sample_procedure;
/
show errors

CREATE OR REPLACE PACKAGE BODY
sample_procedure AS
FUNCTION search_by_desc(desc_str in varchar2, max_row_count in number)
RETURN search_result IS
rc search_result;
BEGIN
OPEN rc for
SELECT cmgt_product.sku_name,
cmgt_product_locale.NAME,
```

```
cmgt_product_locale.DESCRPTION
FROM cmgt_product, cmgt_product_locale
WHERE rownum < max_row_count
AND UPPER(cmgt_product_locale.DESCRPTION)
LIKE desc_str
AND cmgt_product_locale.sku_name
= cmgt_product.sku_name(+)
AND cmgt_product_locale.locale
= 'en_US'
ORDER BY cmgt_product.sku_name;
RETURN rc;
END;
END sample_procedure;
/
show errors
```

Pagination

This section describes how you can use the built-in pagination capabilities to handle large lists of data objects. An example of its usage is provided in "Pagination" on page 206.

How do I get a Paginated Result Set?

When a `DataListBean.restore()` is invoked, the first page of results is returned immediately. If there is more than a single page of data, then page files will be created asynchronously.

How do I tell if I have more than one page of results?

The `DataListBean.moreResults()` method will return true.

How do I tell if there are more pages in the page set?

The `DataListBean.morePages()` method will return true.

What happens if I ask for a page that does not exist?

If the page is still being created, then the `DataListBean.getNextPage()` method will wait. If the pagination set has been completely built and the requested page does not exist, then `getNextPage()` will return false.

If I make changes, then will they appear in the page files?

If you perform a `persist()` on a paginated `DataListBean`, then the changes are first persisted to the database, and only then is the relevant page file rewritten.

How do I control the number of results per page?

By default, the number of results per page is controlled by the NumPerCachePage element in the **DataServices.xml** property file. A value of “-1” indicates no limit. This can be overridden by specifying a DataContext during restore.

Is there a limit on the number of page files?

By default, the maximum number of results is controlled by the MaxResults element in the **DataServices.xml** property file. A value of “-1” indicates no limit. This can be overridden by specifying a DataContext during restore.

When are the page files deleted?

Page files can be explicitly released by invoking DataListBean *freeCache()* method. By default, they will be released as soon as the session terminates. They will also be reused by a subsequent restore request from the same session on the same DataListBean.

Can I have multiple paged result sets in the same session?

Normal behavior is to support one result page set per DataListBean type per Session. A subsequent attempt to restore the same DataListBean would normally overwrite a previously created one.

It is possible to create multiple page sets by naming the page set using a DataContext during the restore. If the page set is not named, then it will overwrite an existing page set for that data bean and session combination.

Can I control where the page files are written?

Yes, the directory path for page files is controlled by the rsCachePath element in the **DataServices.xml** property file.

Performance Optimization

This section describes factors that come into play when considering performance issues associated with the data services layer of the Sterling Multi-Channel Selling Solution. Bear in mind that these are guidelines and that they should be complemented by a thorough understanding of the database server in use.

Optimizing Ad Hoc Queries

The new QueryHelper class exists to support the creation of ad hoc search queries. It contains a number of methods that return DsQuery instances. These methods can either create new WHERE clauses, or combine existing ones. The resulting DsQuery tree is passed as a parameter to the DataBean restore method.

The order in which selection criteria are added using the QueryHelper directly translates to how the resulting WHERE clauses are generated. RDBMS provide proprietary tools that can be used to evaluate the execution cost of queries. These tools can be used to determine the best ordering of WHERE clauses. There may be additional efficiencies to be gained through the use of sub-queries and the ordering of these sub-queries. The optimal WHERE clause for a specific request is dependent on:

1. The RDBMS
2. The available indices (and the type of each index)
3. The amount of data in each table to be joined
4. The use of RDBMS cost-based vs. syntax-based query optimizers
5. How recently database statistics have been generated (where appropriate for the specific RDBMS)
6. The uniqueness of the selection criteria
7. Whether the RDBMS has cached any of the relevant tables or indices
8. The on-disk distribution of database tables and indices

Due to the number of factors that influence query performance, query tuning recommendations should be obtained from your proprietary database documentation. Query tuning is typically a combination of WHERE clause and index optimization.

While we have attempted to create appropriate indexing for common queries issued by the Sterling Commerce software, customizations may involve additional selection criteria that will perform more efficiently with additional database indexing. We strongly recommend that the DsQuery mechanism be used whenever non-key queries are issued.

Optimizing Data Retrieval Sizes

The DataContext mechanism can be used to set the number of records per page and the maximum number of records to retrieve.

If a fast initial page display is required, then setting a smaller number of records per page will result in a faster initial response. Remaining data will be automatically retrieved using a background thread.

To limit overall processing overhead, the maximum number of records can be limited. This is especially appropriate in areas such as retrieving a list of products. It is unlikely that an end user will want to scroll through several thousand products.

A more reasonable approach is to limit the number of products to 100 or even 50, and then to allow the user to specify additional selection criteria.

Left-Outer and Equi-Joins

Our default join mechanism is the left-outer join. This mechanism provides the behavior expected by most application developers. We have discovered several cases where an RDBMS generated a sub-optimal execution plan for some queries that used left-outer joins. If a specific query is having performance problems, then you may want to determine if there are left-outer joins that can be converted to equi-joins. For additional information, please refer to "Join Types" on page 288.

Reference and Child Data Objects

Reference DataObjects are intended for 1-to-1 relationships. Child DataObjects are typically used for 1-to-many relationships. There are some circumstances in which you may wish to use a Child DataObject to represent a 1-to-1 relationship.

Remember that Child DataObjects use a lazy link mechanism. This does result in a separate query being issued for the child data, but it also means that the data is not retrieved until it is directly referenced. For data that is infrequently referenced the Child DataObject may be more appropriate.

Using Distinct Tables for Customer Extensions

There has been some concern raised regarding the concept of storing custom data in separate tables. In most cases, this new data has a 1-to-1 relationship to existing tables. This allows the use of Reference DataObjects resulting in a single query to obtain the combined data. In addition, it should be possible to access the custom table by indexed primary key resulting in a very low retrieval cost.

While adding an additional table to a query will always have an impact on the retrieval cost, we feel that cost should be minimal in most cases. The key benefit of using distinct tables for custom data is the ease of upgrade to new releases of the Sterling Commerce software and schema. By using a separate table combined with our XML schema inheritance, the customer can be isolated from both database and XML schema changes. The Object Manager also makes these customizations transparent to the Sterling Commerce software. This combination of factors dramatically simplifies the upgrade process.

Using Stored Procedures

In some extreme cases, there may be a significant performance advantage if RDBMS stored procedures are used in place of a dynamic query.

Stored procedures have the following advantages:

1. The database can normally cache the SQL execution plan.
2. There may be less network traffic required to execute the stored procedure than for an equivalent SQL statement.
3. It may be possible to execute more complex SQL statements.

Stored procedures have the following disadvantages:

1. There is additional maintenance overhead for each stored procedure that is created. This may result in additional work during product upgrades.
2. Stored procedures do not easily handle variable parameter input. This can be accomplished but it tends to result in an extremely complex and possibly inefficient stored procedure.
3. Currently, data beans can only be mapped to a single stored procedure. This means that it is not possible to map to one procedure for data retrieval and a second procedure for update.

In general, we suggest that stored procedures only be considered if they can provide a significant performance benefit. In most cases, with appropriate indexing, the DsQuery mechanism is capable of providing very efficient query execution. For further information, please refer to "Stored Procedures" on page 280.

Oracle Hints

Release 6.3 added support for Oracle hints as described in "Oracle Hints" on page 279. We have found very few instances where this has provided performance improvements that could not be accomplished by restructuring the DsQuery. However, this mechanism is available if query analysis shows it can provide a significant benefit.

Join Types

What is an Equi-Join?

An equi-join is a table join that requires corresponding values to exist in the joined tables. For example given the following two tables:

TABLE 11. Table T1

C1	C2
A	1
A	2

TABLE 11. Table T1 (Continued)

C1	C2
A	3
B	2

TABLE 12. Table T2

C1	C2
1	X
3	Y
4	X

The following query:

```
SELECT * FROM T1, T2 WHERE T1.C2 = T2.C1
```

will return:

TABLE 13. Result Set Table

T1.C1	T1.C2	T2.C1	T2.C2
A	1	1	X
A	3	3	Y

Notice that there are no values returned for T1.C2 = 2 or T1.C1 = B. This is due to the mandatory join requirement.

What is a Left-Outer Join?

A left-outer join will return all rows from the left-side table even when the right-side table in a join does not contain any rows that match the join criteria.

If the above query is revised to use left-outer join syntax as follows:

```
SQL Server: SELECT * FROM T1 LEFT OUTER JOIN T2 ON T1.C2 = T2.C1
```

```
Oracle Syntax: SELECT * FROM T1, T2 WHERE T1.C2 = T2.C1 (+)
```

will return:

TABLE 14. Result Set Table

T1.C1	T1.C2	T2.C1	T2.C2
A	1	1	X
A	2		

TABLE 14. Result Set Table (Continued)

T1.C1	T1.C2	T2.C1	T2.C2
A	3	3	Y
B	2		

What is a Right-Outer Join?

A right-outer join is similar to the left-outer join, except that it returns rows in the right-side table even if there are no matching rows in the left-side table.

If the above query is revised to use right-outer join syntax as follows:

SQL Server: `SELECT * FROM T1 RIGHT OUTER JOIN T2 ON T1.C2 = T2.C1`

Oracle Syntax: `SELECT * FROM T1, T2 WHERE T1.C2 (+) = T2.C1`

will return::

TABLE 15. Result Set Table

T1.C1	T1.C2	T2.C1	T2.C2
A	1	1	X
A	1	3	Y
		4	Z

What is a Cross Join?

A cross-join is the cross product of the rows in both tables. It can be achieved by not specifying any selection criteria. This type of join is rarely of any practical use.

If the above query is revised to use cross join syntax as follows:

`SELECT * FROM T1, T2`

will return:

TABLE 16. Result Set Table

T1.C1	T1.C2	T2.C1	T2.C2
A	1	1	X
A	1	3	Y
A	1	4	Z
A	2	1	X
A	2	3	Y

TABLE 16. Result Set Table (Continued)

T1.C1	T1.C2	T2.C1	T2.C2
A	2	4	Z
A	3	1	X
A	3	3	Y
A	3	4	Z
A	2	1	X
A	2	3	Y
A	2	4	Z

What is our Default Join Mechanism?

By default, the Sterling Multi-Channel Selling Solution uses a left-outer join because this is typically what an application wants, and because this mechanism can perform lazy evaluation of joins for child data objects.

Which Joins do we Support?

We support the left-outer join, the equi-join, .

How do I tell the Data Services Layer to use an Equi-Join?

An equi-join is specified by adding the following attribute to the Relationship element in the data object definition XML file:

```
JoinOperator="EQUI"
```

Remember that an equi-join will not return rows unless a match is found for the join criteria.

Transactions

This section describes the support provided by the Sterling Multi-Channel Selling Solution for transactions: database actions that span one or more atomic operations. In general, you use the Transaction class to manage situations in which several data objects must be persisted together, and if one fails, then they should all fail.

Default Transaction Support

All business objects and generated data beans that reference one or more database tables provide implicit transaction integrity. Any *persist()* operation performed on a business object or data bean ensures that all resulting INSERT, UPDATE, and DELETE requests occur within the context of a single physical database

transaction. If any of the resulting operations fail, then all requests are rolled back. Note that if a data bean has children, then these are also persisted within the same transaction.

Support Using the Transaction Class

In certain circumstances it may be necessary to persist multiple distinct business objects or data beans within the same transaction. This can be accomplished through the use of the Transaction class. See "Transaction Class Methods" on page 292 for details.

When you use the Transaction class, data beans are enlisted into a Transaction object. When the *commit()* method is invoked on the Transaction object, *persist()* operation are invoked on the individual data beans:

- If any of the *persist()* operations fail, then they are all rolled back.
- If all of the *persist()* operations succeed, then they are all committed together.

Support Using the ActiveTransaction Class

In extraordinary circumstances it may be necessary to ensure that the persistence of multiple data beans occur within the same transaction, and that these changes are persisted immediately to allow restore requests within the same transaction to see the changes in real time. This can be accomplished using the ActiveTransaction class.

It must be noted that the ActiveTransaction class uses long running transactions that can have a negative impact on performance and concurrent access. ActiveTransactions should only be used as a last resort when all other possibilities have been discarded. See "How to use the ActiveTransaction Class" on page 294 for more details.

Transaction Class Methods

The Transaction class changes the behavior of the underlying data beans. A *persist()* call to a data bean that is enlisted in a Transaction will be a no-op. The actual persistence of changes will occur when the Transaction *commit()* method is invoked. This allows the use of short duration database transactions, which minimize locking and improve concurrent access. The Transaction class provides the following public methods:

- public Transaction(): the default constructor
- public void enlist(BusinessObject bizObj) throws ICCException: this method is used to enlist a business object in an existing Transaction.

- `public void enlist(TransactionSupport bean)` throws `ICCEException`: this method is used to enlist a data bean in an existing Transaction. The data bean must implement the `TransactionSupport` interface. All generated data beans automatically implement this interface.
- `public void commit()` throws `ICCEException`: this method will persist all changes made to the enlisted objects and if successful it will then commit those changes. If any persist operations fail, then the entire transaction will be rolled back.
- `public void rollback()` throws `ICCEException`: this method restores all enlisted objects, discarding all changes.

To manage the logical transaction you must keep a reference to the Transaction instance.

If a business object or data bean is enlisted in a Transaction, then the *persist()* method will be a no-operation method. Invoking the transaction class's *commit()* method will first persist the changes and then commit the database transaction.

The Transaction class is extremely lightweight and should incur minimal overhead. This technique does not use a two-phase commit mechanism due to performance, concurrency, and database maintenance issues.

Limitations

1. Changes applied to a business object cannot be recovered if the server fails prior to committing the transaction. This is an inherent limitation of any transaction mechanism.
2. Transactions that span multiple database servers cannot be guaranteed.
3. Transactions that involve non-database server data sources cannot be guaranteed.

Sample Usage

An application that wants to update multiple business objects within the context of a transaction will perform the following steps along the lines of this sample code extract:

```
ShoppingCartBean scBean = new ShoppingCartBean();
OrderBean oBean = new OrderBean();
Transaction trans = new Transaction();
trans.enlist(scBean);
trans.enlist(oBean);
...
Restore and make any changes to scBean and oBean.
```

```
Changes can be made in any order.  
...  
trans.commit();
```

See "Detailed Commit Functionality Description" on page 294 for more information on how the commit operation is managed when one or more data sources are involved.

How to use the ActiveTransaction Class

The ActiveTransaction methods and usage are identical to those of the Transaction class. The difference lies in the database transaction duration and persist timing.

When a *persist()* operation is invoked against a data bean that is enlisted in an ActiveTransaction, this immediately begins a database transaction and applies all update operations. This database transaction will be used by all enlisted data beans that use the same Data Source. The ActiveTransaction *commit()* will commit the database transaction.

In order to provide this functionality, the ActiveTransaction exhibits the following behavior:

An active database connection is established and tied up for the duration of the ActiveTransaction. Since the transaction duration is indeterminate, it may remove the connection from the available pool for several minutes. The connection will also remain tied up if the ActiveTransaction is not committed or rolled back. This makes the ActiveTransaction unsuitable for browser based usage.

An active database transaction is established and tied up for the duration of the ActiveTransaction. Depending on the nature of the database operations that are performed, this may result in restrictive locks being held against database resources. In the worst case, these locks may limit concurrent access for the duration of the transaction.

Because the ActiveTransaction uses long duration database transactions, there is an increased risk of database deadlocks.

ActiveTransactions should only be used as a last resort, and even then only for administrative or message based applications.

Detailed Commit Functionality Description

This section describes how a commit operation is managed in a transaction.

Commit with one Database Server

The *commit()* method will apply updates to all enlisted objects within the same transaction and connection. If the updates succeed, then it will commit the transaction. If any of the updates fail, then the transaction will be rolled back.

Commit with Multiple Database Servers

The commit method will apply updates to all enlisted objects. It will not be possible to apply these updates within the same transaction. Only if the all of the updates succeed will it commit each physical transaction. If any of the updates fail, then all transactions will be rolled back.

Commit with a Database Server and non-Database Server Data Source

The *commit()* method will apply updates to all enlisted objects that reference a database server. If the updates succeed, then it will then apply updates to the non-database server objects. If those updates succeed, then and only then, will it commit the original updates.

This leaves open a small window for failure, but the size of that window is minimized. The failure could only be connection-related. Logical failures should be caught by this technique.

SQL Injection

A potential security risk for a Web-based application is that of SQL injection: users enter SQL into text input fields with the aim of inserting SQL that, when it executes, will expose or corrupt data.

The Sterling Multi-Channel Selling Solution Data Services layer always uses bound parameters for SQL. Since bound parameters are simply variables and are not executed as part of the SQL request, this eliminates the possibility of SQL injection.

Note that the SQL logging may be misleading in this regard. In the log output, we substitute the parameter values into the SQL to clarify what was being executed. In the actual request we always use parameter markers.

This chapter describes how to use resources to enhance the end-user experience.

Overview

Resources provide a general mechanism to attach attributes to data objects without specifying the attributes as data fields. Typically, you use resources in situations where some, but not all data objects of a particular type, need an attribute such as datasheet or image associated to them.

For example, you might want to associate product datasheets with some products, though not with all products, or an image with some Sterling Advisor questionnaire pages, but not with all.

Each resource has a resource type: out of the box, the following resource types are supported:

- image
- datasheet
- longtext
- video
- audio

More resource types can be created at implementation time simply by adding them to the **ResourceTypeList** XML data file. Each data object can have zero or more resources, but it can have only one resource of a particular type.

When you want to retrieve resources for a particular data object, you first retrieve the resource key, and then restore a resource list data object as follows:

```
DataContext dataContext = new DataContext();
Long resourceKey = msBean.getResourceKey();
ResourceListBean resourceListBean =
    (com.comergent.bean.simple.ResourceListBean)
    OMWrapper.getObject("com.comergent.bean.simple.ResourceListBean");
DsQuery dsQuery = QueryHelper.newWhereClause("ResourceKey",
    DsQueryOperators.EQUALS, resourceKey);
resourceListBean.restore(dataContext, dsQuery);
QueryHelper.freeQuery(dsQuery);
```

To retrieve the value of a resource of a particular type (say, an image), you must iterate through the ResourceListBean to identify the appropriate resource:

```
ListIterator resourceList = resourceListBean.getIterator();
ResourceBean resourceBean = null;
while (resourceList.hasNext())
{
    resourceBean = (ResourceBean) resourceList.next();
    if (resourceBean.getResourceTypeKey().intValue() == 1020)
    {
        break;
    }
}
if (resourceBean != null)
{
    String valueString = resourceBean.getResourceValue();
}
else
{
    /* Handle the case where there is no image resource */
}
```

Note that helper class and beans have been created in various parts of the Sterling Multi-Channel Selling Solution. For example, ResourceHelper is a class that is used by presentation beans to retrieve resources by type. It supports methods such as:

String getResourceValue(String type)

The abstract class ProdServResource provides a wrapper around this class and presentation beans such as BizConditionBean in the productService packages extend this class to provide easy access to resources.

JSP Page Layer

Resources can be used to "decorate" pages used to display data objects. For example, if you associate a resource of type image with a questionnaire page, then you can display the image on the questionnaire page by adding the following to the **AdvisorBody.jsp** JSP page:

```
<IMG SRC="<%= qpb.getResourceValue("image") %>" />
```

In this example, you are using the fact that the `IPresQueryPage` class extends the `IProdServResource` interface and implements the `getResourceValue()` method.

Data Services Layer

At the data services level, data objects are linked to resources using a `ResourceKey` data field: this maps to a `RESOURCE_KEY` column in the table that underpins the data object. For example, the `Product` data object declares a `ResourceKey` data field and this maps to the `RESOURCE_KEY` column of the `CMGT_PRODUCT` table.

Resources are maintained in the `CMGT_RESOURCE` and `CMGT_RESOURCE_LOCALE` tables. The `RESOURCE_KEY` column in a data object table is a foreign key to the `RESOURCE_KEY` column of the `CMGT_RESOURCE` table: this and the `RESOURCE_TYPE_KEY` column comprise the primary key for the `CMGT_RESOURCE` table: that is, a resource key and resource type uniquely determine the resource and its value.

A resource key is automatically generated for a data object when the first resource is assigned to the data object. The resource key value is unique across all data objects in the Sterling Multi-Channel Selling Solution: no other data object will use that resource key, and only resources that are assigned to that data object will have that resource key.

In many situations, a data object has a state field which is used to manage the data object's life cycle. This chapter provides an overview of how to use state machines to manage the life cycle: what state transitions are permitted and what happens as a data object transitions from one state to another. It covers:

- "Overview" on page 301
- "State Machine Configuration Files" on page 303
- "Customizing a State Machine" on page 306

Overview

Release 6.4 introduces the ability to manage data objects and their transition from one state to another using state machines. Each state machine manages the transitions for a specific data object, such as orders or order line items. The state machine is specified as an XML file. See "State Machine Configuration Files" on page 303 for the structure of a state machine file.

You instantiate a state machine for a data object by calling the *getStateMachine(String s)* method of the *StateMachineFactory* class. This method returns an object that implements the *IStateMachine* interface. This is the state machine class that will manage state transitions for the data object. For example:

```
IStateMachine sm = smf.getStateMachine("OrderStateMachine");
```

An additional parameter can be passed in to specify the state machine for a particular partner:

```
IStateMachine sm = smf.getStateMachine("OrderStateMachine", key);
```

When a state machine is instantiated, it reads in the corresponding **StateMachine.xml** configuration file. This file specifies the precise processing that each input request should undergo, and how the data object should be moved from one state to another. The mapping from state machine to **StateMachine.xml** file is defined in the **StateMachineList.xml** configuration file.

Each Input element specifies the actions that should be taken when the request is made by calling the *performInput()* method of the state machine. This method has a parameter to specify the ID of the input. Typically, there will be a Helper class, such as the OrderStateMachineHelper class that provides a mapping between the input name, such as "ORDER INPUT XML PLACE" and an integer value (in this case, 25). The Roles attribute of the Input element determines which users can perform the action.

The signature of the IStateMachine state machine interface *performInput()* method is:

```
performInput(Long inputId, Object obj, IRdUser user, Hashtable ht)
```

The second parameter in the method call is used to pass in the object that will be processed by the business logic. The Hashtable parameter is used to pass in any other processing parameters that the handler classes may need.

If the input is not valid for this state, then an InputFailedException is thrown, and this should be caught and handled by the appropriate business logic. If the input is valid, then the ActionHandler classes are called, in the order listed in the ActionHandlerList element. Each ActionHandler must implement the IActionHandler interface by providing the *performInputAction()* method: this is the business logic used to process the input request.

The signature of the IActionHandler interface *performInputAction()* method is:

```
performInputAction(IInput input, Object obj, IRdUser user,  
    Hashtable ht)
```

The second parameter in the method call is used to pass in the object that will be processed by the handler. The Hashtable parameter is used to pass in any other processing parameters that the handler class may need.

If any of the ActionHandlers throw an InputFailedException, then the processing of the input request is stopped and the object stays in its current state. If all the

ActionHandlers succeed, then the object is moved into the state specified by the NextState element.

The ActionEvents declared in the ActionEventList element are fired: these should be handled by the EventBus (see CHAPTER 9, "Events" for more information). You should use ActionEvents to trigger processing that should not affect the main business logic used to process the action, but which should happen if the business logic successfully completes. For example, sending out email notifications in the event that an order is successfully placed can be handled using ActionEvents.

State Machine Configuration Files

StateMachineList.xml Configuration File

The state machines are declared in the **StateMachineList.xml** configuration file. By default, its location is *debs_home/Sterling/WEB-INF/statemachines/* and its location is specified in the StateMachines element of the **Comergent.xml** configuration file.

Each state machine is defined by specifying the name of its **StateMachine.xml** configuration file. For example:

```
<StateMachine>EnterpriseOrderStateMachine.xml</StateMachine>
```

It is possible to define different state machines for different storefront partners using the StorefrontStateMachines element. For example, the following example declares the state machine for the storefront partner whose partner key is "21":

```
<StorefrontStateMachines StorefrontKey="21"
  StorefrontName="Allnet">
  <StateMachine>AllnetOrderStateMachine.xml</StateMachine>
</StorefrontStateMachines>
```

For a given storefront, if no StateMachine element is defined, then the corresponding state machine of the DefaultStateMachines element is used.

StateMachine.xml Configuration File

Each **StateMachine.xml** configuration file defines a state machine for a particular application. It specifies how state transitions should be processed for a data object. It comprises a StateMachine element and a child StateList element that contains a set of State elements: each State element specifies through its child elements what the valid inputs are for the state, and how each input should be processed.

The StateMachineName attribute of the StateMachine element is used by the StateMachineFactory class to retrieve a named state machine.

The value, *lookupType*, of the *LookupType* element of the **StateMachine.xml** is used to retrieve the lookup codes from the CMGT_LOOKUPS table.

- Each State element must correspond to a lookup code whose lookup type is *lookupTypeState* so that user-viewable names can be displayed for each supported locale.
- Each Input element must correspond to a lookup code whose lookup type is *lookupTypeInput*.

Note that for legacy reason, some data objects (Order and RFQ) use their Status lookup type. For example, there are lookup codes for the OrderStatus and OrderInput lookup types and these are used by the OrderStateMachine because it declares its *LookupType* by:

```
<LookupType>Order</LookupType>
```

A typical State element looks like this:

```
<State Name="Open" Start="true">
  <Description>
    This is the initial State in the Ordering flow.
  </Description>
  <InputList>
    <Input Name="ORDER INPUT USER PLACE"
      Roles="Partner.DirectCommerceUser;Registered.User;
        Enterprise.CustomerServiceRepresentative">
    <Description>This is the "Place" action.</Description>
    <NextState>Order Submitted</NextState>
    <ActionHandlerList>
      <ActionHandler>
        com.comergent.apps.orderMgmt.orders.bizAPI.OrderPlaceHandler
      </ActionHandler>
      <ActionHandler>
        com.comergent.apps.orderMgmt.orders.bizAPI.OrderPersistHandler
      </ActionHandler>
      <ActionHandler>
        com.comergent.apps.orderMgmt.orders.bizAPI.SaveDiscounts
      </ActionHandler>
      <ActionHandler>
        com.comergent.apps.orderMgmt.orders.bizAPI.WriteHistoryHandler
      </ActionHandler>
    </ActionHandlerList>
    <ActionEventList>
      <ActionEvent>OrderPlaceEmailEvent</ActionEvent>
    </ActionEventList>
  </Input>
  <Input Name="ORDER INPUT XML PLACE"
    Roles="Partner.DirectCommerceUser;Registered.User">
```

```

        <Description>This is the "Place" action.</Description>
        <NextState>Order Submitted</NextState>
        <ActionHandlerList>
            <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.PreProcessXMLPlaceHandler
            </ActionHandler>
            <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.OrderPlaceHandler
            </ActionHandler>
            <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.OrderPersistHandler
            </ActionHandler>
            <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.SaveDiscounts
            </ActionHandler>
            <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.WriteHistoryHandler
            </ActionHandler>
        </ActionHandlerList>
        <ActionEventList>
            <ActionEvent>OrderPlaceEvent</ActionEvent>
        </ActionEventList>
    </Input>
</InputList>
</State>

```

The Roles attribute of the Input element is used to check that only appropriate users can act on the object when it is in a given state. Note that the list of roles is delimited by semi-colons (“;”).

Action Events

When an input has finished being processed, the state machine can also fire action events. These are events that can be broadcast to other parts of the Sterling Multi-Channel Selling Solution so that they can take appropriate actions if need be. Action events are propagated using the event bus framework. see CHAPTER 9, "Events" for details.

You declare the action events using the ActionEventList element: an input can declare zero or more ActionEvent elements. Each such event must be declared in the **events.xml** configuration file. For example, for the ActionEvent declared above, there should be the corresponding entry in the **events.xml** configuration file:

```

<event
    class="com.comergent.api.apps.orderMgmt.orders.OrderPlaceEvent">
    <description>This event is fired when an Order is placed
    </description>
    <consumers-list>

```

```
<consumer>
com.comergent.reference.apps.orderMgmt.orders.OrderEmailEventHandler
</consumer>
<consumer>
com.comergent.reference.apps.orderMgmt.orders.OrderAtStorefrontEmailEventHandler
</consumer>
<consumer>
com.comergent.reference.apps.salesContracts.SalesContractOrderEventHandler
</consumer>
</consumers-list>
</event>
```

Customizing a State Machine

In your implementation of the Sterling Multi-Channel Selling Solution you may need to modify the way in which a state machine works for a data object. Typically, this will involve one or more of the following:

- "Changing the Business Logic associated with a Change in State" on page 306
- "Changing the Available State Transitions" on page 307
- "Adding a New State" on page 308

Changing the Business Logic associated with a Change in State

If you want to modify the logic that is executed when an object changes from one state to another, then you must modify the list of ActionHandler elements associated with the state and input.

Example

For example, suppose that you want to replace the SaveDiscount ActionHandler class with a custom class in the logic that is executed when an Order in the Open state receives the ORDER INPUT USER PLACE input.

1. First, you must create your custom class, say the CustomSaveDiscount class. This class must implement the IActionHandler interface as described above.

Then you modify the ActionHandlerList element by changing the corresponding ActionHandler element in the list of ActionHandlers:

```
<Input Name="ORDER INPUT USER PLACE"
  Roles="Partner,DirectCommerceUser;Registered.User;
  Enterprise.CustomerServiceRepresentative">
```

```
<Description>This is the customized "Place" action.</Description>
<NextState>Order Submitted</NextState>
  <ActionHandlerList>
    <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.OrderPlaceHandler
    </ActionHandler>
    <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.OrderPersistHandler
    </ActionHandler>
    <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.CustomSaveDiscounts
    </ActionHandler>
    <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.WriteHistoryHandler
    </ActionHandler>
  </ActionHandlerList>
</Input>
```

Changing the Available State Transitions

If you want to modify the available state transitions for a state, then you must modify the `InputList` element by adding or removing the input associated with the state transition.

Example

For example, suppose that you want to allow an order that is in the `Open` state to receive an input that suspends the order. Because we want to use a new input, we must create a corresponding new lookup code along these lines:

```
<LightWeightLookup state="INSERTED">
  <LookupType state="INSERTED">OrderInput</LookupType>
  <LookupCode state="INSERTED">1020</LookupCode>
  <Locale state="INSERTED">en_US</Locale>
  <Description state="INSERTED">ORDER INPUT SUSPEND</Description>
</LightWeightLookup>
```

Then, in the `State` element for `Open` orders, add an input element along these lines:

```
<Input Name="ORDER INPUT SUSPEND"
  Roles="Partner.DirectCommerceUser;Registered.User;
  Enterprise.CustomerServiceRepresentative">
  <Description>This is the customized "Place" action.</Description>
  <NextState>Order Suspended</NextState>
    <ActionHandlerList>
      <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.OrderSuspendHandler
      </ActionHandler>
      <ActionHandler>
com.comergent.apps.orderMgmt.orders.bizAPI.WriteHistoryHandler
```

```
        </ActionHandler>
    </ActionHandlerList>
</Input>
```

Note that in this example, we want the next state to be a new state (Order Suspended) that does not yet exist in the system, and so we must also add this state as described in "Adding a New State" on page 308.

Adding a New State

You may sometimes need to add a new state for an object to the ones that come with the Sterling Multi-Channel Selling Solution. To do so, you must consider what inputs from other states should put an object into the new state, and what valid inputs will change an object's state from the new state to one of the existing ones.

First, you should add the new lookup codes to reflect the new state and new inputs. Having done so, you will need to add Input elements to the existing State elements to support the transitions to the new state, and you will need to add a new State element that defines the valid inputs that the new state supports.

Example

For example, suppose that we want to add an Order Suspended state for the Order object. We want to allow for Open orders to be placed in the Order Suspended state, and the only valid input we want to support for an order in the Order Suspended state is to "reopen" the order by putting it back into the Open state.

1. First, we add the new state to the Order state lookup codes:

```
<LightWeightLookup state="INSERTED">
    <LookupType state="INSERTED">OrderStatus</LookupType>
    <LookupCode state="INSERTED">1020</LookupCode>
    <Locale state="INSERTED">en_US</Locale>
    <Description state="INSERTED">Order Suspended</Description>
</LightWeightLookup>
```

Note the use of the OrderStatus lookup type as noted above.

2. Next, we add the input lookup codes needed to get orders into and out of the new state:

```
<LightWeightLookup state="INSERTED">
    <LookupType state="INSERTED">OrderInput</LookupType>
    <LookupCode state="INSERTED">1020</LookupCode>
    <Locale state="INSERTED">en_US</Locale>
    <Description state="INSERTED">ORDER INPUT SUSPEND</Description>
</LightWeightLookup>
<LightWeightLookup state="INSERTED">
    <LookupType state="INSERTED">OrderInput</LookupType>
```



```
<LookupCode state="INSERTED">1030</LookupCode>
<Locale state="INSERTED">en_US</Locale>
<Description state="INSERTED">ORDER INPUT REOPEN</Description>
</LightWeightLookup>
```

3. Now we modify the Open State element of the order state machine by adding the new input that is used to suspend an open order:

```
<Input Name="ORDER INPUT SUSPEND"
      Roles="Partner.DirectCommerceUser;Registered.User;
            Enterprise.CustomerServiceRepresentative">
  <Description>This is the customized "Place" action.</Description>
  <NextState>Order Suspended</NextState>
  <ActionHandlerList>
    <ActionHandler>
      com.comergent.apps.orderMgmt.orders.bizAPI.OrderSuspendHandler
    </ActionHandler>
    <ActionHandler>
      com.comergent.apps.orderMgmt.orders.bizAPI.WriteHistoryHandler
    </ActionHandler>
  </ActionHandlerList>
</Input>
```

4. Now we add a new State element to say what inputs an order in the Order Suspended state can accept:

```
<State Name="Order Suspended" Start="true">
  <Description>
    This is the suspended State in the Ordering flow.
  </Description>
  <InputList>
    <Input Name="ORDER INPUT REOPEN"
          Roles="Partner.DirectCommerceUser;Registered.User;
                Enterprise.CustomerServiceRepresentative">
      <Description>This is the "reopen" action.</Description>
      <NextState>Open</NextState>
      <ActionHandlerList>
        <ActionHandler>
          com.comergent.apps.orderMgmt.orders.bizAPI.OrderReopenHandler
        </ActionHandler>
        <ActionHandler>
          com.comergent.apps.orderMgmt.orders.bizAPI.OrderPersistHandler
        </ActionHandler>
        <ActionHandler>
          com.comergent.apps.orderMgmt.orders.bizAPI.SaveDiscounts
        </ActionHandler>
        <ActionHandler>
          com.comergent.apps.orderMgmt.orders.bizAPI.SaveDiscounts
        </ActionHandler>
      </ActionHandlerList>
      <ActionEventList>
        <ActionEvent>OrderReopenEmailEvent</ActionEvent>
      </ActionEventList>
    </Input>
  </InputList>
</State>
```

```
        </ActionEventList>
    </Input>
</InputList>
</State>
```

This chapter describes how to use widgets in your Sterling Multi-Channel Selling Solution applications. Widgets are primarily used for Sterling Portal pages, but may be used throughout the system.

Overview

A widget is a custom tag that can be used in a JSP page (referred to here as the container JSP page) to provide a UI component in the generated Web page. It is self-contained in that the widget tag may be moved from one part of a JSP page to another without effecting the look-and-feel of the rest of the page and the widget content is generated independently of the rest of the page.

Widgets work by making a separate call to the Sterling Multi-Channel Selling Solution which executes a different message type to the rest of the container JSP page. By executing a distinct message type, you can call a different controller and use a distinct JSP page to generate the output for the widget content. The controllers used by widgets should always extend the `WidgetController` class. This controller extends the `IncludeController` class which invokes the `include()` method on the `RequestDispatcher` as opposed to the more commonly used `forward()` method.

Widgets work as HTML includes and so they re-use the same cascading style sheets as the rest of the Web page. Care must be taken in defining Javascript

functions and form variables to avoid name duplication with other elements of the Web page. See "Guidelines" on page 312.

Widget Tag

The widget tag takes these named attributes:

- **height**: the height of the widget element in pixels
- **name**: the name of the widget is the message type executed by the Sterling Multi-Channel Selling Solution
- **width**: the width of the widget element in pixels

Note that the height and width parameters may not always be realized in the Web page seen by the user. These set the height and width of the HTML table attributes, but the user's browser renders the page in the light of all of the HTML it receives for the Web page.

In addition, you can define any number of parameters in the body of the tag. These are passed to the controller and BLC through the request object. Each parameter takes the form *name=value* and each pair is separated by an ampersand ("&") from the next. For example:

```
<cmgt:widget name="MyOrdersWidget" height="300" width="500">
    numberOfRows=5&orderBy=lastupdate
</cmgt:widget>
```

Guidelines

Follow these steps to create a widget:

1. Define the message type in the appropriate **MessageTypes.xml** file. Typically, it will be of this form:

```
<MessageType Name="MyOrdersWidget">
    <ControllerMapping>
        com.comergent.apps.orderMgmt.orders.controller.-
        MyOrdersWidgetController
    </ControllerMapping>
    <JSPMapping>
        ../orderMgmt/Orders/MyOrdersWidget.jsp
    </JSPMapping>
</MessageType>
```

2. Create the controller class declared in the ControllerMapping element to process the request. You should extend the WidgetController class by

overwriting its *execute()* method. By calling the *WidgetController*'s method *callJSP()*, you can forward the request to the JSP page defined by the *JSPMapping* element.

3. Create the JSP page declared in the *JSPMapping* element. You must follow these rules in writing this JSP page:
 - Widgets should use the widget style for display: this ensures that they have a common look-and-feel throughout the Sterling Multi-Channel Selling Solution.
 - Begin and end the HTML content of this page with `<table>` and `</table>`. All widgets define their content in the context of a table. Use only HTML tags and syntax that are valid in an HTML table.
 - The JSP page must include the **cmgtinclude.jspf** page through the standard JSP `<% include>` directive.
 - Adopt a naming convention for all parameters, functions, and variables in the JSP page so that they do not conflict with other usages on the container JSP page. We recommend a convention that prepends the name of the widget before the object name. For example: *MyOrdersWidget_function* or *MyOrdersWidget_formName*.
 - Take care that actions performed on the widget's JSP page do not act on the container page. Links or buttons on a widget's page should take a user to a new Web page.
4. You can retrieve parameters defined in the widget tag through the request object. For example, using the example above, you can retrieve the value of the *orderBy* parameter by:

```
String temp_ParameterString = request.getParameter("orderBy");
```

As with any request parameter, it is returned as a *String*, so you must parse a parameter to recover a numeric value.

5. You can retrieve session information through a standard call to the *ComergentSession* object. In particular, you can retrieve the session user by the following:

```
User temp_User = comergentSession.getUser();
```

6. Add the widget to the container JSP page with the following:

```
<% out.flush(); %>
<cmgt:widget name="widgetName"
    height="heightInPixels" width="widthInPixels">
    parameter1=value1&parameter2=value2&...&parametern=valuen
```

```
</cmgt:widget>
```

Note that you must flush the contents of the output stream before the widget. If you do not do this, then the HTML generated by the widget is dispatched to the browser before the rest of the HTML stream.

7. Make any desired modifications to the **ErrorWidget.jsp** JSP page. This page is displayed in the area defined for the widget if an unhandled error condition arises.

Integrating a Widget in a Portal Page

If you have your own portal application and you want to add a Sterling Multi-Channel Selling Solution widget into a portal page, then you can do this as follows:

1. Create your Sterling Multi-Channel Selling Solution widget by following the steps described in "Guidelines" on page 312.
2. In your portal application, declare the portlet using the syntax required to set up a portlet. The portlet type of Sterling Multi-Channel Selling Solution portlets is HTML.
3. To specify the URL required to provide the portlet content, use a URL like this:

```
http://<server:port>/Sterling/en/US/direct/matrix?login=user-  
name&passwd=password&cmd=directLogin&LoginData-messageType=MyO-  
rdersWidget&LoginData-displayBorders=false&LoginData-  
entryPoint=direct&validate=true
```

The login and password parameters need to be generated dynamically based on the user, and so you will need to be able to retrieve the username and password for the user to identify themselves to the Sterling Multi-Channel Selling Solution.

The LoginData-messageType parameters is used to specify the widget's message type. If other parameters are required by the widget, then pass them in as part of the URL too.

Example

In this example, we show how the MyOrdersWidget is used to display a small panel of current orders to a user.

Container JSP Page

The container JSP page has the following text:

```
<% if (isDirect) { %>
    <% out.flush(); %>
    <cmgt:widget name="MyOrderWidget" height="300" width="500" >
        numberOfOrders=5
    </cmgt:widget>
<% } %>
```

Note the use of the boolean variable `isDirect` to determine whether the user is a direct commerce user (and hence a user who can create orders).

MessageTypes.xml Entry

The following entry is added to the direct commerce user message group:

```
<MessageType Name="MyOrdersWidget">
    <ControllerMapping>
        com.comergent.apps.orderMgmt.orders.controller.-
            MyOrdersWidgetController
    </ControllerMapping>
    <JSPMapping>
        ../orderMgmt/Orders/MyOrdersWidget.jsp
    </JSPMapping>
</MessageType>
```

WidgetController

A new class `MyOrdersWidgetController` is created which extends the `WidgetController` class. Its `execute()` method overwrites the `execute()` method of the `WidgetController` class with:

```
public void execute() throws
    ControllerException, ICCEException, IOException
{
    try
    {
        String numberOfRowsStr = null;
        int numberOfRows = DEFAULT_NUMBER_OF_ROWS;
        numberOfRowsStr = request.getParameter("numberOfRows");
        if (numberOfRowsStr != null && !(numberOfRowsStr.equals("")) )
        {
            numberOfRows = Integer.parseInt(numberOfRowsStr);
        }
        boolean bAscending = false;
        IOrderFactory fac = OrdersAPI.getFactory();
        IRdLightWeightOrdersList orderedCarts =
            fac.getListOfOrders(numberOfRows, "UpdateDate", bAscending);
        request.setAttribute("orderedCarts",
            (IRdLightWeightOrdersList) orderedCarts);
    }
    catch (Exception e)
```

```
    {  
        sendWidgetError(e);  
    }  
    // Dispatch  
    callJSP();  
}
```

The final call *callJSP()* forwards the request to the widget JSP page: **MyOrdersWidget.jsp**. Note the use of the `OrdersAPI` class and `IOrderFactory` interface to retrieve carts of the appropriate type.

Widget JSP Page

Every widget JSP page has these important components:

- the include tag for **cmgtinclude.jspf**
- a scriptlet section that recovers the height, width, and other parameters from the request
- the HTML table that provides the content of the widget

See the **MyOrdersWidget.jsp** file for an example widget JSP page. It is in *debs_home/Sterling/WEB-INF/web/en/US/orderMgmt/Orders/MyOrdersWidget.jsp*.

The Sterling Multi-Channel Selling Solution offers a sophisticated search capability. It is based on the Apache Lucene project. This chapter provides a guide to customizing the search capabilities to meet your implementation requirements.

Overview

The advanced search capabilities of the Sterling Multi-Channel Selling Solution are based on the creation of search indexes. A search index is a set of files that index the occurrence of search terms in data objects. At any one time, there may be many search index sets stored in the Sterling Multi-Channel Selling Solution.

Different search applications can access the same or different search index sets, but at any one time each search application can use only one *active* index set.

When an end-user performs a search, the search engine is used to search through the index for the requested terms and to return the search results. The search results are filtered prior to the results being displayed to the end-user to remove products that they should not be able to see: for example, by virtue of the price list assignment to their partner or effectivity dates on the products.

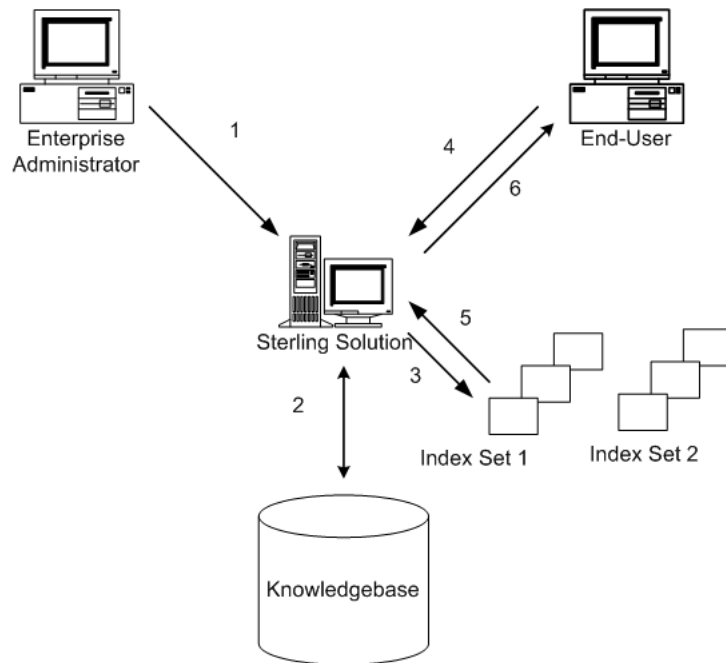


FIGURE 8. Advanced Search Concepts

Conceptually, the process comprises these steps:

1. An enterprise administrator initiates the creation of a search index. You can click the **Generate New** button in the Search Administration tab of the Product Manager application or create a cron job to generate search indexes at regular intervals.
2. The index set is created by an index set builder class and the index builder classes it invokes: these work through the product catalog by instantiating data beans for each product, feature, and so on.
3. The index builders create index documents and write out the documents to the file system on the Sterling Multi-Channel Selling Solution machine. Each index set is created in a separate directory, for example as: *debs_home/Sterling/WEB-INF/data/searchIndex/en_US/MasterIndex_101/*. In the directory, a number of index files are created: they contain a binary representation of the index set using a Lucene file format.

4. An end-user initiates a search either by performing a simple search using the **Find** button on the catalog pages or by navigating to the Advanced Search page and creating a search query using search terms.
5. The Sterling Multi-Channel Selling Solution processes the request as follows:
 - a. A list of search terms is created based on the terms entered by the user.
 - b. A searcher is instantiated and initialized with the search terms: one for each row of the Advanced Search Terms form entered by the user.
 - c. The *search()* method is invoked on the searcher. First, the query search terms are used to retrieve a raw list of search results, and then the filter search terms are used to refine the list by filtering out search results that should be excluded by virtue of factors such as the effectivity dates and price lists. The result is a list of hits.
 - d. The hits are transformed into a list of objects representing the search results.
6. The search results are passed to the JSP page and displayed to the end-user.

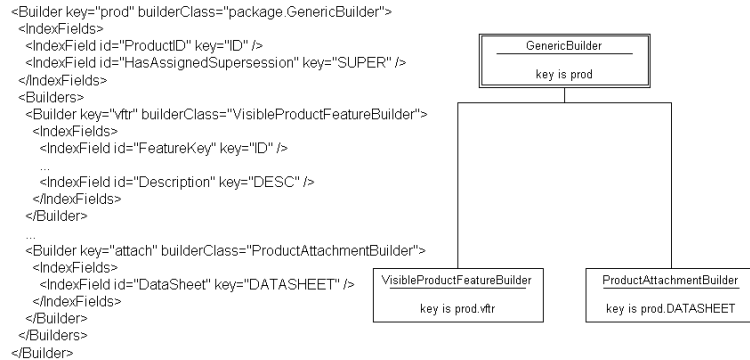
Building Indexes

Search indexes are built using instances of the IndexBuilder classes and its sub-classes. All the builders implement the IIndexBuilder interface and should extend the abstract BasicBuilder class. The main IndexBuilder method used to create an index is *build()*. This method generates a document based on the list of entities passed to it.

Index builders can contain one or more child index builders, and so you can have a nested hierarchy of index builders. You can add and remove child index builders from parent index builders. In general, the hierarchy of index builders should reflect the relationships between the entities being indexed. For example, you should use a child index builder to index the data fields of child data objects.

Each index builder is associated with a prefix: the prefixes are used to build up a concatenated list of prefixes that reflect the hierarchy of index builders. When a child index builder creates index entries, its entries are prefixed by the prefix of its parent.

The hierarchy of index builders and associated prefixes are specified using the **SearchConfigurationProperties.xml** file. The index builders are declared in a nested set of Builder elements and each index builder is declared by specifying its prefix and the data field it indexes. The prefix is the key attribute of the Builder element and the index fields are declared as a list of IndexField elements.

**FIGURE 9. Index Builder Hierarchy**

Note that the **SearchConfigurationProperties.xml** file is a shared file: access to it should use the *adjustFileName()* method and use the boolean values to access a shared, private, noloadable file.

Customizing Dictionary Mappings

If a user is searching for “color”, then you might want them to find items that use the terms “colour” or “hue”. You specify the equivalence of search terms and words using the **CatalogDictionary.mappings** file. Each line of this file takes the form:

```
term, word, word, word, ...
```

The first string is referred to as the “term” and the following words are equivalent words. You can add terms or edit terms to specify the word equivalences you want. When a search is performed, occurrences of these words are regarded as equivalent to occurrences of the term. If a user searches for the term, they will see results that contain any of the other words. For example, suppose that you have in the mappings file:

```
color, colour, hue
```

Searches for “color” will also return references to “colour” and “hue”; however, searches for “hue” will not return references to “color” and “colour” unless you have another line that reads:

hue,color,colour

Note that the **CatalogDictionary.mappings** file is a shared file: access to it should use the *adjustFileName()* method and use the boolean values to access a shared, private, noloadable file.

Processing Search Requests

Each end-user search request is handled by a sequence of these controllers:

1. CatalogAdvancedSearchController:
 - a. Receives the search request and sets the session context: the *SessionContext* class is instantiated with a string that identifies the index set to be used. The *SessionContext* class is used to hold information about the user's context such as their current locale, their price lists, and so on.
 - b. It pre-processes the request by updating any filters to be used to filter the results.
 - c. It creates a list of search terms as a List of search terms: each term is an instance of the *SearchTerm* class.
 - d. The controller forwards the search request to the *CatalogSearchResultController* class.
2. CatalogSearchResultController: this class executes the search as follows:
 - a. Initialize the *SearchContext* with information from the user's session.
 - a. Create a *Searcher* using the List of *SearchTerms* created by the *CatalogAdvancedSearchController*.
 - b. Invoking *search()* on the *Searcher* object. This returns a list of hits as a *Hits* object.
 - c. The *Hits* object is transformed into a List of data beans: this is set in the request object and control is passed to the display controller and JSP page.
 - d. Search results can be displayed either by rank or by category: the controller determines which display view has been requested, and forwards the request either using the message type "catSearchResultByCategory" or "catSearchResultByRank".

Lucene Classes

The advanced search functionality uses the APIs provided by the Apache Lucene project. You should not need to modify these classes in any way. In particular, the following important classes are used:

- Analyzer: the class used to parse, stem, and tokenize index entries.
- Document: the class used to hold index fields and to write them out to the index set files.
- Field: an index entry together with flags that indicate how it is to be used in searches.
- Filter: used to filter search results. It is extended by the CmgFilter class.
- Hits: this class encapsulates the results of a search of the index set. The SearchResultBuilder class provides the *process()* method that transforms a Hits object into a List of results. The *score(int i)* method returns a score for the hit indexed by i: this reflects how well the hit matches the search criteria specified by the user.
- IndexReader: used to read index entries from the Lucene file format files.
- IndexWriter: used to write documents out in the Lucene file format.
- Query: the basic search object used to retrieve search results.
- Searcher: the basic class used to initiate searches over an index set. Its *search()* method typically takes a Query and a Filter and returns a Hits object.

IndexBuilder and IndexSetBuilder Classes

IndexBuilders

Index builders are Java classes that implement the IIndexBuilder interface. They are used to create index entries based on the values of fields in objects. The abstract BaseBuilder class implements the interface and all IndexBuilders should extend BaseBuilder. The principal methods that must be implemented are:

- public Document build() throws ComerгентException: builds the index given the current document.
- public Document build(Document doc, IIndexBuilder parentBuilder) throws ComerгентException: used when the index builder is a child of another index builder. The parent builder object is used to add the parent's key prefix to the current index builder's prefix. The List of entities is initialized with the parent's List of entities. The BaseBuilder class defines this method so that it first calls *buildSelf()* and then recursively calls the *build()* method of the child index builders.

- protected Document buildSelf(Document doc) throws ComergentException: the method used to create the index entries for this index builder. Each entry is an instance of the Field class: the document is built up by creating each field and then adding each to the document. For example:

```
IndexFieldConfiguration iconf =
    this.conf.getIndexFieldConfiguration(id);
Field field = new Field(this.getPrefix()+iconf.getKey(),
    result, iconf.getIsStore(), iconf.getIsIndex(),
    iconf.getIsTokenize());
doc.add(field);
```

In creating a custom IndexBuilder, this method is overwritten with the specific index building method required to create the custom index entries.

- public void addBuilder(IndexBuilder builder): add a child index builder to the current index builder.
- public List getEntities(): get the List of objects currently being indexed.
- public String getEntityType(): get the name of the class that is indexed by this index builder. For example, "com.comergent.bean.simple.ProductBean".
- public String getPrefix(): get the full prefix for entries created by this index builder. For example, "product.name".
- public void init(List entities) throws ComergentException: initializes the index builder with the list of entities to be indexed. Its main purpose is to take the list of entities passed in and build the list of entities that it must index. For example, for an index builder working on features, if the *init()* method is passed a list of products, it might be used to build a list of features that are assigned to the products along these (simplified) lines:

```
for (int i = 0; i < entities.size(); i++)
{
    IBizProduct prod = null;
    try
    {
        prod = (IBizProduct) entities.get(i);
        prod.restoreFeatures(true, context.getLocale());
        this.addEntities(getVisibleFeatures(prod.getFeatures()));
    }
    catch(ComergentException e)
    {
        throw new ComergentException(e.toString());
    }
}
```

```
}
```

- `public void removeBuilder(int i)` throws `ComergentException`: remove a child index builder.

A `GenericBuilder` class can be used for simple index builders: it can perform the basic index building required for data fields of data beans. Each builder contains its configuration as a `BuilderConfiguration` class: this is passed in its constructor. The `BuilderConfiguration` class holds the key to be used while indexing: this can be accessed using `getKey()` and `setKey()` methods. It also identifies the Entity class (for example, `ProductBean`) and a Map of `IndexFieldConfiguration` classes: each `IndexFieldConfiguration` class is a mapping between a key and an ID. The ID identifies the field of the entity class whose values are to be indexed. The key is the string is to be used to uniquely identify this key from the other keys being generated by building the index.

For example, if the `Name` data field of the `ProductBean` data object is to be indexed by an index builder whose key is “prod” and it must index using the key “name”, then you would use the following calls while creating the index builder:

```
BuilderConfiguration productBuilderConfiguration =
    new BuilderConfiguration();
productBuilderConfiguration.setKey("prod");
productBuilderConfiguration.setEntityClass(
    "com.comergent.bean.simple.ProductBean");
IndexFieldConfiguration productName = new IndexFieldConfiguration();
productName.setKey("name");
productName.setID("Name");
productBuilderConfiguration.addIndexFieldConfiguration(productName);
GenericBuilder productIndexBuilder =
    new GenericBuilder(productBuilderConfiguration);
```

Index entries that it creates are retrieved using the “prod.name” key: this is the concatenation of the index builder’s key with the index field’s key. If the index builder is itself a child index builder of a parent index builder whose key is “catalog”, then the key to retrieve entries is “catalog.prod.name”.

IndexSetBuilders

Each index set is created by invoking an `IndexSetBuilder`. The `IndexSetBuilder` class is an abstract class: you must create a sub-class that implements its `build()` method.

The `build()` method does the work of indexing the objects and writing out the results to the file system. For example, the `CatalogIndexSetBuilder` class implements the `build()` method by:

1. Instantiating the root index builder specified in the **SearchConfigurationProperties.xml** file. Typically, this is done using the *getRootIndexBuilder()* method of the *IndexSetBuilder* class. It invokes a factory method that creates the hierarchy of index builders.
2. Creating an index writer: this manages writing out the index document to the index files.
3. Retrieving the list of products.
4. For each product in the list of products:
 - a. Pass the product to the builder as a parameter. It gets added to the list of entities in the index builder.
 - b. Create the index document by invoking *build()* on the index builder.
 - c. Writing out the document to the index writer.
5. Tidying up by logging the completion time.

Search Terms

Search terms are used to specify what index entries should be returned by the Searcher class. The *SearchTerm* class is used to specify a single search term and then a list of search terms is passed to the searcher by invoking the *addSearchTerm()* method: this takes a List of *SearchTerms* as its parameter.

Search terms can be aggregated: by adding search terms together you build up the complete search term used to perform the search.

The *SearchTerm* class has the following important methods:

- *addTerm()*: adds a search term to the current search term.
- *setCondition()*: specify whether this search term is looking for a field that must or must not be in the search results. You can also use:

```
setCondition(SearchTerm.CONDITION_PREFER);
```

in situations where the user has expressed this preference.
- *setFieldName()*: set the name of the index field to be searched.
- *setOP()*: specifies the operator to be used to compare the search term value to the field values.
- *setType()*: specifies whether the search term is to be used as a query search term or a filter search term.

- *setValue()*: the value to search for.
- *setWeight()*: set the weight to place on this search term when a hit is found. This is used to evaluate the score for the hit.

For example, here is an example code fragment in which the search term is defined to retrieve those *prod.name* fields with the value of “MXWS-7890”.

```
//Create a new advanced searcher
ICmgtSearcher temp_Searcher = new AdvancedSearcher();
//initialize with the a session context
SessionContext temp_Context = createSessionContext();
temp_Searcher.init(temp_Context);
//Create a search term
SearchTerm temp_SearchTerm = new SearchTerm();
temp_SearchTerm.setCondition(SearchTerm.CONDITION_MUST);
temp_SearchTerm.setFieldName("prod.name");
temp_SearchTerm.setOP(SearchTerm.OP_EQUAL);
temp_SearchTerm.setType(SearchTerm.TYPE_QUERY);
temp_SearchTerm.setValue("MXWS-7890");
temp_SearchTerm.setWeight(1.0);
//Add search term to list of search terms
List allSearchTerms = new ArrayList();
allSearchTerms.add(temp_SearchTerm);
temp_Searcher.addSearchTerm(allSearchTerms);
//Execute the search, retrieving results as a Hits object
Hits hits = temp_Searcher.search();
```

Search Term Types

There are different types of search terms:

- **Query**: these search terms are used to build the initial query which is used to search the index set.
- **Filter**: these search terms are used to filter the results returned from the initial search query.
- **Filtering Query**: this is a helper type of search term used when the search request has a “Must Have” condition.

Filters

Each search result is represented as an instance of the Document class. Filter search terms can act on each document to determine whether the result meets the requirements of the filter or to filter the result out. The following code example demonstrates the use of filter search terms: it creates a combination of search terms that exclude products whose effectivity dates mean that the product would not be available at the time of the search.

```
// Create parameters used in defining search terms
String now = DateField.dateToString(new Date());
SearchFieldConfiguration sconf =
    cntx.getIndexSet().getSearchFieldConfiguration("prodSDate");
SearchFieldConfiguration econf =
    cntx.getIndexSet().getSearchFieldConfiguration("prodEDate");
// Create top-level search term
SearchTerm allTerms = new SearchTerm();
// Create top-level filter term
SearchTerm top = new SearchTerm();
top.setFieldName("effectivityCheck");
top.setCondition(SearchTerm.CONDITION_MUST);
top.setNeedParsing(false);
top.setType(SearchTerm.TYPE_FILTERING_QUERY);
// term for checking effective start date
SearchTerm st1 = new SearchTerm();
st1.setFieldName(sconf.getKey());
st1.setCondition(SearchTerm.CONDITION_MUST);
st1.setNeedParsing(false);
st1.setOP(SearchTerm.OP_LET);
st1.setValue(now);
// term for checking for effective end date
SearchTerm st2 = new SearchTerm();
st2.setFieldName(econf.getKey());
st2.setCondition(SearchTerm.CONDITION_MUST);
st2.setNeedParsing(false);
st2.setOP(SearchTerm.OP_GET);
st2.setValue(now);
//Add filter terms to top-level filter term
top.addTerm(st1);
top.addTerm(st2);
//Add filter term to top-level search term
allTerms.add(top);
```

Note the use of the OP.LET and OP.GET operators: these are the "less than or equal" and "greater than or equal" operators used to compare dates represented as Strings.

Processing Results

Once the search has returned its list of results in the form of a Hits object, you must ready the results to pass them to the JSP page used to display them. You can use a SearchResultBuilder class for this purpose: this abstract class provides methods to process the results, and sub-classes of this class can provide custom processing.

The *getProdScoresAndTrim()* method is used to turn the Hits object into an ArrayList of Document objects, one for each hit. It also creates a HashMap of scores that is used to order the results by score.

The key method that sub-classes must implement is the *process()* method. Its purpose is to turn the Hits into a list of objects that can be rendered on the JSP page: typically, this is an ArrayList of data beans or presentation beans.

Here is a simplified example of what the process method does:

```
public List process(Hits hits, int pageNum, SessionContext cntx)
    throws ICCEException, IOException
{
    this.indexSet = cntx.getIndexSet();
    Long stopCount = cntx.getStopCount().longValue();
    ArrayList docs = super.getProdScoresAndTrim(hits, stopCount);
    super.setTotalBeforeStopCount(hits.length());
    super.setTotalAfterStopCount(docs.size());
    super.setCurPageNum(pageNum);
    // Sort the result.
    this.doSort(docs, super.getSortCriteria(),
        super.isSortAscending());
    // gets price stored in the index.
    this.getProductPrices(docs);
    // get results for the page
    ArrayList pageDocs = getPage(docs, pageNum, super.getPageSize());
    // get product ids
    SearchFieldConfiguration sconf =
        this.indexSet.getSearchFieldConfiguration("prodID");
    ArrayList productIDs =
        this.getProductIDs(pageDocs, sconf.getKey());
    // create query
    DsQuery query = getProductQuery(productIDs);
    // restore products based on the query
    IBizProductList pl = restoreProducts(super.getDc(),
        query, super.isShowPromotions());
    // Need to re-order results returned from query
    List pList = pl.getProducts();
    pList = filterByEffectivity(pList);
    setPrices(pList);
    pList = reorderResults(productIDs, pList);
    return pList;
}
```

Typically, a controller constructs the appropriate results builder, uses it to process the results, and then passes off the result to the JSP page:

```
SearchResultBuilder temp_ResultBuilder = new ProductListBuilder();
List resultList = temp_ResultBuilder.process(hits, pageNumber, cntx);
```

```
request.setAttribute("products", resultList);
```

Customizing IndexBuilders

Typically, you can customize index building in these ways:

- Modify the configuration using the configuration files and creating new index builders.
- Create complex search terms using the query, filter, and filtering query search term types.
- Apply filters that limit the objects to be indexed: building filters that perform complex comparisons of terms.
- Add or remove fields to be indexed: modifying the **SearchConfigurationProperties.xml** file to add new index fields and corresponding index builders for the new fields.
- Customize the stemming and parsing logic: either extend the existing `CatalogSearchAnalyzer` class or create a new `Analyzer` class that extends the `Lucene Analyzer` class.

The Sterling Multi-Channel Selling Solution provides a set of Web services that can be used to execute Sterling Multi-Channel Selling Solution functionality from remote clients. Release 7.0 and higher provide an extensible framework in which SOAP messages can be handled, and some specific Web services that can be used out-of-the-box. This chapter covers:

- "Overview" on page 331
- "Web Services Provided by Sterling Multi-Channel Selling Solution" on page 334
- "Creating a Web Service" on page 341

The Web services also provide the basic capability to provide portlets that display the data returned by the Web services. See the *Sterling Multi-Channel Selling Solution Implementation Guide* for details.

Overview

Web services provide a framework that enables Web applications to expose functionality in a standard way to remote clients. They use a combination of XML and HTTP to communicate between client and server. Most Web services use the Simple Object Access Protocol (SOAP) to exchange the remote procedure calls, although other protocols can also be supported.

The basic rules in writing a new Web service and WSDL Interface definition are:

1. The input message should have a single part and is an element.
2. The Element should have the same name as the operation name.
3. The elements complex type should not have attributes.
4. The response element should be operationName appended with “Response”.

WSDL Files

When a Web application provides a Web service, it declares them using a Web Services Description Language (WSDL) file: this is an XML file that describes the Web service: it specifies the location of the Web service and the methods that it exposes. For example, the following fragment of a WSDL file is used to obtain a stock quote:

```
<portType name="StockQuotePortType">
  <operation name="GetLastTradePrice">
    <input message="tns:GetLastTradePriceInput"/>
    <output message="tns:GetLastTradePriceOutput"/>
  </operation>
</portType>
```

In this example, the Web service, `StockQuotePortType`, supports a method called `GetLastTradePrice` that takes one parameter, an object of type `GetLastTradePriceInput`, and it returns an object of type `GetLastTradePriceOutput`. The precise structure of the `GetLastTradePriceInput` and `GetLastTradePriceOutput` types are also defined in the same WSDL document.

Web Service Clients

In order to access the Web service, you must write a client that generates SOAP messages and sends them to the Web application in such a way that the Web application can process the messages and respond. The client can be written in any programming language, provided that it can correctly issue and receive SOAP messages.

Writing the client entirely by hand could be a laborious task: fortunately, tools are available to generate the client code. The tools use the WSDL file to generate the client “stub” classes that can handle the SOAP communication between client and Web application, and so all you need to do is to write the application logic for the client.

Most modern integrated development environments (IDEs) such as Eclipse and Visual Studio support the generation of client classes, and an open source software project, AXIS, can also be used.

Typically, you use the automatically-generated “locator class” to instantiate a client class that can invoke the Web service, and then the client class can invoke one of the Web service operations in way which is entirely invisible to the client application.

Example

For example, the **OrderInterface.wsdl** WSDL file provided by the Sterling Multi-Channel Selling Solution contains the following XML fragments:

```
<xsd:element name="OrderCreateRequest">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element name="MessageHeader" type="tns:MessageHeaderType" />
      <xsd:element name="RemoteUser" type="tns:RemoteUserType" />
      <xsd:element name="Order" type="tns:OrderCreateParams" />
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
```

If you run one of the Java-based tools against this WSDL, then you will see that (among others) the following classes are generated:

- OrderCreateServiceLocator.java
- OrderCreateParams.java
- OrderCreatePortType.java
- OrderCreateRequest.java
- OrderCreateResponse.java

By using these classes in your client application, you can invoke the Web service along these lines:

```
try
{
    OrderCreateServiceLocator temp_OrderCreateServiceLocator =
        new OrderCreateServiceLocator();
    OrderCreatePortType temp_OrderCreatePortType =
        temp_OrderCreateServiceLocator.getOrderCreatePort();
    MessageHeaderType temp_MessageHeaderType =
        new MessageHeaderType();
    MessageTypeType temp_MessageTypeType =
        MessageTypeType.fromString("dXML");
```

```
temp_MessageHeaderType.setMessageType(temp_MessageTypeType);
MessageVersionType temp_MessageVersionType =
    MessageVersionType.fromString("5.1");
temp_MessageHeaderType.setMessageVersion(
    temp_MessageVersionType);
temp_MessageHeaderType.setMessageID("Fred");
RemoteUserType temp_RemoteUserType = new RemoteUserType();
temp_RemoteUserType.setUserLogin("ERPAdmin");
temp_RemoteUserType.setUserAuthenticator("ERPAdmin");
OrderCreateParams temp_OrderCreateParams =
    new OrderCreateParams();
temp_OrderCreateParams.setCurrencyCode("USD");
... set the values of other order fields
DXMLOrderType temp_DXMLOrderType =
    temp_OrderCreatePortType.orderCreateRequest(
        temp_MessageHeaderType,
        temp_RemoteUserType, temp_OrderCreateParams);
OrderResponseType temp_OrderResponseType =
    temp_DXMLOrderType.getOrder();
OrderCreateResponse temp_OrderCreateResponse =
    temp_OrderCreatePortType.orderCreate(temp_OrderCreateRequest);
}
catch (Exception e)
{
    System.out.println("Throwing exception " + e.toString());
    e.printStackTrace(System.out);
}
...
```

The key lines are the ones that create the `OrderCreateServiceLocator` locator class, use the locator class to create the `OrderCreatePortType`, create the `OrderCreateParams` class, and then the line that invokes the service and receives back an instance of the `DXMLOrderType` class. Note the use of a try-catch block to capture any problems associated with invoking the Web service. The `SOAPFault` mechanism is used to capture any server-side errors and using the `printStackTrace()` method on the exception will help you to identify the cause of an error.

Web Services Provided by Sterling Multi-Channel Selling Solution

The Sterling Multi-Channel Selling Solution provides the following Web services:

- "Attribute Management" on page 336
- "Attribute Group Management" on page 336
- "Catalog Management" on page 337

- "Invoice Management" on page 337
- "Lead Management" on page 337
- "OIL Management" on page 337
- "Order Management" on page 338
- "Partner Management" on page 338
- "Pricing Service" on page 338
- "Promotion Management" on page 339
- "Proposal Management" on page 339
- "Quote Management" on page 339
- "Return Management" on page 339
- "Sales Contract Management" on page 340
- "Service Contract Management" on page 340
- "Task Management" on page 340
- "User Management" on page 340

The Web services are declared in the Interface WSDL files to be found in the *debs_home/Sterling/dXML/5.1/* directory:

- **AttributeInterface.wsdl**
- **AttributeGroupInterface.wsdl**
- **CatalogInterface.wsdl**
- **InvoiceInterface.wsdl**
- **LeadInterface.wsdl**
- **OILInterface.wsdl**
- **OrderInterface.wsdl**
- **PartnerInterface.wsdl**
- **PricingServiceInterface.wsdl**
- **PromotionInterface.wsdl**
- **ProposalInterface.wsdl**
- **QuoteInterface.wsdl**

- **ReturnInterface.wsdl**
- **SalesContractInterface.wsdl**
- **ServiceContractInterface.wsdl**
- **TaskInterface.wsdl**
- **UserInterface.wsdl**

Before you notify your customers of the Web services, be sure to check that you know the URL that should be used to access the WSDL files. For example, suppose that the main URL used to access the Sterling Multi-Channel Selling Solution is:

```
http://www.matrix.com:8080/Sterling/en/US/enterpriseMgr/matrix
```

Here, the last portion of the URL is “matrix”: this is a skin used to enter the Sterling Multi-Channel Selling Solution. Then you use a URL along these lines to retrieve the WSDLs:

```
http://www.matrix.com:8080/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=ServiceInterface.wsdl
```

Note	If you are adding the URL in a .bat or .sh script you may need to add a “^” (caret) symbol immediately before the “&” (ampersand), depending on your interpreter.
-------------	---

Attribute Management

You can access the following Attribute-related services:

- AttributeDelete
- AttributeGet
- AttributeUpdate

You can access the Attribute Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=AttributeInterface.wsdl
```

Attribute Group Management

You can access the following Attribute Group-related services:

- AttributeGroupDelete
- AttributeGroupGet
- AttributeGroupUpdate

You can access the Attribute Group Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=AttributeGroupInterface.wsdl
```

Catalog Management

You can access the following Catalog-related services:

- ProductGet
- ProductSearch

You can access the Catalog Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=CatalogInterface.wsdl
```

Invoice Management

You can access the following Invoice-related services:

- InvoiceChange
- InvoiceCreate
- InvoiceGet
- InvoiceListGet

You can access the Invoice Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=InvoiceInterface.wsdl
```

Lead Management

You can access the following Lead-related services:

- LeadGet
- LeadSearch

You can access theLead Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=LeadInterface.wsdl
```

OIL Management

You can access the following OIL-related services:

- OILCreate

- OILGet
- OILSearch
- RoutedOILSearch

You can access the OIL Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=OILInterface.wsdl
```

Order Management

You can access the following Order-related services:

- OrderCreate
- OrderGet
- OrderSearch
- OrderStatus

You can access the Order Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=OrderInterface.wsdl
```

Partner Management

You can access the following Partner-related services:

- PartnerCreate
- PartnerChange

You can access the Partner Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=PartnerInterface.wsdl
```

Pricing Service

You can access the following pricing-related services:

- PricingLineService
- PricingCartService
- CouponValidation

You can access the Pricing Service WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/
```

`GetWSDL.jsp?sfName=matrix&fileName=PricingServiceInterface.wsdl`

Promotion Management

You can access the following Promotion-related services:

- PromotionGet
- PromotionSearch

You can access the Promotion Management WSDL at:

`http://<server:port>/Sterling/dXML/5.1/
GetWSDL.jsp?sfName=matrix&fileName=PromotionInterface.wsdl`

Proposal Management

You can access the following Proposal-related services:

- ProposalGet
- ProposalSearch

You can access the Proposal Management WSDL at:

`http://<server:port>/Sterling/dXML/5.1/
GetWSDL.jsp?sfName=matrix&fileName=ProposalInterface.wsdl`

Quote Management

You can access the following Quote-related services:

- QuoteGet
- QuoteSearch

You can access the Quote Management WSDL at:

`http://<server:port>/Sterling/dXML/5.1/
GetWSDL.jsp?sfName=matrix&fileName=QuoteInterface.wsdl`

Return Management

You can access the following Return-related services:

- ReturnGet
- ReturnSearch

You can access the Return Management WSDL at:

`http://<server:port>/Sterling/dXML/5.1/
GetWSDL.jsp?sfName=matrix&fileName=ReturnInterface.wsdl`

Sales Contract Management

You can access the following Quote-related services:

- SalesContractGet
- SalesContractSearch

You can access the Sales Contract Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=SalesContractInterface.wsdl
```

Service Contract Management

You can access the following Service Contract-related services:

- ServiceContractSearch
- ServiceContractGet

You can access the Service Contract Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=ServiceContractInterface.wsdl
```

Task Management

You can access the following Task-related services:

- TaskGet
- TaskSearch

You can access the Task Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=TaskInterface.wsdl
```

User Management

You can access the following User-related services:

- UserGet
- UserUpdate

You can access the Shopping Cart Management WSDL at:

```
http://<server:port>/Sterling/dXML/5.1/  
GetWSDL.jsp?sfName=matrix&fileName=UserInterface.wsdl
```


Common Components

These files make use of common definitions defined in the dXML schema definition XSD files:

- **dXML-AttributeGroupObjectDefinitions.xsd**
- **dXML-AttributeObjectDefinitions.xsd**
- **dXML-BasicComponents.xsd**
- **dXML-CatalogObjectDefinitions.xsd**
- **dXML-InvoiceObjectDefinitions.xsd**
- **dXML-LeadObjectDefinitions.xsd**
- **dXML-OILObjectDefinitions.xsd**
- **dXML-OrderObjectDefinitions.xsd**
- **dXML-PartnerObjectDefinitions.xsd**
- **dXML-PricingServiceObjectDefinitions.xsd**
- **dXML-PromotionObjectDefinitions.xsd**
- **dXML-ProposalObjectDefinitions.xsd**
- **dXML-QuoteObjectDefinitions.xsd**
- **dXML-ReturnObjectDefinitions.xsd**
- **dXML-SalesContractDefinitions.xsd**
- **dXML-ServiceContractDefinitions.xsd**
- **dXML-TaskObjectDefinitions.xsd**
- **dXML-UserObjectDefinitions.xsd**

The **dXML-BasicComponents.xsd** XSD file defines elements that are common to all the Web services supported by the Sterling Multi-Channel Selling Solution, and the other XSD files are specific to each of the Interface Web services.

Creating a Web Service

This section describes how to go about creating a Web service using the Sterling Multi-Channel Selling Solution APIs. Throughout this section we use the example of creating a Web service to provide pricing information for a user.

To create a Web service for an existing API, you must provide the following components:

- **WSDL:** create a WSDL which declares the form of the request and response used to invoke the Web service. The WSDL file can include XSD files that define specific types used by the WSDL.
- **Business API:** either identify or create the business API used to perform the business logic and retrieve the required information.
- **Bizlet Class:** you must implement a Bizlet class to process the inbound service request.
- **Message Conversion Files:** these are entries in the corresponding converter definition files (**dxml_5_1_to_comergent_4_0.xml** and **native_to_dxml_5_1.xml** for the inbound and outbound messages respectively), and the stylesheets used to convert the messages.

The following diagram provides a picture of how the components work together:

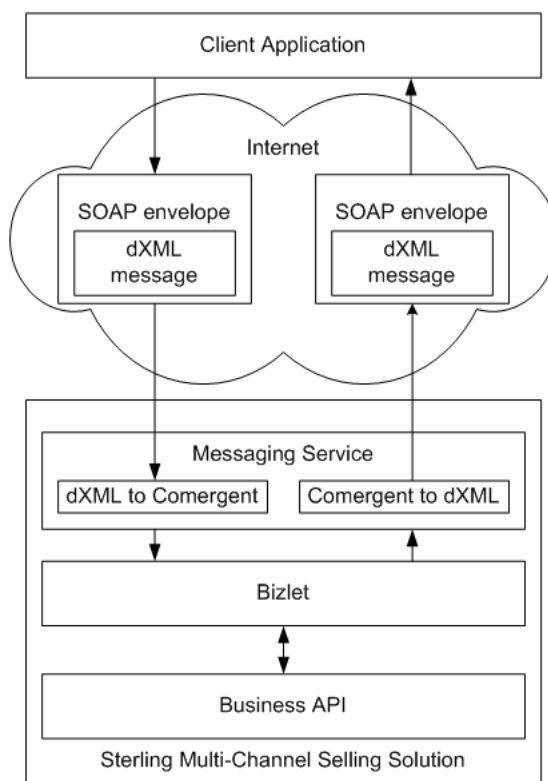


FIGURE 10. Sterling Multi-Channel Selling Solution Web Services

In developing your Web service, you will find it very helpful to have the following components set up:

- Logging set to debug in the business API that your Web service invokes.
- Logging set to debug in the messaging layer: this will enable you to view the form of the dXML 5.1 and Comergent 4.0 XML messages, and verify that the stylesheets are correctly converting from one to the other.
- A tool such as the Axis TCPMon tool: this enables you to view the form of the XML message being sent by your client application into the Sterling Multi-Channel Selling Solution and the form of the XML message being returned from the Sterling Multi-Channel Selling Solution to your client application.

WSDL

You must create the WSDL file that defines the Web service. The WSDL file must declare the form in which the request must be packaged and the form in which the response is packaged. Using a tool such as TCPMon, you can verify that the client application is sending and receiving XML messages that match the specification declared in the WSDL file and its included XSD files.

In our example, we declare the form of the PricingGetRequest and PricingGetRequestResponse in a **PricingInterface.wsdl** file as follows:

```
<xsd:element name="PricingGetRequest">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element name="MessageHeader" type="cmgt:MessageHeaderType"/>
      <xsd:element name="RemoteUser" type="cmgt:RemoteUserType"/>
      <xsd:element name="PriceAvailabilityRequest"
        type="cmgt:PriceAvailabilityRequest"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
<xsd:element name="PricingGetRequestResponse">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element name="dXML" type="cmgt:dXMLPriceAvailabilityType"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
```

The names of `xsd:elements` will determine the names of XML elements within the XML message passing over the wire. The types must be defined in the WSDL file (or files included using the `xsd:include` tag). For example, the `cmgt:dXMLPriceAvailabilityType` is declared as:

```
<xsd:complexType name="dXMLPriceAvailabilityType">
  <xsd:sequence>
    <xsd:element name="MessageHeader" type="cmgt:MessageHeaderType"/>
    <xsd:element name="ResponseHeader"
      type="cmgt:ResponseHeaderType"/>
    <xsd:element name="PriceAvailability"
      type="cmgt:PriceAvailabilityResponseType"/>
  </xsd:sequence>
</xsd:complexType>
```

In the same way, the `cmgt:PriceAvailabilityResponseType` is declared with its subsidiary types as:

```
<xsd:complexType name="PriceAvailabilityResponseType">
  <xsd:sequence>
```

```
<xsd:element name="CurrencyCode" type="cmgt:StringType"
  minOccurs="0" maxOccurs="1"/>
<xsd:element name="CustomerType" type="cmgt:StringType"
  minOccurs="0" maxOccurs="1"/>
<xsd:element name="PaLineList" type="cmgt:PaLineArray"
  minOccurs="0" maxOccurs="1"/>
</xsd:sequence>
</xsd:complexType>
<xsd:complexType name="PaLineArray">
  <xsd:sequence>
    <xsd:element name="PaLine" type="cmgt:PaLine"
      minOccurs="0" maxOccurs="unbounded"/>
  </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="PaLine">
  <xsd:sequence>
    <xsd:element name="SKU" type="cmgt:SKUType"/>
    <xsd:element name="Quantity" type="cmgt:QuantityType"
      minOccurs="0" maxOccurs="1"/>
    <xsd:element name="ListPrice" type="cmgt:AmountType"
      minOccurs="0" maxOccurs="1"/>
  </xsd:sequence>
```

Once the WSDL and included files are writtten, you should drop them into the ***debs_home/Sterling/dXML/5.1/*** directory, and verify that you can generate client stub classes by running a Web services tool such as the Axis WSDL2Java script against this WSDL.

If you write a client application using the generated client stub classes, then you should be able to run the client application and verify that an error message is reported by the Sterling Multi-Channel Selling Solution messaging layer (because you have not yet defined the message type that you want to use to invoke the Web service).

Business API

Web services provide a mechanism to expose some of your business logic so that it can be executed by remote clients. You may already have created the business logic or you may have to create it as part of the process of creating the Web service.

In this section, we are using the example of the business API used to retrieve prices. Specifically, we want to invoke the *check(pricing Cart pc)* method of the *com.comergent.api.apps.pricingMgr.PriceCheckAPI* class. To do this, our Bizlet implementation class will need to assemble a *PricingCart* object from the inbound message: this *PricingCart* encapsulates all the information that the pricing engine requires: the partner key, the customer type, the currency, and the product IDs.

Bizlet Class

CHAPTER 5, "Bizlets" provides an introduction to the use of Bizlets in the Sterling Multi-Channel Selling Solution, and so this section concentrates on the specific implementation we use in this example. Bizlets use beans to specify their interfaces, and so we must use either a pre-existing data object definition or create one, so that the bean class is generated. The data object definition can be used to generate the corresponding Comergent 4.0 DTD: it is this DTD that determines how the stylesheet will transform the inbound dXML message into the Comergent 4.0 XML form that is used to create the data bean used by the Bizlet class.

Together with the Bizlet class, you must declare the `MessageType` entry in one of the **MessageTypes.xml** configuration files: this provides the mapping between the message type and the Bizlet class. In our example, we simply create an entry in the `PricingAdminAndAssignGroup` message group along these lines:

```
<MessageType Name="PriceAvailabilityRequest">
  <ControllerMapping>
    com.comergent.dcm.bizlet.BizRouter
  </ControllerMapping>
  <BizletMapping>
    com.comergent.apps.priceCheck.bizlet.PriceCheckBizlet.checkPrices
  </BizletMapping>
</MessageType>
```

In our example, we will use the `PriceAvailability` data object: its XML data object definition file is part of the Release 8.0 WAR release, and its DTD is generated as part of an SDK installation. The Bizlet interface we create is called `PriceCheckBizlet` and its corresponding implementation class is `PriceCheckBizletImpl`. The interface supports one method:

```
public PriceAvailabilityBean checkPrices(PriceAvailabilityBean
    priceAvailabilityBean)
```

The implementation class provides the following implementation of the *checkPrices()* method:

```
public PriceAvailabilityBean checkPrices(PriceAvailabilityBean
    priceAvailabilityBean) throws ICCEException
{
    PricingCart temp_InboundPricingCart =
        convertPABeanToPricingCart(priceAvailabilityBean);
    PricingCart temp_OutboundPricingCart =
        PriceCheckAPI.check(temp_InboundPricingCart);
    convertPricingCartToPABean(temp_OutboundPricingCart,
        priceAvailabilityBean);
    return priceAvailabilityBean;
}
```

Here, helper methods are used to convert between the bean used by the Bizlet API and the PricingCart used by the PriceCheck API.

At this point, you should be able to verify that the Bizlet class is being invoked correctly, by directly posting into the Sterling Multi-Channel Selling Solution messages that match the Comergent 4.0 representation of the bean that your Bizlet uses.

Message Conversion Files

This section covers the conversion of the inbound XML message from the client application, and the outbound message back to the client. This involves creating stylesheets, and in addition to the stylesheets, you must update the converter configuration files to declare the new stylesheets

(**dxml_5_1_to_comergent_4_0.xml** and **native_to_dxml_5_1.xml** for the inbound and outbound messages respectively).

Inbound Conversion

When the client application invokes the Web service by means of the stub classes, it sends a dXML message as an inbound post into the Sterling Multi-Channel Selling Solution. The inbound message is transformed using a stylesheet that converts the dXML into Comergent 4.0 (the “native” format) XML, and then the messaging layer can convert this into the bean that the Bizlet class is expecting. Consequently, a stylesheet has to be created to convert the inbound dXML message into the Comergent 4.0 form.

For example, to manage the conversion of the inbound PricingGetRequest, the following entry is added to the **dxml_5_1_to_comergent_4_0.xml** file:

```
<MessageType Name="PricingGetRequest">
<ConvertedMessageType>PriceAvailabilityRequest</ConvertedMessageType>
<ConverterImpl>com.comergent.converter.ConverterImpl</ConverterImpl>
<Stylesheet>
  /WEB-INF/stylesheets/dXML51toCmgt40_PriceAvailability_Req.xsl
</Stylesheet>
</MessageType>
```

In the **dXML51toCmgt40_PriceAvailability_Req.xsl** stylesheet file, the following element is used to convert the MessageHeader element of the inbound dXML message into the corresponding MessageHeader element of the Comergent 4.0 message:

```
<xsl:template match="cmgtws:MessageHeader">
  <xsl:variable name="messageType"
    select="'PriceAvailabilityRequest'"/>
  <xsl:variable name="messageVersion" select="'4.0'"/>
```

```
<MessageHeader>
  <MessageType>
    <xsl:value-of select="$messageType"/>
  </MessageType>
  <MessageVersion>
    <xsl:value-of select="$messageVersion"/>
  </MessageVersion>
  <MessageID>
    <xsl:value-of select="/cmgtws:PricingGetRequest/
cmgtws:MessageHeader/cmgtws:MessageID"/>
  </MessageID>
  <SessionID>
    <xsl:value-of select="/cmgtws:PricingGetRequest/
cmgtws:MessageHeader/cmgtws:SessionID"/>
  </SessionID>
</MessageHeader>
</xsl:template>
```

Similarly, the following element converts the PriceAvailabilityRequest element:

```
<xsl:template match="cmgtws:PriceAvailabilityRequest">
  <PriceAvailability type="BusinessObject" state="INSERTED">
    <CurrencyCode>
      <xsl:value-of select="/cmgtws:PricingGetRequest/
cmgtws:PriceAvailabilityRequest/cmgtws:CurrencyCode"/>
    </CurrencyCode>
    <OrderType>
      <xsl:value-of select="/cmgtws:PricingGetRequest/
cmgtws:PriceAvailabilityRequest/cmgtws:CustomerType"/>
    </OrderType>
    <PaLineItemList state="INSERTED">
      <xsl:for-each select="/cmgtws:PricingGetRequest/cmgtws:PriceAv-
ailabilityRequest/cmgtws:PaLineList/cmgtws:PaLine">
        <PaLineItem>
          <SellerSKU>
            <xsl:value-of select="cmgtws:SKU"/>
          </SellerSKU>
          <BuyerSKU>
            <xsl:value-of select="cmgtws:SKU"/>
          </BuyerSKU>
          <Quantity>
            <xsl:value-of select="cmgtws:Quantity"/>
          </Quantity>
        </PaLineItem>
      </xsl:for-each>
    </PaLineItemList>
  </PriceAvailability>
</xsl:template>
```


Outbound Conversion

The conversion from Comergent 4.0 back to dXML 5.1 is declared in the **native_to_dxml_5_1.xml**. For example:

```
<MessageType Name="PriceAvailabilityReply">
  <ConvertedMessageType>PricingGetResponse</ConvertedMessageType>
  <ConverterImpl>com.comergent.converter.ConverterImpl</Converter-
Impl>
  <Stylesheet>
    WEB-INF/stylesheets/NativetodXML51_PricingGet_Rep.xsl
  </Stylesheet>
</MessageType>
```

The stylesheet uses the following elements to convert the Comergent 4.0 PriceAvailability element:

```
<xsl:template match="PriceAvailability">
  <PriceAvailability>
    <xsl:call-template name="PriceAvailability"/>
    <xsl:apply-templates select="PaLineItemList" />
  </PriceAvailability>
</xsl:template>
<xsl:template name="PriceAvailability">
  <CurrencyCode>
    <xsl:value-of select="/Comergent/PriceAvailability/CurrencyCode"/>
  </CurrencyCode>
  <CustomerType>
    <xsl:value-of select="/Comergent/PriceAvailability/OrderType"/>
  </CustomerType>
</xsl:template>
<xsl:template name="PaLineItemList" match="PaLineItemList">
  <PaLineList>
    <xsl:for-each select="PaLineItem">
      <PaLine>
        <SKU>
          <xsl:value-of select="SellerSKU"/>
        </SKU>
        <Quantity>
          <xsl:value-of select="Quantity"/>
        </Quantity>
        <ListPrice>
          <xsl:value-of select="ListPrice"/>
        </ListPrice>
      </PaLine>
    </xsl:for-each>
  </PaLineList>
</xsl:template>
```

At this point, you should be able to verify that the Bizlet class is being invoked correctly, by directly posting into the Sterling Multi-Channel Selling Solution messages that match the dXML 5.1 form of the message that your Web service uses. If this succeeds, then you should be able to test the system end-to-end by running your client application class.

This chapter describes how to keep track of the history of a data object as it is created and modified. This information can be useful to users to understand what changes have been made to objects such as order, invoices, quotes, and so on. In addition, the history gives an audit trail of changes in cases where it becomes critical to understand which user made which changes to an object.

Framework

The recommended approach is to save the history of changes to a data object by using a history data object that takes a “snapshot” of the data object, and then persisting the history data object to the Knowledgebase. Before saving the snapshot you can add or remove information that you do not need to record from the history data object. Typically, the original data object has a field that acts as its unique key: this key can be used to retrieve all of the history data objects that relate to each original data object.

The approach taken is to define the history data object by extending the original data object. Using the *copyBean()* method to copy the data from the original bean to the history data bean is possible because the history data bean class extends the original bean class. Depending on what history is required to save, you can have additional fields in the history data object which should be populated before calling *persist()* on the history data bean.

Example

In this example, we use the OrderLine Item as the data object whose history we want to record. So assume that there is an **OrderLineItem.xml** file defining the structure of the data object, and that a corresponding simple bean and list bean have been generated: OrderLineItemBean.java and OrderLineItemListBean.java.

Here is a simplified form of the data object file:

```
<DataObject Extends="OrderInquiryListLineItem" Name="OrderLineItem"
  ObjectType="JDBC" Version="6.0">
  <DataFieldList>
    <DataField ExternalFieldName="LIST_PRICE" Mandatory="n"
      Name="OrderListPrice" Writable="y"/>
    ...
  </DataFieldList>
</DataObject>
```

1. Define a new data object to capture line item history. This should extend the OrderLineItem data object to keep it forwardly compatible with OrderLineItem across any changes. For example:

```
<DataObject Name="OrderLineItemHist" Extends="OrderLineItem"
  ExternalAlias="LI" ExternalName="CMGT_OIL_LI_H"
  ObjectType="JDBC" Version="6.0">
  <KeyFields>
    <KeyField Name="HistoryLineKey"
      ExternalName="HISTORY_LINE_KEY"
      KeyGenerator="HistoryLineKey"/>
  </KeyFields>
  <DataFieldList>
    <DataField Name="HistoryLineKey"
      ExternalFieldName="HISTORY_LINE_KEY"
      Mandatory="n" Writable="y"/>
  </DataFieldList>
</DataObject>
```

Note that in this example, the OrderLineItemHist data object uses a different table than the OrderLineItem. This is not strictly necessary. There are some additional data fields which may be relevant for the history capture. It defines a key field that uniquely identifies this version of the line history.

2. Make the relevant entries in the **DsDataElements.xml**, **DsBusinessObjects.xml**, and **DsRecipes.xml** files.
3. Run the bean generator to generate the data beans and their interfaces.

4. In the application that creates and modifies the `OrderLineItem` data objects, add the following to capture history. It uses the *copyBean()* method to transfer the data from the `OrderLineItemBean` class to the corresponding `OrderLineItemHistBean` class. Assume that you have an instance, `olib`, of the order line item bean for which you want to capture history:

```
OrderLineItemBean olib = instance of OrderLineItemBean
//Create an instance of the History bean
OrderLineItemHistBean newBean = (OrderLineItemHistBean)
    OMWrapper.getObject(OrderLineItemHistBean.class.getName());
//Call copyBean method to copy to new bean
olib.copyBean(newBean);
// Optional step to remove shipping information
int cnt1 = newBean.getOrderLineItemShipInfoCount();
Vector v1 = newBean.getOrderLineItemShipInfoVector();
for (int i = 0; i < cnt1; i++)
{
    OrderLineItemShipInfoBean fool =
        (OrderLineItemShipInfoBean) v1.elementAt(i);
    fool.prune();
}
// Optional step to remove configuration information
int cnt2 = newBean.getCartConfigurationCount();
Vector v2 = newBean.getCartConfigurationVector();
for (int i = 0; i < cnt2; i++)
{
    CartConfigurationBean foo2 =
        (CartConfigurationBean) v2.elementAt(i);
    foo2.prune();
}
//Persist this new history bean
newBean.persist();
```

The following conventions are Sterling Commerce coding conventions. By following them, you ensure that your code can be maintained easily.

Using Session and Cache Objects

When writing applications for the Sterling Multi-Channel Selling Solution, bear in mind that you have the following available mechanisms for storing information:

- Using the Web Application: storing information on the server running the Sterling Multi-Channel Selling Solution.
- Using the Client Application: storing information on the user's browser.

Using the Web Application

ComergentSession

Use the *ComergentSession* object when you need to persist information from one request of a user's session to another. If you are using a clustered installation of the Sterling Multi-Channel Selling Solution, then you must use a *ComergentSession* and its *setAttribute()* method to ensure that data can be retrieved from one request to the next. See "Wrapper Classes" on page 18 for more information about *ComergentSession*. Objects stored in a *ComergentSession* must be serializable.

- Use *setAttribute(String s, Object o)* when the data must be persistent for the lifetime of the session. The object must be small and serializable. Retrieve the object with *getAttribute(String s)*.
- Use *cache(String s, Object o)* when the data is sufficiently recoverable if it is garbage collected. The object need not be serializable and will not be available to other members of a cluster. There is no constraint on its size. Retrieve the object with *retrieve(String s)*.

GlobalCache

Data stored in the GlobalCache is available to all applications running as part of the Sterling Multi-Channel Selling Solution. It is also available to other machines running as part of the same cluster. See the *Sterling Multi-Channel Selling Solution Implementation Guide* for implementation steps to support clustering. You should bear in mind the possibility of another application using the same String as a key.

Information stored in the GlobalCache is subject to garbage collection. If you store an object in the GlobalCache using *cache()*, then you must check for null when you retrieve the object, and you must be able to re-create the object if it is no longer in the cache. See "GlobalCache Interface" on page 27 for more information regarding the methods available to store and retrieve information in the GlobalCache.

- Use *cache(String s, Object o)* when the data is volatile and may be recovered if garbage collected. Objects need not be serializable and are not restricted in size. Retrieve the object with *get(String s)*.
- Use *set(String s, Object o)* when the data must be safe from garbage collection. This method is deprecated. Objects need not be serializable and are not restricted in size. Bear in mind that the object will not be available to other members of a cluster. Retrieve the object with *get(String s)*.

In general, you should try to use the *ComergentSession* for data that must persist from one request to another and which must be available irrespective of which machine in a clustered deployment of the Sterling Multi-Channel Selling Solution is serving a request.

For performance reasons, you should otherwise limit your use of *ComergentSession* and use the GlobalCache mechanism for other data. However, bear in mind the cost of retrieving an object if it has been removed from the GlobalCache before you want to re-use it.

ComergentContext

You can access the *ComergentContext* to store server-wide data that needs to be accessed by different Sterling Multi-Channel Selling Solution applications. Objects

stored in the `ComergentContext` are not shared across a cluster. There is no restriction on the size of objects stored in the `ComergentContext`. In general, you should use its `setAttribute()` and `getAttribute()` methods to manage storing and retrieving data. Data stored in the `ComergentContext` is not garbage-collected, so bear in mind memory-consumption issues.

Using the Client Application

In addition to storing data as part of the Web application, you can also store data in a user's Web browser so that it can be retrieved as part of the execution of a user's request.

Form Data

When you generate a Web page as part of a Sterling Multi-Channel Selling Solution application, you can store data that you would like to have returned as part of the request using a hidden input field in a form or as a URL parameter. For example:

```
<FORM ACTION="http://<server:port>/Sterling/partnerMkt/
matrix?cmd=CartDisplay>
<INPUT TYPE="HIDDEN" NAME="cartKey" VALUE="17">
</FORM>
```

or

```
http://<server:port>/Comergent/partnerMkt/matrix?cmd=CartDis-
play&cartKey=17
```

Note that users can edit the values of hidden input variables or URL parameters before posting a form request or URL, and so your application must verify that the variables are returned unchanged or check for access entitlements.

Cookies

You can store data as a cookie in the user's browser. Note that if a user has disabled the use of cookies in their browser, then any application that relies on the use of cookies may break. For this reason, we recommend against using cookies unless you can safely require that users must enable cookies in their browser. In addition, cookies may be hacked so you should not store user-sensitive or application-critical data in a cookie.

File Access

You should write your applications so that they are ready to support the deployment of the Sterling Multi-Channel Selling Solution in a clustered environment. In particular, make sure that when your application accesses files that it uses methods

that will ensure that the location of the files is independent of which server in a cluster is making the access. Use the following classes and methods:

- `ComergentContext` provides the `getResourceAsStream()`: this method provides read-only access to a file as a stream. See "ComergentContext" on page 18 for more information.
- `ComergentAppEnv` provides the `adjustFileName()` method: this method must be used in its four-parameter form. See "ComergentAppEnv Class" on page 27 for more information.

Naming Conventions

These naming conventions are useful to improve the readability of the code.

TABLE 17. Naming Conventions

Type	Description	Examples
Packages	Base packages should start at the <code>com.comergent</code> level, followed by the product and then module group name. All components of package names should be lower-case.	<code>com.comergent.dcm.protocol</code>
Classes and Interfaces	Class names should be nouns, in mixed case with the first letter of each internal word capitalized. Try to keep class names simple and descriptive. Interface names should begin with "I".	<code>DataManager</code> <code>ProductBean</code> <code>IAccProduct</code> <code>IChannelCart</code>
Constants (static final variables)	Constants should be all uppercase with words separated by underscores ("_").	<code>REPLY_HEADER</code> <code>REPLY_STATUS_CODE</code>
Methods	Method names should be verbs and be in mixed case with the first letter lowercase, and the first letter of each internal word capitalized. (This rule also applies to variables and parameters.)	<code>listen()</code> <code>parseProps(DcmsEnv env)</code>

TABLE 17. Naming Conventions (Continued)

Type	Description	Examples
Member Variables	Member variables must start with "m_" and should be short yet meaningful.	private int m_statusCode
Variables and Parameter	Variable names should be intuitive to the casual reader. One-character variable names should be avoided.	int idx long sessionId String tmp

Source File Organization

Each Java source file should contain a single class or interface. Avoid associating more than one class or interface in one file except inner classes. (Inner classes should be avoided in general.)

Package Organization

You should follow the overall structure of the Sterling Multi-Channel Selling Solution source code in which a distinction is made between API classes, implementation classes, and reference classes. See CHAPTER 11, "Modularity and Generated Interfaces" for more information.

Source Files

Java source files should observe the following ordering:

- Standard file comment template
- Package statement
- Import Statements
- Class or Interface Declarations

Import Statements

Try to import only the packages and classes that are needed, packages imported should be ordered from the most fundamental package to more specific ones. For example:

```
import java.io.*;
import java.util.*;
import com.ibm.xml.parser.*;
import com.comergent.dcm.DataServices.DsElement;
```

For classes that import many packages, a blank line can be used to separate package groups.

Class or Interface Declarations

The general organization of classes should be as follows:

- Class/interface documentation comment that complies with the Javadoc syntax (that is, `/**...*/`).
- Class or interface statement.
- Class or interface implementation comment, if necessary. This comment should be included where there is class-specific information, such as implementation or algorithmic details that are not appropriate for formal documentation.
- Constants, class variables, and the keyword `static`, should start the statements (for example, `static public final int OBJECT_NOT_FOUND_ERROR = 404;`).
- Member variables, organized in a semantically meaningful way.
- Constructor(s) of the class.
- Methods, organized in a semantically meaningful order.

Style and Presentation

Comment style Javadoc comments should be provided for all classes and methods, including private and package private entities. Additional documentation, such as `@see`, `@param`, `@return` and other tags should be used where additional values can be provided.

For comments within methods, C++ comment style: `//`, should be used as opposed to Standard C comment style, that is `/* . . . */`. The C comment style should be used only to comment out code segments (and for the file comment template).

Comments should be indented to the level of the code that follows. There should be a blank line before every comment and a blank line after every multi-line comment. Trailing comments should be avoided.

There should be two blank lines between methods, and no blank lines between method descriptions and bodies.

Example of method description and body:

```
/**
```

```
    * This method returns the width of the object.
    */

    public int getWidth()
    {
        return this.m_width;
    }

    /**
    * This method returns the y coordinate of the object.
    */

    public int getY()
    {
        return this.m_y;
    }
```

This chapter describes the Sterling Commerce tag library that may be used with Web pages served by the Sterling Multi-Channel Selling Solution.

Overview

A servlet-based product can use the technology of Java Server Pages (JSP) to serve content to users. A JSP page comprises a mixture of standard HTML content and special "tags" that are processed dynamically as the page content is generated. JSP tags may be used to generate HTML dynamically and to control the flow of the page based on attributes of the tag.

Sterling Multi-Channel Selling Solution provides some custom tags in a tag library. The tag library is declared in a Tag Library Descriptor (TLD) file, **cmgt.tld**, found in the **cmgt-taglibs.jar** file of your installation. The following tags are used:

- encode Tag (deprecated)
- frame Tag (deprecated)
- getAttribute Tag (deprecated)
- getEscaped Tag (deprecated)
- getPrice Tag (deprecated)
- getProperty Tag (deprecated)

- `getResource` Tag (deprecated)
- `if` Tag (deprecated)
- `ifResource` Tag (deprecated)
- `link` Tag (deprecated)
- `list` Tag (deprecated)
- `paramtext` Tag
- `text` Tag
- `url` Tag (deprecated)
- `widget` Tag (deprecated)

We refer you to standard JSP books for more detail regarding the creation and use of JSP tags. This chapter is limited to providing a description of the custom tags provided by the Sterling Multi-Channel Selling Solution.

General Usage

You must use the `jsp:useBean` tag as follows:

1. The controller class that is used to process the request creates beans that are set as attributes. Typically the bean is an attribute of the incoming request or is set in the current session. However, it is possible to set a bean as an attribute in the page or context.
2. The tag retrieves the bean through the `name` attribute of the tag.
3. The tag uses the bean to determine its actions; such as looping through a set of objects or evaluating the truth or falsity of a test condition.

Each JSP page used by the Sterling Multi-Channel Selling Solution must declare all the beans passed into the JSP page with the standard `<jsp:useBean>` tag at the top of the page. These declarations must follow the page and `taglib` statements.

You must use the fully-qualified class name for each bean; do not rely on `import` statements to provide package information. Note that if you have not passed the JSP page a bean of the appropriate id, then the JSP page creates a bean of the specified type.

For example, to declare a product list bean whose id is "productList" and that has been set as an attribute of the request, enter the following at the start of the JSP page:


```
<jsp:useBean id="productList"
    class="com.comergent.apps.catalog.bean.entity.ProductList"
    scope="request" />
```

Tag Library

This section describes all the custom tags used by the Sterling Multi-Channel Selling Solution. The tag attributes are described, and we include an example of their use.

encode Tag

Use this tag to encode the body content to be HTML and Javascript friendly.

Attributes

- `type = "HTML | JavaScript"` (required)
- `convertSpace = "true | false"`: this optional attribute determines whether to convert a space to ` ` (ASCII code 160). Note that if `convertSpace` is set to true, then the returned string may not be equal to the original string because space characters (ASCII code 32) are changed to ` `. The default value is false (do not convert).

If a string has one space between words, then the space is preserved. However, two or more spaces are converted to a space followed by the appropriate number of ` `. Thus, “one space” is converted to “one space”, whereas “two spaces” is converted to “two ` `spaces”.

Usage

HTML pages use a specific set of characters in them. For example, “<” to denote the start of a tag, “>” to end a tag, and so on. When you want to include HTML special characters in strings, you must encode the string in order to avoid breaking the page. Furthermore, Javascript string literals do not support `'\n'`, `'\r'`, `'` (single quote), and `"` (double quote) characters. These characters need to be escaped whenever they occur in Javascript strings.

The following examples illustrate different ways to use the tag. We use SKU name in these examples because it is frequently system-generated and can contain any character.

1. Suppose that you need to put the SKU name, which is a property string, in a form hidden variable.

```
<INPUT type="hidden" name="skuName" value='<mgmt:encode
```

```
type="HTML"><jsp:getProperty name="currSku" property="SKUName"/>
</cmgt:encode>' />
```

Note that `convertSpace` is not set here.

2. Suppose that you need to put an attribute string in a hidden variable.

```
<cmgt:encode type="HTML"><%= request.getAttribute("SkuName") %>
</cmgt:encode>
```

3. Suppose that you need to put SKU name in a HTML table cell to display.

```
<TD>SKU Name: <cmgt:encode type="HTML" convertSpace="true">
<jsp:getProperty name="currSku" property="SKUName"/>
</cmgt:encode>
</TD>
```

Note that `convertSpace` is set to `true` here.

The general rule is that if you want to display a string, then set `convertSpace` to “true”. If the value needs to be sent to the Sterling Multi-Channel Selling Solution, then set it to “false”.

4. Suppose that you need to assign a SKU name string to a Javascript variable.

```
var skuName = '<cmgt:encode type="JavaScript"><jsp:getProperty
name="idSkus" property="SKUName"/></cmgt:encode>';
```

5. Suppose that you need to call a JavaScript function when a user clicks a SKU name hyperlink on your HTML page.

```
<A id='aItem<%=i%>' href="javascript:ProcessSku-
Click('<cmgt:encode type="HTML">
<cmgt:encode type="JavaScript">
<jsp:getProperty name="idSkus" property="SKUName"/>
</cmgt:encode>
</cmgt:encode>')">
<cmgt:encode type="HTML" convertSpace="true">
<jsp:getProperty name="idSkus" property="SKUName"/>
</cmgt:encode></A>
```

Note that in this example the string is converted first to Javascript and then to an HTML escape string.

frame Tag

This tag is used as a workaround if the servlet container appends session information to a URL in the wrong place. It is principally used when a URL is built up in a Javascript function from several fragments.

Attributes

- name="frame name" (required)
- src="URL to frame content" (required)

Usage

Instead of using:

```
<frame name="Header" src="URL to header content">
```

you can use:

```
<cmgt:frame name="Header" src="URL to header content" />
```

getAttribute Tag

This tag is used to get and display an attribute from the page, request, session, or application scope. The scopes are searched in that order.

Attributes

- name="attribute name" (required)
- alt="alternate text"

Usage

To display the attribute, using its implicit *toString* method, use:

```
<cmgt:getAttribute name="thisProduct" alt="Not available" />
```

getEscaped Tag

This tag is used to retrieve a String property and to replace escape sequences to make the String Javascript friendly.

Note: This tag is deprecated. You should use the encode tag instead.

Attributes

- name="name of bean" (required)
- property="name of the property in the bean" (required)

Usage

To retrieve a String property of a bean as an escaped String, use the tag like this:

```
<cmgt:getEscaped name="thisProduct" property="name" />
```

In this example, if the Name variable of this particular product as a Java string is '15" Monitor', then this tag returns '15\' Monitor'.

getPrice Tag

This tag is used to display the price of a named bean which may be a Product. It uses the `getPrice()` method of the Bean. The price is formatted for locale and currency. It also rounds numbers appropriately if they have been calculated.

Attributes

- `name="name of bean"` (required)
- `alt="alternate text to display if price is null"` (optional)

Usage

To display the price of a product that has been passed to the JSP page as a bean, use the tag like this:

```
<cmgt:getPrice name="thisProduct" alt="Price unavailable"/>
```

If the product bean has a null value for the price, then the alternate text will be displayed.

getProperty Tag

This tag is used to extend the functionality of the standard JSP `getProperty` tag. It enables you to specify a default value if the property value is null.

Attributes

- `name="name of bean"` (required)
- `property="name of the property in the bean"` (required)
- `default="default value in case the property value is null"` (optional)

Usage

Use the tag to enable the JSP page to display a default value like this:

```
<cmgt:getProperty name="thisProduct" property="description"
  default="Description not available" />
```

getResource Tag

This tag is used to get and display a resource from a named bean given the resource type. The field attribute is used to specify whether the resource value, label, or description should be displayed.

Attributes

- name="resource name" (required)
- type="type of resource" (required)
- field = "ResourceValue | ResourceLabel | ResourceDescription" (required)

Usage

To display a resource associated to a bean, use the tag like this:

```
<cmgt:getResource name="thisProduct" type="URL"
    field="ResourceValue" />
```

if Tag

A body tag which is used to include the body of the tag conditionally on the evaluation of the test condition.

Attributes

- name="bean name | attribute name" (required)
- property="bean property" (optional)
- test="defined | undefined | true | false | eq | lt | gt" (required)
- value="integer" (optional)

Usage

Extending the example of list tag, suppose that you wish to control the appearance of an HTML page by indicating whether or not a particular product is configurable. Suppose that the Product class has a boolean variable, `boolean_Config` with an accessor method `getConfigurable()`. Then, you can modify the JSP page along the following lines:

```
<TABLE>
<TR><TH>Name</TH><TH>Click to configure</TH></TR>
<cmgt:list id="thisProduct" name="productList" property="products">
    <!-- Body of list loop. For example: -->
    <TR>
    <TD>
    <jsp:getProperty name="thisProduct" property="name"/>
    </TD>
    <cmgt:if name="thisProduct" property="configurable" test="true">
    <TD>
    <IMAGE SRC="images/configurable.gif">
    </TD>
    </cmgt:if>
```

```
<cmgt:if name="thisProduct" property="configurable" test="false">
  <TD>
    <IMAGE SRC="images/notconfigurable.gif">
  </TD>
</cmgt:if>
</TR>
</cmgt:list>
</TABLE>
```

ifResource Tag

This tag is used to test the existence or value of a resource for a bean. You use the type attribute to specify the resource type. The field attribute distinguishes between a resource's value, label, or description.

Attributes

- name="bean name | attribute name" (required)
- type="resource type" (required)
- field = "ResourceValue | ResourceLabel | ResourceDescription" (required)
- test="defined | undefined | true | false | eq | ne | lt | gt" (required)
- value="integer" (optional)

link Tag

You use this tag to generate an appropriately encoded url. If the user's browser has disabled cookies, then the session information is encoded as part of the generated URL. URL parameters are encoded to escape characters such as spaces. The URL path information is specified as attributes of the tag whereas the body of the tag is used to pass parameters.

Note that the URL contains an identifier that is used to determine which instance of the Sterling Multi-Channel Selling Solution should service the request. In a standard installation of the Sterling Multi-Channel Selling Solution, this is defined as the default partner in the **Comergent.xml** configuration file. In a hosted partner implementation of the Sterling Multi-Channel Selling Solution, the identifier distinguishes between the hosted partners.

Attributes

- app="name of the application examples: catalog, deps, and so on" (required). Note that "deps" is used to point to a special class of message types, and the syntax of the generated URLs is consequently different.

- `cmd="name of the message type"` (optional)
- `forwardParam="a flag that is false by default, you can set it to true to forward the current request parameters to another url"` (optional)

Usage

Here are some example usages of the link tag:

JSP tag	URL on the generated page
<code><cmgt:link app="debs" cmd="Display">UserKey=3</cmgt:link></code>	<code>debs/matrix/Display?UserKey=3</code>
<code><cmgt:link app="catalog" cmd="Display" forwardParam="true">UserName=Brent Wells</cmgt:link></code>	<code>catalog/matrix?cmd=Display&Username=Brent%20Wells</code>
<code><cmgt:link app="pricing" cmd="find" /></code>	<code>pricing/matrix&cmd=find</code>

list Tag

A body tag used to iterate through a list of member beans, repeating the body content for each element. The counter attribute can be used to refer to an index for each member bean.

Attributes

- `counter = "index"` (optional)
- `id = "user element name"` (required): the id attribute is used within the body of the list to refer to the member bean in the list
- `name = "bean name | attribute name"` (required): the name attribute refers to the list bean. Typically, the list bean has been passed to the JSP page through the request or session object
- `property = "bean property"` (optional): the property attribute is the member variable of the list bean that accesses the list of member beans.
- `type = "fully qualified name of class"` (required): this is the class of the member beans. If the list bean is a generated bean, then typically this is an inner class of the list bean.

Usage

In this section, imagine that you are creating a list of products that you wish to display as a list on an HTML page. You want to generate an HTML table that lists the products one for each row of the table.

1. The controller creates the list object. This may be either:

- an Enumeration, Hashtable, Vector, or an array

or

- an object that holds the list as a member variable accessible through an accessor method.

In our example, we use a class called `ProductList` that contains a `Vector` member variable, `m_ProductsVector`. This `Vector` is intended to hold one or more products. Each product is an instance of a `Product` class. The `m_ProductsVector` can be accessed through an accessor method `getProducts()`. The `Product` class has member variables `Name` and `Sku` accessible through standard accessor methods `getName()` and `getSku()` respectively.

Suppose that the controller creates a `ProductList` object called `temp_ProductList`. The controller sets the object as a bean in the request or session. For example:

```
getRequest().setAttribute("productList", temp_ProductList);
```

2. The list object is retrieved in the JSP page use of the list tag. In our example,

```
<TABLE>
<TR><TH>Name</TH><TH>SKU</TH></TR>
<cmgt:list id="thisProduct" name="productList" property="products"
    type="com.comergent.apps.catalog.bean.entity.Product"
    counter="count">
  <!-- Body of list loop. For example: -->
  <TR>
    <TD>
      <cmgt:getAttribute name="count"/>
    </TD>
    <TD>
      <jsp:getProperty name="thisProduct" property="name"/>
    </TD>
    <TD>
      <jsp:getProperty name="thisProduct" property="sku"/>
    </TD>
  </TR>
</cmgt:list>
</TABLE>
```

If the list object is itself an Enumeration, Hashtable, Vector, or array, then you do not have to use the property attribute in the list tag. For example, if you had set:

```
getRequest().setAttribute ("productList", m_ProductsVector);
```

then you can retrieve the list object through the tag:

```
<cmgt:list id="thisProduct" name="productList">
```


paramtext Tag

A body tag used to prepare strings used in a text tag. Typically, the values of the tag are derived from scriptlets. It must be used within the body of a text tag. Each occurrence of the paramtext tag is stored in an array and is retrieved using the notation {0}, {1}, and so on.

Usage

The following example uses paramtext twice to manage the display of two strings in a sentence:

```
<%
    Weather tWeather = (Weather) session.getAttribute("weather");
    Date tDate = new Date();
%>
...
<cmgt:text id="*">
    <cmgt:paramtext>
        <%= DateFormat.getDateInstance().format(tDate) %>
    </cmgt:paramtext>
    <cmgt:paramtext>
        <%= tWeather.getState() %>
    </cmgt:paramtext>
    Today is {0}: it is {1} out.
</cmgt:text>
```

Here, the value of the second string is assumed to have been localized prior to having been set in the Weather object whereas the date is localized using the DateFormat class.

text Tag

A body tag used to manage the display of locale-specific text. Use it to prepare your JSP pages for localization for new locales. It is used in conjunction with resource bundles that are created and maintained for each JSP page and JSP fragment. You can maintain resource bundles manually or use the tool provided as part of the Software Development Kit.

Its behavior is governed by configuration parameters set in the **Internationalization.xml** configuration file.

Attention: Do not use this tag in scriptlets. When you need to localize text in scriptlets, use the *cmgtText()* method. See "Included JSP Pages" on page 241 for more information.

Attributes

- **bundle**: specifies the resource bundle in which the display text is specified. This is primarily for use in JSP fragments which are included in multiple JSP pages.
- **id**: identifies a tag uniquely within a JSP page or JSP fragment.

Usage

To prepare text for locale-substitution, wrap each displayed string in the text tag:

```
<cmgt:text id="1234">Display text</cmgt:text>
```

In general, formatting tags and font tags should be outside the text tag. That is:

```
<b><cmgt:text id="1234">Display text</cmgt:text></B>
```

For each id value, make sure that you have a corresponding name-value pair in each of the supported locales properties files. For example:

```
1234 = Welcome to Matrix
```

in the *<Name of JSP page>_en_US.properties* file and

```
1234 = Bienvenue á Matrix
```

in the *<Name of JSP page>_fr_FR.properties* file.

If you plan to use the SDK tool to generate the ids automatically, then set the id to “*”. If you set the id to “!”, then the tag is ignored: this is useful for text that is constant in every locale: for example the “*” character that denotes required fields. You can ensure that the same text is displayed in two different places on the same JSP page by using the same value for the id attribute.

You can control the behavior of the tag using the following elements of the **Internationalization.xml** configuration file:

- **debugJSPResouceBundle**: a value of “true” will display error messages if the text id is not found in the resource bundle, or if the id is “*” as follows:

```
## 'Username' error: missing text for id: 'user'##
```
- **enableJSPResouceBundle**: a value of “false” will render the cmgt:text tag as a no-op: that is, the body of the tag is passed through unprocessed.
- **enableJSPResouceBundleCaching**: a value of “false” will make the page load the resourcebundle every time.

Use the HTML sequences for “{” and “}”: these are { and } respectively.

url Tag

A body tag used to perform URL rewriting if required. If the browser has cookies disabled, then this tag re-writes the body URL to contain session information. Note that the way in which session information is encoded is servlet container-specific. If the browser is cookie-enabled, then the URL is not encoded with the session information.

Note: This tag is deprecated. You should use the link tag.

Attributes

None

Usage

To encode a URL, wrap it in the url tag:

```
<A HREF="<cmgt:url>ProductSelect</cmgt:url>">Select a product</A>
```

widget Tag

This tag is used to deploy UI widgets in Sterling Multi-Channel Selling Solution application pages. See the CHAPTER 25, "Widgets" for more information on the use of widgets.

Attributes

- height: the height of the widget element in pixels
- name: the name of the widget is the message type executed by the Sterling Multi-Channel Selling Solution
- width: the width of the widget element in pixels

Comergent Internet Commerce Tag Library

This chapter describes the Comergent Internet Commerce (CIC) tag library. This tag library is designed to be used as a set of UI components that can be used in JSP pages of the Sterling Multi-Channel Selling Solution. It covers the following tags:

- "cic:banner Tag" on page 387
- "cic:checkbox Tag" on page 388
- "cic:column Tag" on page 388
- "cic:columnHeader Tag" on page 389
- "cic:command_link Tag" on page 389
- "cic:concat Tag" on page 390
- "cic:date Tag" on page 390
- "cic:div Tag" on page 390
- "cic:el Tag" on page 391
- "cic:img Tag" on page 391
- "cic:input Tag" on page 391
- "cic:inputDate Tag" on page 392
- "cic:javascriptLink Tag" on page 393

- "cic:link Tag" on page 393
- "cic:options Tag" on page 394
- "cic:outputLink Tag" on page 394
- "cic:param Tag" on page 395
- "cic:property Tag" on page 395
- "cic:quickSearch Tag" on page 396
- "cic:quickSearchParams Tag" on page 397
- "cic:select Tag" on page 398
- "cic:span Tag" on page 399
- "cic:table Tag" on page 399
- "cic:title Tag" on page 400
- "cic:whitespace Tag" on page 400
- "cic:workspace Tag" on page 401
- "cic:workspace_command Tag" on page 402

In addition to this chapter, the Javadoc provided with the SDK index documentation documents the classes that implement the tags.

Overview

We refer you to standard JSP books for more detail regarding the creation and use of JSP tags. This chapter is limited to providing a description of the custom CIC tags provided by the Sterling Multi-Channel Selling Solution. These tags provide a set of re-usable UI components intended to support customization of Sterling Multi-Channel Selling Solution JSP pages. These tags are declared in the **cic.tld** tag library descriptor file to be found in the **cmgt-taglibs.jar** file. A set of legacy tags to support backward-compatibility with Release 6.7 is declared in the **cic67.tld** tag library descriptor file. They can be used together with or independently from the tags declared in the **cmgt.tld** tag library descriptor file and described in CHAPTER 30, "Comergent Tag Library".

CIC tags give you the ability to create pages that look and behave similarly using the same components. For example:

- Column sorting behavior is built into the `cic:column` tag

- Inquiry list-like objects can be displayed using the `cic:table` tag

CIC tags provide common ways to pass properties and parameters to UI components which make the UI easier to maintain and customize.

CIC tags are also intended to be modelled on the JavaServer Faces (JSF) framework and consequently will make it easier both to use JSF components and to migrate pages to JSF-style presentation logic in the future.

Tag Specification

Each CIC tag is declared in the `com.comergent.taglib.cic` package or a sub-package. Typically, you should use tags already created in the `com.comergent.taglib.cic.commerce` package or create your own custom package for your UI tags.

Each CIC tag is designed to be used as a UI component whose basic structure is defined by a JSP page. The CIC tags that extend the `cicComponent` class have a member variable called `JSPMessageType`. Setting this variable to the name of the message type is what determines which JSP page is used to render the content for the tag.

Tags come in two flavors: atomic tags and component tags.

Atomic Tags

Atomic tags are used for rendering HTML that requires no customization. For example, the `comand_link` tag is used to generate the opening and closing tags for the anchor element: `<a>` and ``. Each atomic tag builds a formattable object and this object renders the HTML.

Component Tags

Component tags render UI components such as workspace tabs. Component tags reflect the MVC architecture in that the tag implementation creates a component model object in memory and uses a JSP page to render the view of the model as HTML. The models follow the Java Swing model pattern whereby the model holds all the data required to render the component. If the look-and-feel of a component is to be changed, then the JSP page can be modified without changing the underlying model.

An example of a component tag is the `cicCommerceProductList` tag: this tag specifies the "cicCommerceProductList" as the value of the `JSPMessageType` variable. In the **cicMessageTypes.xml** file, there is a message type element as follows:

```
<MessageType Name="cicCommerceProductList">
```

```
<JSPMapping>../cic/cicCommerceProductList.jsp</JSPMapping>
</MessageType>
```

Thus the **cicCommerceProductList.jsp** JSP page is used to render content whenever the `cicCommerceProductList` tag is used.

Table-based tags such as the `cicWorkspace` tag makes use of the `cic:column` tag. Column tags should be used in the order that the columns are displayed in the table and they can include atomic tags within them to display links and other content.

Nesting CIC Tags

The CIC component tags are designed to be nested. For example, the table tags typically use column tags within them to control the display of table columns.

Customizing Tags

You can create and use custom tags in the following ways:

- Changing the Look-and-Feel
- Extending a Tag

Changing the Look-and-Feel

By modifying the JSP page of a component tag, you change the way in which the tag renders the underlying model.

Extending a Tag

You can create a new tag by extending an existing one. Make sure that you declare the new tag in the **cic.tld** file. In the case of a new component tag, make sure to create a message type and corresponding JSP page to render the HTML. The message type to JSP page mapping should be added to the appropriate **MessageTypes.xml** file.

JSP Expression Language

The Sterling Multi-Channel Selling Solution also supports the use of the JSP 2.0 expression language as specified in the JSP specification 1.2. Note that this support is only for J2EE 1.3 or above servlet containers. See "JSP Expression Language" on page 402 for more information.

rendered Attribute

The `rendered` attribute can be used to mark an element to be skipped if a condition is not met. For example:

```
<cic:outputLink rendered="${line.promoKey != null}"
```



```
href="javascript:displayPromo('${line.promotionCount}')" ">
<cic:img src="../../images/ico_sale.gif"/>
</cic:outputLink>
```

In this `cic:outputLink`, the link will be displayed if the `promoKey` is not null; that is, the link will not be displayed if the `promoKey` field of the line item is null.

To evaluate booleans in the rendered attribute, you must set the booleans in one of the page, request, or session contexts. For example, to use an expression such as:

```
<cic:column rendered="${isDealer || isInternal || isExternal}"
css="left">
```

You must include code along the following lines before this tag:

```
pageContext.setAttribute("isDealer", new Boolean(isDealer));
pageContext.setAttribute("isInternal", new Boolean(isInternal));
pageContext.setAttribute("isExternal", new Boolean(isExternal));
```

General Usage

You set the CIC tags in JSP pages simply by declaring them as part of the JSP page. For example:

```
<cic:commerceProductList beanName="cartPresentation"
formAction='<%=link("","ShoppingCartDataDisplay")%>'>
...
</cic:commerceProductList>
```

Tag attributes serve to pass in parameters to the JSP page. For example, the `beanName` attribute is used to pass in the bean used to provide the data for the content of the page. Properties in the bean can be retrieved using the `cic:property` tag. For example:

```
<cic:commerceProductListColumn width="25%" align="left">
<cic:title><cmgt:text id="*">Name</cmgt:text></cic:title>
<cic:property name="Name" />
</cic:commerceProductListColumn>
```

Example

Suppose that you would like to display a list of leads in a table that looks like this:

ID	Name	Priority	Lead Status	Created By
600501	Western Sales Conference 1	Low	Unassigned	1
600500	Table Lead	Low	Unassigned	1

FIGURE 11. CIC Tag Table Example

In HTML, the table looks like this:

```
<table cellpadding="0" cellspacing="0" border="0" width="100%">
  <tr>
    <td class="standardBackgroundColor" colspan="2" rowspan="2"
      width="-1%">
      
    </td>
    <td class="columnHeaderBorderColor" colspan="9" width="100%">
      
    </td>
    <td class="standardBackgroundColor" colspan="2" rowspan="2"
      width="-1%">
    </td>
    <td width="-1%">
    </td>
  </tr>
  <tr>
    <td class="standardBackgroundColor" colspan="9" width="-1%">
      
    </td>
  </tr>
  <tr class="standardBackgroundColor">
    <!-- a width of -1% is needed for Netscape //-->
    <td class="columnHeaderBorderColor" width="-1%">
      
    </td>
    <td class="standardBackgroundColor" width="-1%">
      
    </td>
    <td class="dataTableHeader" height="18" width="20%"
      nowrap="true" align='center'>
      <a href="javascript:sort('LeadKey');">ID</a>
    </td>
    <td class="columnHeaderBorderColor" width="-1%" >
      
    </td>
    <td class="dataTableHeader" height="18" width="20%"
      nowrap="true" align='center'>
      <a href="javascript:sort('Name');">Name</a>
    </td>
    <td class="columnHeaderBorderColor" width="-1%" >
```

```

        
    </td>
    <td class="dataTableHeader" height="18" width="20%"
        nowrap="true" align='center'>
        <a href="javascript:sort('LeadPriorityString');">
        Priority</a>
    </td>
    <td class="columnHeaderBorderColor" width="-1%" >
        
    </td>
    <td class="dataTableHeader" height="18" width="20%"
        nowrap="true" align='center'>
        <a href="javascript:sort('LeadStatusString');">
        Lead Status</a>
    </td>
    <td class="columnHeaderBorderColor" width="-1%" >
        
    </td>
    <td class="dataTableHeader" height="18" width="20%"
        nowrap="true" align='center'>
        <a href="javascript:sort('CreatedBy');">Created By</a>
    </td>
    <td class="standardBackgroundColor" width="-1%">
        
    </td>
    <td class="columnHeaderBorderColor" width="-1%">
        
    </td>
</tr>
<tr>
    <td class="standardBackgroundColor" rowspan="2" colspan="2"
        width="-1%">
        
    </td>
    <td class="standardBackgroundColor" colspan="9">
        </td>
    <td class="standardBackgroundColor" rowspan="2" colspan="2"
        width="-1%">
        
    </td>
    <td width="-1%">

```

```
</td>
</tr>
<tr>
  <td class="columnHeaderBorderColor" colspan="9">
    
  </td>
</tr>
<tr>
  <td width="-1%">
    
  </td>
  <td width="-1%">
    
  </td>
  <td class="dataTable" height="18" align='left'>600501&nbsp;
  </td>
  <td width="-1%">
    
  </td>
  <td class="dataTable" height="18" align='left'>
    Western Sales Conference 1&nbsp;
  </td>
  <td width="-1%">
    
  </td>
  <td class="dataTable" height="18" align='left'>Low&nbsp;
  </td>
  <td width="-1%"></td>
  <td class="dataTable" height="18" align='left'>
    Unassigned&nbsp;
  </td>
  <td width="-1%">
  </td>
  <td class="dataTable" height="18" align='left'>1&nbsp;
  </td>
  <td width="-1%">
  </td>
  <td width="-1%">
  </td>
</tr>
```

```

<tr>
  <td class="standardBackgroundColor" colspan="11">
    
  </td>
</tr>
<tr>
  <td width="-1%">
  </td>
  <td width="-1%">
  </td>
  <td class="dataTable" height="18" align='left'>
    600500&nbsp;
  </td>
  <td width="-1%">
  </td>
  <td class="dataTable" height="18" align='left'>
    Table Lead&nbsp;
  </td>
  <td width="-1%">
  </td>
  <td class="dataTable" height="18" align='left'>Low&nbsp;
  </td>
  <td width="-1%">
    
  </td>
  <td class="dataTable" height="18" align='left'>
    Unassigned&nbsp;
  </td>
  <td width="-1%">
  </td>
  <td class="dataTable" height="18" align='left'>1&nbsp;
  </td>
  <td width="-1%">
  </td>
  <td width="-1%">
  </td>
</tr>
<tr>
  <td class="standardBackgroundColor" colspan="11">
    
    </td>
</tr>
</table>
```

Using the `cic:table` tag, we can generate this table from the `LeadListBean` as follows:

```
<%
    ListIterator iterator = leadList.getLeadLightWeightIterator();
    request.setAttribute("iterator", iterator);
%>
<cic:table datasourceRef="iterator" var="lead" showSelect="false"
    sortAscending="<%= sortOrderAscending %">
    <cic:column width="20%" sortProperty="LeadKey" align="left">
        <cic:columnHeader><cic:span value="ID"/></cic:title>
        <cic:span value="{lead.leadKey}"/>
    </cic:column>
    <cic:column width="20%" sortProperty="Name" align="left">
        <cic:columnHeader><cic:span value="Name"/></cic:columnHeader>
        <cic:span value="{lead.name}"/>
    </cic:column>
    <cic:column width="20%" sortProperty="LeadPriorityString"
        align="left">
        <cic:columnHeader><cic:span value="Priority"/>
    </cic:columnHeader>
        <cic:span value="{lead.leadPriorityString}"/>
    </cic:column>
    <cic:column width="20%" sortProperty="LeadStatusString"
        align="left">
        <cic:columnHeader><cic:span value="Lead Status"/>
    </cic:columnHeader>
        <cic:span value="{lead.leadStatusString}"/>
    </cic:column>
    <cic:column width="20%" sortProperty="CreatedBy" align="left">
        <cic:columnHeader><cic:span value="Created By"/>
    </cic:columnHeader>
        <cic:span value="{lead.createdBy}"/>
    </cic:column>
</cic:table>
```

The `cic:table` tag uses the `datasourceRef` attribute to specify which `Iterator` object is to be used to display rows in the table. You must set the `Iterator` object in the request so that the tag can retrieve it.

Each `cic:column` tag declares a column of the table: they specify the column heading (using the `cic:title` tag), and the data object property whose data should populate the column. Each `cic:property` name attribute must be the same as a data field name of the bean objects in the iterator. In this example, the `lead` data object

has fields called `LeadKey`, `Name`, and so on. The `cic:whitespace` tag is used to provide a little separator space around each string.

Tag Library

This section describes all the main CIC tags used by the Sterling Multi-Channel Selling Solution. The tag attributes are described, and we include an example of their use.

cic:banner Tag

Use this tag to generate the banner at the top of HTML pages. Its attributes, `renderHelp`, `renderHome`, and so on, take the values “true” or “false” and are used to specify whether buttons are displayed for these general navigation functions.

Attributes

- `helpTopic="topic"`: determines which help page is displayed. The mapping from topic to topic ID is maintained in the **HelpTopicsMap.xml** configuration file: see "Configuration Files" on page 259 for more information.
- `navigationTarget="target"`: specifies the value of the target attribute of the links rendered in the banner.
- `renderHeader="true"`: determines if the header is displayed.
- `renderHelp="true"`: determines if **Help** button is displayed.
- `renderHome="true"`: determines if **Home** button is displayed.
- `renderLogout="true"`: determines if **Logout** button is displayed.
- `renderWorkspace="true"`: determines if a Workspace page is to be displayed.
- `workspaceTab="Tab Header"`: determines which tab is displayed.

Usage

```
<cic:banner renderHeader="true" renderHelp="true"
  helpTopic="<%=ph(helpTopic)%>">
  <cic:span css="banner"
    value="{localized['UserListHeaderText']}" />
  <cic:el>&nbsp;&nbsp;&nbsp;</cic:el>
  <cic:span rendered="{partnerInScope}" css="banner-small"
    value="{partnerScopeName}" />
</cic:banner>
```

cic:checkbox Tag

The use of this tag is deprecated. Use this tag to display check boxes.

Attributes

- `property="Property"`: specifies the value of the checkbox. The corresponding data bean must have a method called `getProperty()`.

Usage

```
<cic:checkbox property="Property"/>
```

Example

```
<cic:checkbox property="InvoiceKey"/>
```

cic:column Tag

Use this tag to specify the column of a table.

Attributes

- `align="alignment"`: takes the standard HTML alignment values of "center", "left", and "right".
- `width="width%"`: the width of this column as a percentage of the width of the entire table.

Usage

```
<cic:column width="x%" align="align">
...
</cic:column>
```

Example

```
<cic:column width="17%" align="left">
  <cic:columnHeader><cic:span value="List Name"/>
</cic:columnHeader>
  <cic:command_link target="_top">
    <cic:link app="partnerMkt" cmd="OILDisplay">
      <cic:param name="ShoppingCartKey">
        <cic:property name="ShoppingCartKey" />
      </cic:param>
    </cic:link>
    <cic:property name="Name" />
  </cic:command_link>
</cic:column>
```


cic:columnHeader Tag

Use this tag to specify what text should be displayed in the header for a table column.

Attributes

- `sortProperty="sortProperty"`: the property on which to sort the table if the header of this column is clicked.

Usage

```
<cic:columnHeader sortProperty="${localized['ProductID']}">  
  <cic:span value ="${localized['ProductID']}"/>  
</cic:columnHeader>
```

cic:command_link Tag

The use of this tag is deprecated. Use this tag to generate a clickable link.

Attributes

- None

Usage

```
<cic:command_link>  
...  
</cic:command_link>
```

The value of the tag is displayed as the clickable link. Within the `cic:command` tag, you must specify the type of link to be used using one of:

- `cic:javascriptLink`
- `cic:link`

Example

```
<cic:command_link>  
  <cic:javascriptLink methodName="processDetail" >  
    <cic:param name="SKU">  
      <cic:property name="SKU" />  
    </cic:param>  
  </cic:javascriptLink>  
  <cic:property name="SKU" />  
</cic:command_link>
```

This tag will be replaced by the string `href="javascript:processDetail(SKU)"`, where *SKU* is determined by the use of the `cic:property` tag.

cic:concat Tag

Use this tag to concatenate strings. You can nest the usage of this tag to concatenate more than two strings.

Attributes

- None

Usage

```
<cic:span value="${cic:concat(cic:concat(invoice.dataBean.lastName,
', '), invoice.dataBean.firstName)}"/>
```

cic:date Tag

The use of this tag is deprecated. Use this tag to display a date. Typically, the date is retrieved using the cic:property tag from a data bean.

Attributes

- None

Usage

```
<cic:date>
...
</cic:date>
```

Example

```
<cic:date>
  <cic:property name="CreateDate" />
</cic:date>
```

cic:div Tag

Use this tag to generate an HTML DIV tag.

Attributes

- `css="class"`: specifies the CSS class used to format the link.
- `id="id"`: used to set an ID for this DIV element.

Usage

```
<cic:div css="box no-border">
<cic:span css="instruction"
value="${localized['InstructionalText']}"/>
</cic:div>
```

cic:el Tag

Use this tag to include HTML tags such as `
` or ` `. You can use this tag to add hidden field in forms:

```
<cic:el>
<input type="hidden" name="parameterName" value="parameterValue">
</cic:el>
```

You can also use the rendered attribute of the `cic:el` tag to mark a particular section of HTML as being displayed if a condition is met. For example:

```
<cic:el rendered="${line.isMajorLine && line.isEditable}">
Renderable content
</cic:el>
```

You can read this to say: only display this content if the line is a major line item and it is editable. If you want to use boolean values to control this tag, then the booleans must be added to the request object. For example:

```
<%
    boolean rule = true;
    request.setAttribute("rule", new Boolean(rule));
%>
<cic:el rendered="${rule}"><hr></cic:el>
```

cic:img Tag

Use this tag to display images when you want to test for a condition to determine if the image should be displayed.

Attributes

- `rendered="true"`: determines whether the image is displayed.
- `src="URL"`: specifies the URL for the image source.

You can also specify the other standard image attributes used by the IMG HTML tag.

Usage

```
<cic:img src="../images/btn_add.gif"
        width="37" height="19" border="0" />
```

cic:input Tag

Use this tag to specify the input field use to enter values. the id attribute distinguishes between input fields. The value attribute is used to specify the name-value combination of the request parameter that is returned to the server.

The type attribute of a `cic:input` tag can be used to specify different forms of input field, such as “checkbox”, “hidden”, “input”, “radio”, and so on.

You can specify the following HTML attributes as being true or false:

- disabled
- readonly
- ismap
- multiple
- checked
- nowrap
- selected

Example

```
<cic:input id="QuickSearchCartSKU" selected="true"
  value="${cic:equals(param['CommerceQuery_SearchField'],
    'CommerceQuery_SKU')}?
  param['CommerceQuery_SearchFieldValue']:''"/>
```

cic:inputDate Tag

Use this tag to create an input field with a calendar widget associated with it. To use this tag, you must include the **Calendar.jsp** JSP page and reference the required Javascript files as follows:

```
<jsp:include page="../../common/Calendar.jsp"/>
<script type="text/javascript" src="../../js/commerce.js"></script>
<script type="text/javascript" src="../../js/com_DateUtils.js"></script>
```

Attributes

- `id="field"`: identifies the name of the parameter associated with the input field.
- `value="value"`: the displayed value if it exists.

Usage

```
<cic:inputDate id="CommerceQuery_ContractStartDateStart"
  value="${cic:formatDate(query.dateFieldsMap['ContractStart-
Date'].startDate, null)}" />
```

cic:javascriptLink Tag

The use of this tag is deprecated. Use this tag to generate a clickable link that invokes a Javascript method when clicked.

Attributes

- `methodName="MethodName"`: name of Javascript method (required).

Usage

```
<cic:javascriptLink methodName="MethodName" >
...
</cic:javascriptLink>
```

You must provide any parameters to the tag using the `cic:param` tag.

Example

```
<cic:javascriptLink methodName="processDetail" >
  <cic:param name="SKU">
    <cic:property name="SKU" />
  </cic:param>
</cic:javascriptLink>
```

This tag will be replaced by the string `href="javascript:processDetail(SKU)"`, where *SKU* is determined by the use of the `cic:property` tag.

cic:link Tag

The use of this tag is deprecated. Use this tag to generate a clickable link that points to a standard hypertext link.

Attributes

- `app="ApplicationName"`: name of application (required).
- `cmd="CommandName"`: name of message type to be specified as the `cmd` parameter in the URL.

Usage

```
<cic:link app="ApplicationName" cmd="MessageType">
...
</cic:link>
```

You must provide any parameters to the tag using the `cic:param` tag.

Example

```
<cic:command_link target="_top">
  <cic:link app="*" cmd="PartnerProfileDisplay">
```

```
<cic:param name="PartnerKey">
  <cic:property name="ContactPartnerKey" />
</cic:param>
</cic:link>
<cic:property name="PartnerName" />
</cic:command_link>
```

This tag will be replaced by the string:

```
<a href="http://server:port/Sterling/en/US/catalog/matrix?
  cmd="PartnerProfileDisplay&PartnerKey=21">Anderel</a>
```

cic:options Tag

Use this tag to specify the values that may be selected from a drop-down list. It can be used to retrieve all values of the specified lookup type.

Attributes

- `labelRef="reference"` is the value of the description field of the lookup code.
- `selectedValue="value"`: the value displayed when the page is first rendered.
- `valueRef="reference"` is usually the value of the lookup code.

Users see the `labelRef` values, and their choice of search value is passed back to the server as the `valueRef` value.

Example

```
<cic:options var="statusCode" valueRef="${statusCode.code}"
  labelRef="${statusCode.string}" dataSourceRef="${states}"
  selectedValue="${cic:equals(param['CommerceQuery_SearchField'],
  'CommerceQuery_InvoiceStatusCode')}?
  param['CommerceQuery_SearchFieldValue']:''"/>
```

In this example, the lookup type is the `InvoiceStatus`, so that the `valueRef` and `labelRef` fields will take pairs of values such as 10 and “New” as determined by the `CMGT_LOOKUPS` table values.

cic:outputLink Tag

Use this tag to generate links. The `href` attribute can use the `link()` method to generate the hyperlink and the `cic:span` tag is used to generate the displayed text for the link.

Attributes

- `css="class"`: specifies the class used to format the link.
- `href="URL"`: the hyperlink behind the visible link.
- `rendered="boolean"`: used to specify if the link should be displayed.
- `target="target"`: used to specify the target window or frame to populate when the link is clicked.

Example

```
<cic:outputLink rendered="${isLineCount}"
    css="focus-button focus-button-small right"
    href="javascript:createMemo();">
    <cic:span value="${localized['Create']}" />
</cic:outputLink>
```

cic:param Tag

The use of this tag is deprecated. Use this tag to generate parameters in the form *name=value*.

Attributes

- `name="ParameterName"`: name of parameter (required).

Usage

```
<cic:parameter name="ParameterName">Value
</cic:parameter>
```

You must provide the value of the parameter as the value of the `cic:parameter` tag.

Example

```
<cic:param name="SKU">
    <cic:property name="SKU" />
</cic:param>
```

This tag will be replaced by the string `SKU=SKU`, where *SKU* is determined by the use of the `cic:property` tag.

cic:property Tag

The use of this tag is deprecated. Use this tag to retrieve values from a bean. The bean is usually specified in the component tag that includes the `cic:property` tag as a child element.

Attributes

- `name = "PropertyName"`: name of property (required). There must be a corresponding `getPropertyName()` method defined on the bean. If no such method exists, then the tag will attempt to retrieve a data bean from the bean by first calling `getDataBean()` on the bean, and then calling the `getPropertyName()` method if it is defined on the retrieved data bean.

Usage

```
<cic:property name="PropertyName" />
```

Example

Suppose that you have a Cart data object and a corresponding CartBean data bean, and suppose that for presentation purposes, you have created a CartPresentationBean as a wrapper to the CartBean class. Suppose that you use the `cic:property` tag like this:

```
<cic:commerceProductList beanName="cartPresentation"
    formAction='<%=link("**", "ShoppingCartDataDisplay") %>'>
...
    <cic:property name="SKU">
...
</cic:commerceProductList>
```

This tag will be replaced by the value returned by `getSKU()` invoked on the `cartPresentation` bean. If the `cartPresentation` bean has no `getSKU()` method, then the tag will effectively try to call:

```
CartBean cartBean = cartPresentationBean.getDataBean();
cartBean.getSKU();
```

This will display the result of calling `getSKU()` on the `cartBean` data bean.

cic:quickSearch Tag

Use this tag to display a Search widget on a page. Use the `cic:quickSearchParam` tag to specify which fields should be displayed in the drop-down list of search criteria. Use the `cic:outputLink` tag to display other links within the Search widget (such as More and Advanced Search links).

FIGURE 12. Example Quick Search Widget

The left-hand field is where users enter their search values, and the right-hand field is where they select on which field they want to search.

Example

```
<cic:quickSearch css="box medium padded-bottom"
  title="{localized['QuickSearchTitle']}"
  idToSubmit="CommerceQuery_SearchField"
  idValueToSubmit="CommerceQuery_SearchFieldValue"
  action='<%=link("**", "InvoiceWorkspaceDisplay")%>'>
  <cic:quickSearchParam name="CommerceQuery_OrderNumber"
    label="{localized['OrderNumber']}">
    <cic:input id="QuickSearchOrderNumber"
      value="{cic:equals(param['CommerceQuery_SearchField'],
'CommerceQuery_OrderNumber')?param['CommerceQuery_SearchFieldValue']:
''}"/>
    </cic:quickSearchParam>
  ...
  Possibly other cic:quickSearchParam tags
  ...
  <cic:outputLink css="edit" href='<%=link("**",
    "InvoiceWorkspaceDisplay", "ShowAll=true")%>'>
    <cic:span value="{localized['ShowAll']}" />
  </cic:outputLink>
  <cic:outputLink css="edit" href='<%=link( "**",
    "InvoicesAdvancedSearch")%>'>
    <cic:span value="{localized['AdvancedSearch']}" />
  </cic:outputLink>
</cic:quickSearch>
```

cic:quickSearchParam Tag

Use this tag within a `cic:quickSearch` tag. Each `quickSearchParam` tag specifies a different selectable search field. The `cic:input` tag specifies the name of the parameter that will be passed back to the server and how the search value is retrieved.

Example

In this form of the `cic:quickSearchParam` tag, the name of the search field is specified through the use of the `cic:equals` function, and the value field is left blank for free-form entry of the search value.

```
<cic:quickSearchParam name="CommerceQuery_OrderNumber"
  label="${localized['OrderNumber']}">
  <cic:input id="QuickSearchOrderNumber"
    value="${cic:equals(param['CommerceQuery_SearchField'],
'CommerceQuery_OrderNumber')}?param['CommerceQuery_SearchFieldValue']:"
    ''"/>
</cic:quickSearchParam>
```

In the following form of the `cic:quickSearchParam` tag, the search values field is pre-populated by the valid values of the field:

```
<cic:quickSearchParam name="CommerceQuery_InvoiceStatusCode"
  label="${localized['InvoiceStatus']}">
  <cic:select id="QuickSearchStatusCode">
    <cic:options var="statusCode" valueRef="${statusCode.code}"
      labelRef="${statusCode.string}" datasourceRef="${states}"
      selectedValue="${cic:equals(
param['CommerceQuery_SearchField'],
'CommerceQuery_InvoiceStatusCode')}?
param['CommerceQuery_SearchFieldValue']:'')"/>
  </cic:select>
</cic:quickSearchParam>
```

The valid values are determined by the `cic:options` tag. This uses the `valueRef` and `datasourceRef` attributes to retrieve the valid values of this lookup type from the Knowledgebase.

cic:select Tag

Use this tag to generate a drop-down list of values. It uses a `cic:options` tag to generate the list of valid option elements with their labels and values. The `id` attribute is used to distinguish between `cic:select` tags.

Attributes

- `displayAsText="true"`: determines whether the component is read-only.
- `id="id"`: identifies the input field.
- `onchange="function"`: associates a Javascript function if the selected value in the drop-down list changes.
- `rendered="true"`: determines whether the drop-down list is displayed.

Example

```
<cic:select id="QuickSearchStatusCode">
  <cic:options var="statusCode" valueRef="${statusCode.code}"
    labelRef="${statusCode.string}" datasourceRef="${states}"
    selectedValue="${cic:equals(param['CommerceQuery_SearchField'],
    'CommerceQuery_InvoiceStatusCode')}?
    param['CommerceQuery_SearchFieldValue']:''"/>
</cic:select>
```

cic:span Tag

Use this tag to generate display text. You can manage the display of localised text by using the `${localized['String']}` function: this will retrieve the locale-specific form of the String value from the resource bundle for the JSP page.

Example

```
<cic:span value="${localized['AdvancedSearch']}"/>
```

cic:table Tag

Use this tag to display tables that take their data from ListBean objects. Within this tag, each column is declared using the `cic:column` tag.

Attributes

- `css="data-table"`: this attribute specifies the style used to render the table.
- `datasourceRef="${majorLines}"`: specifies an object to be used to iterate through the rows of the table. The object must be either of type `Iterator`, `Collection`, or `Array`. You must add the object to the request object and then retrieve it from the request. For example:

```
<%
ListIterator iter = commentListBean.getCommentIterator();
request.setAttribute("commentList", iter);
%>
<cic:table datasourceRef="${commentList}" var="comment"
  showSelect="false" sortAscending="true" labelrowcss="label"
  rowcss="normal,alternate" >
```

- `jsp="./cic/cicCommerceProductList.jsp"`: specifies a JSP page to be used to render the table. By default, **cic/cicTable.jsp** is used.
- `labelrowcss="label"`: specifies the style used for the table labels.
- `listBeanParam="List Iterator"`: this attribute is a deprecated attribute, you should use the `datasourceRef` attribute. It specifies the iterator used to iterate through the list of beans. Typically, you get this object by calling

the *getObjectIterator()* method on the list bean whose items you want to display.

- **messageType**: specifies the message type that is used to identify which JSP page is used to render the tag.
- **rowcss="normal,alternate"**: specifies the styles used to display rows.
- **showHeaderRow="true"**: specifies whether the table has a header row. If this attribute is set to “true”, then you should specify a `cic:columnHeader` in each `cic:column` tag.
- **showPagination="true"**: specifies whether to show the Previous and Next links to navigate back and forth through a paginated data set.
- **showSelect**: not used in this release.
- **sortAscending**: takes “true” or “false” to specify whether the table should be sorted ascending or descending.

cic:title Tag

The use of this tag is deprecated. Use this tag to set the title of a column in a table.

Attributes

- None

Usage

```
<cic:title>Title</cic:title>
```

Example

```
<cic:title><cmgt:text id="*">List Name</cmgt:text></cic:title>
```

This column in which this `cic:title` tag is used will have the title "List Name" (or whatever this text tag maps to in the generated JSP properties file).

cic:whitespace Tag

The use of this tag is deprecated. Use this tag to add space around text in a table.

Attributes

- None

Usage

```
<cic:whitespace/>
```

cic:workspace Tag

The use of this tag is deprecated. Use this tag to display workspace tabs in the Sterling Multi-Channel Selling Solution UI.

Attributes

- `cartListParam`="id of List Bean to be used to display rows"
- `sortAscending`="Sort order"
- `sortFieldName`="Field on which to sort"
- `formName`="FormName"
- `formAction`="FormAction"

Usage

```
<cic:workspace cartListParam="workspaceLists"
    sortAscending="sortOrder" sortFieldName="sortField"
    formName="FormName" formAction="FormAction" >
...
</cic:workspace>
```

Example

```
<cic:workspace cartListParam="workspaceLists"
    sortAscending="<%=sortOrder%>"
    sortFieldName="<%=sortField%>" formName="domMyLists"
    "formAction='<%=link("**", "WorkspaceDisplay") %>'">
  <cic:workspace_command operation="optionCommand" action="email"
    description="<cmgt:text id='cmgt_invoicing/
WorkspaceInvoiceData_11' bundle='invoicing.WorkspaceInvoiceDataRe-
sources'>Email Selected Invoices</cmgt:text>"
    type="option"/>
  <cic:workspace_command operation="optionCommand"
    action="download" description="<cmgt:text id='cmgt_invoicing/
WorkspaceInvoiceData_12' bundle='invoicing.WorkspaceInvoiceDataRe-
sources'>Download Selected Invoices</cmgt:text>"
    type="option"/>
  <cic:column width="3%">
    <cic:checkbox property="InvoiceKey"/>
  </cic:column>
  <cic:column width="12%" sortProperty="InvoiceNumber"
    align="left">
    <cic:title>
      <cmgt:text
        id='cmgt_invoicing/WorkspaceInvoiceData_13'
        bundle='invoicing.WorkspaceInvoiceDataResources'>
        Invoice Number
```

```
        </cmgt:text>
    </cic:title>
    <cic:command_link target="_top">
        <cic:link app="*" cmd="InvoiceDisplay">
            <cic:param name="invoiceKey">
                <cic:property name="InvoiceKey" />
            </cic:param>
        </cic:link>
        <cic:property name="InvoiceNumber" />
    </cic:command_link>
</cic:column>
... some columns omitted
</cic:workspace>
```

cic:workspace_command Tag

Use this tag to add commands to a workspace tab defined using the cic:workspace tag.

Attributes

- operation="OptionCommand"
- action="Action"
- description="Description of command"
- type="Type of command"/>

Usage

```
<cic:workspace_command operation="OptionCommand" action="Action"
    description="Description of command" type="Type of command"/>
```

Example

```
<cic:workspace_command operation="optionCommand" action="email"
    description="<cmgt:text id='cmgt_invoicing/
WorkspaceInvoiceData_11' bundle='invoicing.WorkspaceInvoiceDataRe-
sources'>Email Selected Invoices</cmgt:text>"
    type="option"/>
```

JSP Expression Language

Overview

To address the current restrictions on column cell customization, the Sterling Multi-Channel Selling Solution now supports use of the expression language defined in

the JSP 2.0 specification. This adoption allows for greater customizability for the column cells while making compatible with the future specifications.

The expression language introduces a new “el” tag and modifies the “if” and “icon” tags to use expression languages for defining conditions. For a more detailed explanation of the full capability of the expression language please refer to JSP 2.0 specifications and the J2EE 1.4 tutorial mentioned above.

Tag Changes

el tag

The “el” tag allows the JSP page designer to write expression language scripts that will be evaluated on each iteration to render the tables. Those scripts can access the request, session parameters, and JSP page variables. The examples below use the current `lineItem` bean for the row being rendered using the identifier “`lineItem`”.

You can access three methods to protect from cross-site scripting attacks as follows. The methods are “`cic:pu`”, “`cic:ph`” and “`cic:pj`”: these all take a single string and return a string.

An example of the usage of the “el” tag follows:

```
<cic:el>
  <table cellpadding="0" cellspacing="3" border="0">
    <tr>
      <td>
        ${cic:pu(lineItem.formattedComputedPrice)}
      </td>
    </tr>
    <tr>
      <td>
        ${cic:pu(lineItem.formattedDiscountMarkupComputedPrice)}
      </td>
    </tr>
  </table>
</cic:el>
```

In this example, you can see that the “el” tag can incorporate normal text and an expression enclosed with the “`${}`” syntax. The “`cic:pu`” call gives access to the “`pu`” function that protects against cross-site scripting, while the “`lineItem`” reference gives access to the current row bean.

The following example shows how to access the properties in the data bean associated with the presentation bean; this is accomplished using the dot notation.

```
<cic:el>
<input type = "text"
```

```
name = "Discount${cic:pu(lineItem.dataBean.lineKey)}"  
value = "${cic:pu(lineItem.discount)}" />  
</cic:el>
```

Note that the property name must have its first character in lower case.

if and icon Tags

Note that the use of the `cic:if` tag is deprecated. Use the rendered attribute to manage tests for conditions that control the display of elements. The rest of this section is included to support legacy code.

For the `if` and `icon` tags, there is an alternate usage to make use of the expression language. Instead of using the “property” and “testValue” attribute to specify a condition, you can use the new “test” attribute to specify an expression that will evaluate to true or false. Using expression language allows the access to the data bean’s properties and to the request and session attributes as well as page variables.

The following examples demonstrate how to use the new attribute instead of the old ones. Here is an example of the usage of the `if` tag from earlier releases:

```
<cic:if property "isEditable" testValue="true">  
  <cic:then>  
    ...  
  </cic:then>  
  <cic:else>  
    ...  
  </cic:else>  
</cic:if>
```

This is an example of the new usage:

```
<cic:if test="${lineItem.isEditable}">  
  <cic:then>  
    ...  
  </cic:then>  
  <cic:else>  
    ...  
  </cic:else>  
</cic:if>
```

This example does not show much difference in format, but it makes it easier to identify the property to the line item bean.

In earlier releases, you have to nest `if` tags to test for two conditions:

```
<cic:if property "isEditable" testValue="true">  
  <cic:then>  
    <cic:if property "IsInvalidProduct" testValue="true">  
      <cic:then>  
        ...  
      </cic:then>  
    </cic:if>  
  </cic:then>  
  <cic:else>  
    ...  
  </cic:else>  
</cic:if>
```



```
        </cic:then>
    </cic:then>
</cic:if>
```

You can now implement this as:

```
<cic:if test="${lineItem.isEditable && lineItem.isInvalidProduct}">
    <cic:then>
        ...
    </cic:then>
    <cic:else>
        ...
    </cic:else>
</cic:if>
```

In this example we see that we can use a single if tag to specify an “and” condition instead of having to nest if tags.

The next example shows how to access a data bean property.

```
<cic:if test="${lineItem.dataBean.lineKey='44'}">
    <cic:then>
        ...
    </cic:then>
    <cic:else>
        ...
    </cic:else>
</cic:if>
```

The next example shows how to access the request parameter called “productId”.

```
<cic:if test="${param['productId']=='6'}">
    <cic:then>
        ...
    </cic:then>
    <cic:else>
        ...
    </cic:else>
</cic:if>
```

This chapter describes localization issues to consider while you work on Sterling Multi-Channel Selling Solution applications.

Overview

The Sterling Multi-Channel Selling Solution has built-in support for:

- multiple currencies
- multiple languages
- number and date formats
- character sets

You can also manage other aspects of localization for specific markets such as:

- local laws and regulations
- currency processing
- shipping and export information
- taxes

Support for internationalization is managed using locales. Each locale identifies a language and country. By identifying which locale is to be used when displaying

information to a user, you ensure that the user sees information that is both specific to their locale and presented as they would expect to see it. See the *Sterling Multi-Channel Selling Solution Implementation Guide* for more information regarding locales.

When users log in to the Sterling Multi-Channel Selling Solution, a locale is assigned to the session: this is the preferred locale specified in the user's profile. Users can change their preferred locale in their user profile and the change takes take effect the next time they log in. User administrators can change a user's preferred locale just as they can change other aspects of a user's profile. See *Sterling Multi-Channel Selling Solution Administration Guide* for more information about user administration.

The system default locale is specified in the **Internationalization.xml** configuration file using the `defaultSystemLocale` element. You can specify a default locale for each language: see "Failover Behavior" on page 412 for more information.

The Sterling Multi-Channel Selling Solution offers full Unicode support for data entry and display.

A significant amount of localization can be performed using Java ResourceBundles: see "Resource Bundles and Formats" on page 419 for more details.

Supporting Locales

If you plan to implement the Sterling Multi-Channel Selling Solution to provide support for more than the `en_US` locale, then you must produce pages to reflect local language and other locale-specific information (such as office locations).

Presentation and Session Locales

When a user logs in to the Sterling Multi-Channel Selling Solution, the authentication process retrieves their preferred locale: this is defined in their user profile. The system makes use of two logically distinct locales:

- session locale: this determines what data is retrieved for data objects from the Knowledgebase.
- presentation locale: this determines what JSP pages and resource bundles are used to render HTML pages to the user.

In general, the set of locales that you support as presentation locales must be a subset of the possible session locales. For example, you choose to maintain `fr_CA`,

fr_CH, and fr_FR as session locales, but only support fr_FR and fr_CA as presentation locales.

When a user first logs in, the system calculates a presentation locale for the user session as follows:

1. If the user's preferred locale is declared in the Sterling Multi-Channel Selling Solution **web.xml** file, then set this to be the presentation locale.
2. If not, then consult the **Internationalization.xml** file: if the useCountryDefaulting element is set to "true", then identify the default country locale for the language of the user's preferred locale. Check to see if the default country locale is declared in the **web.xml** file. If it is, then set the presentation locale to this.
3. If either the useCountryDefaulting element is set to "false" or the default country locale is not present in the **web.xml** file, and if the useGeneralDefaulting element is set to "true", then set the user's presentation locale to the default system locale specified by the defaultSystemLocale element.
4. If the Defaulting elements are set to false or if no locale is identified that is declared in the **web.xml** file, then the presentation locale is set to the session locale.

This presentation locale is used to determine the user's experience as they navigate through the Sterling Multi-Channel Selling Solution by controlling which JSP pages and properties files are used to render the Web pages that they see. At the same time, the preferred locale is also set as their *session locale*: this session locale is used to determine what data is retrieved from the database when localized data objects are displayed to the user.

Attention: You must make sure that every locale you create in the database either has a corresponding set of entries in the web.xml file or that its default country locale has entries in the web.xml file and you enable country defaulting. If you do not do this, then some users may not be able to access the system.
--

JSP Pages and Properties Files

1. For each JSP page, there must be at least one JSP page located in the appropriate module sub-directory under the system default locale directory. When you first install the Sterling Multi-Channel Selling Solution, the default system locale is set to en_US. Consequently a full set of JSP pages is provided under **debs_home/SterlingWEB-INF/web/en/US/**. If you change the default

system locale, then take care to fully populate the corresponding directories for the new locale.

2. All visible text on each page is declared using the Comergerent tag library text tag or the corresponding *cmgtText()* method. For example:

```
<cmgt:text id='cmgt_channelMgmt/channelCartDisplay/  
ChannelCartDisplayData_7' bundle='channelMgmt.channelCartDis-  
play.ChannelCartDisplayDataResources'>Build Product List  
</cmgt:text>
```

or

```
String title =  
    cmgtText("cmgt_commerce/search/AdvancedSearchBody_2",  
        "Inquiry Lists Search");
```

The bundle attribute must correspond to a file in the `com.comergerent.reference.jsp` package of the class tree. For the example above, there must be a file called

ChannelCartDisplayDataResource.properties in the *debs_home/Sterling/WEB-INF/classes/com/comergerent/reference/jsp/channelMgmt/channelCartDisplay/* directory. The id attribute must be unique within the properties file. For the example above, there should be a line of the form:

```
cmgt_channelMgmt/channelCartDisplay/  
ChannelCartDisplayData_7=Build Product List
```

3. For each additional supported locale (say, *la_CO*), you must copy the following directories from **debs_home/Sterling/WEB-INF/web/en/US/** to **debs_home/Sterling/WEB-INF/web/la/CO/**:
 - **cic/**
 - **common/**
 - **home/**
4. For each additional supported locale (say, *la_CO*) and for each JSP page, you must:
 - a. Either create a new JSP page for the locale and put it in the corresponding directory location in the Web application: a directory under **debs_home/Sterling/WEB-INF/web/la/CO/**. If the same page can be used for more than one locale in the same language (for example, *fr_FR* and *fr_CA*), then make sure that you put it in the default locale for the language. See "Failover Behavior" on page 412 for more information about default locales for languages.

- b. Or prepare a properties file that contains the appropriate text for each id. These properties files are organized so that there is one for each JSP page and JSP fragment.

Note:	HTML and Javascript characters such as "<", ">", "'", and so on must not be included in the property values. These characters must be escaped using the HTML or Javascript mechanisms to escape characters. For example: use "<" for "<" in HTML and "\" for "\"" in Javascript.
--------------	---

The properties files must conform to the Java standard for properties files used by resource bundles. Specifically, they should follow this naming convention: **<Name of JSP page>Resources_la_CO.properties**. They must be text files in which each line should take this form:

`cmgt_module/package/JSPname_n=Display text for this locale`

For example:

`cmgt_channelMgmt/channelCartDisplay/
ChannelCartDisplayData_7=Build Product List`

The properties files are all located in the **debs_home/Sterling/WEB-INF/classes/com/comergent/reference/jsp/** directory and are organized by module within this directory in the same way that the module JSP pages are organized within a module. Note that if you want to change the location of these resource bundles, then you must customize the text tag to retrieve the resource bundles from their new location.

If you add text to a JSP page, then take care to update the corresponding locale JSP pages or properties files, either with amended text for an existing tag id or by adding a new id.

Notes

Note the following:

- The length of the translated text can be significantly different: this can affect the layout of a Web page.
- Drop-down lists and Javascript functions can have text that if translated will affect the logic of the Sterling Multi-Channel Selling Solution. See "Javascript" on page 417 and "JSP Pages" on page 417.
- Local regulations can effect the display of information (such as the display of prices in both Euros and a local currency).
- Take particular care if the logical flow of pages must change to reflect local practice (such as the display of an export notice or tax information).

Debugging

You can use the debugJSPResourceBundle element of the **Internationalization.xml** configuration file to help you identify missing strings. Set this element to "true" and if a string is missing from the referenced resource bundle, then an error message is displayed on the browser page. You should set this value to "false" in your production systems.

Failover Behavior

This section describes what happens when resources (JSP pages or properties) are not defined for the user's current presentation locale. Note that the failover behaviors are slightly different for JSP pages and resource bundles:

- JSP pages can fail over from a specific locale to the default country for the language locale and then to the system default locale. For example: fr_CA to fr_FR to en_US.
- Resource bundles fail over according to the Java specification:
*_fr_CA.properties to *_fr.properties to *.properties.

Two properties in the **Internationalization.xml** configuration file are used to manage failover behavior for JSP pages:

- useCountryDefaulting: if this is set to true, then default to the country specified in the appropriate language element if no resource is present for the presentation locale.
- useGeneralDefaulting: if this is set to true, then default to the system locale if no resource is available for the presentation locale.

Resource Bundles

You do not need to translate all text strings into each locale. If a text string is not present for a given id in a resource bundle properties file, then the standard Java failover process is followed. For example, if the

ChannelCartDisplayDataResource_fr_CA.properties does not define the cmgt_channelMgmt/channelCartDisplay/ChannelCartDisplayData_7 string, then, if it exists the **ChannelCartDisplayDataResource_fr.properties** file is consulted. If this file does not exist or does not have an entry for this id, then the **ChannelCartDisplayDataResource.properties** file is consulted.

JSP Pages

Not all the JSP pages need be available for all supported locales. For example, you may choose to use en_US pages for all but a small number of pages viewed by

en_CA users. This section describes what happens when a message type is processed:

The request is forwarded to the JSP page specified by the JSPMapping element of the message type in the appropriate **MessageTypes.xml**.

1. If the JSP page does exist for the current locale, then this page is used to generate the Web page.
2. If the JSP page does not exist for the current locale, then the failover mechanism identifies the default locale for the language of the current locale. This is declared as the defaultCountry element for the language in the **Internationalization.xml** configuration file.
3. If a JSP page exists in the language-default locale, then this page is used to generate the Web page. For example, the following element in **Internationalization.xml** specifies that US is the default country for the en language locales, and so if a JSP page is not present for the en_CA locale, then the corresponding en_US JSP page is used.

```
<en visible="false">
  <defaultCountry ...>US</defaultCountry>
</en>
```

4. If there does not exist a JSP page for the default country, then the failover mechanism identifies the default system locale. This is declared as the value of the defaultSystemLocale element of the **Internationalization.xml** file. If a JSP page exists in the system default locale, then this page is used to generate the Web page.
5. Finally, if no JSP page exists in the default system locale, then an exception is thrown and an error page is displayed.

Methods to Retrieve Locales

Most of the time you should be able to make use of the Sterling Multi-Channel Selling Solution's built-in support to display appropriate content to users for their locales. If you do need to manually access locales, then the `ComergentI18N` class can be used. It provides the following methods:

- `getDefaultLocale()`: returns the system default locale.
- `getComergentLocale(boolean b)`: if `b` is true, then returns the user's presentation locale; otherwise returns the user's session locale.
- `findPresentationLocale(Locale sessionLocale)`: used to calculate what presentation locale should be used for a given session locale.

Using Properties Files in Code

You can make use of properties files in your Java code too. For example, to retrieve the locale-specific String that corresponds to the String keyString defined in the **com.comergent.reference.jsp.AdvisorBodyResources.properties** file, use:

```
String temp_NamedPopertiesFile =  
    "com.comergent.reference.jsp.AdvisorBodyResources.properties";  
ResourceBundle temp_ResourceBundle =  
    com.comergent.dcm.util.ComergentI18N.-  
        getBundle(temp_NamedPopertiesFile);  
String temp_LocalisedString =  
    temp_ResourceBundle.getString("keyString");
```

This uses the current locale of the user as stored in the user's session. If you want to force the use of a different locale, then use:

```
Locale specific_Locale = new Locale("fr", "CA");  
String temp_NamedPopertiesFile =  
    "com.comergent.reference.jsp.AdvisorBodyResources.properties";  
ResourceBundle temp_ResourceBundle =  
    com.comergent.dcm.util.ComergentI18N.-  
        getBundle(temp_NamedPopertiesFile, specific_Locale);  
String temp_LocalisedString =  
    temp_ResourceBundle.getString("keyString");
```

Data for Internationalization

If you expect enterprise users and end-users to be entering data in multi-byte characters, then you need to consider the length of data fields and their corresponding database table columns. In our experience, data entered into the Sterling Multi-Channel Selling Solution that uses multi-byte characters can be up to three times as long in the database as the strings used for the en_US locale. Consequently, you should review the length of fields in which you expect data to be entered that will take multi-byte characters: notably name and description fields.

If you want to change the length of fields, then bear in mind that you have to both change them in the **DsDataElements.xml** configuration file and make the corresponding change to the SQL script that is used to generate the Knowledgebase schema.

For example, to make the Description field of the Product data object suitably long for multi-byte characters, you must do the following:

1. Identify the data field that is used to hold product descriptions. Because the Product data object is a localizable data object (Localized="y"), this is the

Description field of the ProductLocale data object. Its corresponding database table and column is CMGT_PRODUCT_LOCALE.DESCRPTION.

```
<DataField Name="Description" ExternalFieldName="DESCRIPTION"
  Mandatory="n" Writable="y"/>
```

2. Suppose that you want to allow for descriptions that are up to 240 characters long:

```
<DataElement Name="Description" DataType="STRING"
  Description="Description" MaxLength="240" />
```

3. Change the corresponding SQL statement that creates the CMGT_PRODUCT_LOCALE table so that the DESCRIPTION column is set to VARCHAR2(720):

```
DESCRIPTION VARCHAR2(720) DEFAULT 'Not available',
```

4. Run the appropriate SDK targets (merge and createDB) to make the changes to your implementation of the Sterling Multi-Channel Selling Solution.

Note that in this example, the Description data field is widely used by many different data objects and so changing its definition in the **DsDataElements.xml** configuration file can have unanticipated side-effects elsewhere. An alternative approach is to create a new data field called ProductDescription and to use this in the ProductLocale data object. Thus, you could put in the **ProductLocale.xml** file:

```
<DataField Name="ProductDescription"
  ExternalFieldName="DESCRIPTION" Mandatory="n" Writable="y"/>
```

Then put in the **DsDataElements.xml** configuration file:

```
<DataElement Name="ProductDescription" DataType="STRING"
  Description="This is the product description field"
  MaxLength="240" />
```

Note also that if you provide a Javascript methods to validate that users have entered valid data in fields, then when you check for length of fields, check for the length specified in the corresponding DataElement.

Email Templates

If your system supports languages other than English and your installation of the Sterling Multi-Channel Selling Solution uses email templates to generate messages that are sent to users, then bear in mind that these need to be translated.

Release 6.4 has introduced the ability to use JSP pages to generate email messages: see CHAPTER 10, "Sending Email from the Sterling Multi-Channel Selling

Solution" for more information. This provides support for internationalizing email messages by using the existing framework for internationalizing JSP pages.

For legacy applications, you can use the default templates provided by the Sterling Multi-Channel Selling Solution: these are located in *debs_home/Sterling/WEB-INF/templates/*.

HTML Pages

Static HTML pages must be translated where appropriate. If you want to provide support for multiple languages simultaneously, then you should take care to produce pages for each language. Provided that you maintain the location of these pages consistently across your locale directory structure, then the relative references to these pages will always resolve correctly to the correct HTML page.

For example, the following JSP fragment will dynamically generated URLs to point to a locale-specific **Example.html** page:

```
<A HREF="<cmgt:link app="catalog">
/static/Example.html
</cmgt:link>">
resourceBundle.getString("ExamplePage")
</A>
```

In this example, a resource bundle is used to determine the displayed text for the link.

Images

In general, use images that do not have embedded text. Doing so, ensures that you can use the same images in more than one locale: thereby reducing the cost of localization and maintenance.

However, where necessary you should provide localized versions of images. Just as for static HTML pages, you can use relative URLs to ensure that locale-specific images are retrieved from the correct location relative to the JSP page.

In particular, remember that all of the buttons in externally facing pages are image buttons with text. Where necessary, you should create localized versions of each button. The image source URLs can then be generated as follows:

```
<IMG ALT="Locale-specific alternate text goes here"
SRC="../images/button.gif"></A>
```

Javascript

Take care to localize displayed text used in your Javascript. For example, alert dialog boxes should reflect the user's locale in the displayed text.

- Some Javascript files are included in the Web pages along these lines:

```
<script language='JavaScript' src='../js/genericUtil.js'>
</script>
```

You must maintain these Javascript files for each locale so that the browser can correctly include these in the generated Web pages.

- When Javascript is defined within a JSP page or an included JSP fragment, then display text must be wrapped in the text tag. For example:

```
alert("<cmgt:text id=\"*\">Product ID is missing.</cmgt:text>");
```

When these tags are processed as part of the SDK tool, then the id attribute is changed into a unique ID, and the ID and body of the tag are added to the resource bundle for the JSP page or fragment.

JSP Pages

In general, all localization for labels, explanatory text, populated lists, and locale-specific formatting for dates and currencies should be reflected in the JSP pages created for a locale.

A useful organizing principle is to create a HashMap of all localized strings on page, and then to refer to this throughout the rest of the page. For example:

```
HashMap localized = new HashMap();
localized.put("TaskListHeader",
    cmgtText("cmgt_taskMgr/TaskWorkspaceData_3","Task List:"));
localized.put("QuickSearchTitle",
    cmgtText("cmgt_taskMgr/TaskWorkspaceData_4","Search for Tasks"));
localized.put("TaskID",
    cmgtText("cmgt_taskMgr/TaskWorkspaceData_5","ID"));
localized.put("TaskName",
    cmgtText("cmgt_taskMgr/TaskWorkspaceData_6","Name"));
localized.put("Status",
    cmgtText("cmgt_taskMgr/TaskWorkspaceData_7","Status"));
localized.put("Priority",
    cmgtText("cmgt_taskMgr/TaskWorkspaceData_8","Priority"));
localized.put("CreateDate",
    cmgtText("cmgt_taskMgr/TaskWorkspaceData_9","Create Date"));
request.setAttribute("localized", localized);
```

You can reference these strings using the scripting capabilities along these lines:

```
<cic:span css="banner" value="${localized['TaskListHeader']}"/>
```

This technique has the advantages that JSP pages are more readable, that you can re-use localized strings easily, and it is closer to the JSF model.

See "Calendar Widget" on page 418 for information about localizing this UI component. For example, populate a drop-down list of days of the week for a French-language locale as follows:

```
<SELECT Name="DayOfWeek">
<OPTION VALUE=0>dimanche</OPTION>
<OPTION VALUE=1>lundi</OPTION>
<OPTION VALUE=2>mardi</OPTION>
<OPTION VALUE=3>mercredi</OPTION>
<OPTION VALUE=4>jeudi</OPTION>
<OPTION VALUE=5>juin</OPTION>
<OPTION VALUE=6>vendredi</OPTION>
<OPTION VALUE=7>samedi</OPTION>
</SELECT>
```

You can also use resource bundles to manage locale-specific display information. For example, this would be an alternate method for populating a drop-down list of days of the week in the Gregorian calendar:

```
<SELECT Name="DayOfWeek">
<OPTION VALUE=0><%= resourceBundle.getString("Sunday") %></OPTION>
<OPTION VALUE=1><%= resourceBundle.getString("Monday") %></OPTION>
<OPTION VALUE=2><%= resourceBundle.getString("Tuesday") %></OPTION>
<OPTION VALUE=3><%= resourceBundle.getString("Wednesday") %></OPTION>
<OPTION VALUE=4><%= resourceBundle.getString("Thursday") %></OPTION>
<OPTION VALUE=5><%= resourceBundle.getString("Friday") %></OPTION>
<OPTION VALUE=6><%= resourceBundle.getString("Saturday") %></OPTION>
</SELECT>
```

Calendar Widget

When you use the calendar widget (see "Using the Calendar Widget" on page 227) in a JSP page, then it must be localized. You do this by customizing the **I18N.js** Javascript file to be found in the locale directory

***debs_home*/Sterling//la/CO/js/**. For example, to support the **de_DE** locale, create a file called ***debs_home*/Sterling/de/DE/js/I18N.js** that reads:

```
// DEFAULT LOCALE (English)
var MONTH_NAMES = new Array('Januar', 'Februar', 'Maerz', 'April',
'Mai', 'Juni', 'Juli', 'August', 'September', 'Oktober', 'November',
'Dezember', 'Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug',
'Sep', 'Okt', 'Nov', 'Dez');
var DAYOFWEEK_HEADER_NAMES = new
```

```
Array("So", "Mo", "Di", "Mi", "Do", "Fr", "Sa");  
var WEEK_START_DAY = 0;  
// Create CalendarPopup object  
var popupCal = new CalendarPopup();
```

Style Sheets

The Sterling Multi-Channel Selling Solution uses cascading style sheets to set the formatting of HTML elements. If you use fonts for a specific locale, then make sure that you create a style sheet that specifies these fonts. For each locale save this locale-specific style sheet in the same relative location.

In JSP pages, you can include a locale-specific cascading style sheet, say **customer.css**, with the following:

```
<LINK rel="stylesheet" href="../../../css/customer.css" type="text/css">
```

System Properties

In general, the configuration files only present data to administrators. To localize these files, you should not need to change the names or values of elements, but you should consider changing the Help text for elements. Note that there is only one set of configuration files for each Sterling Multi-Channel Selling Solution, and so you should use the language of the default system locale for these files.

Resource Bundles and Formats

PropertyResourceBundles and Properties Files

The Sterling Multi-Channel Selling Solution makes extensive use of properties files to manage locale-specific data. These have replaced the use of ResourceBundle Java classes. See "Supporting Locales" on page 408 for more details.

ResourceBundles

A useful mechanism to manage localization is the use of Java ResourceBundles.

Note:	The use of resource bundles classes in the Sterling Multi-Channel Selling Solution is deprecated. You should use properties files as described in "Supporting Locales" on page 408.
--------------	---

These are classes that manage locale-specific information. ResourceBundle classes used in the Sterling Multi-Channel Selling Solution all extend the

ListResourceBundle. These define the mapping between name Strings and the value Strings returned when the *getString (String nameString)* method is invoked.

By following the naming convention for ResourceBundles, you can create locale-specific ResourceBundles for all of the locales you need to support. For example, you can create the following ResourceBundles to be used in a new application called Inventory:

- InventoryResourceBundle
- InventoryResourceBundle_fr
- InventoryResourceBundle_fr_FR
- InventoryResourceBundle_fr_CA

The following scriptlet can retrieve the appropriate resource bundle for use in a JSP page:

```
<%  
    String baseName = "AdvisorResourceBundle";  
    ResourceBundle resourceBundle =  
        AdvisorResourceBundle.getBundle (baseName,  
            session.getLocale());  
%>
```

NumberFormats and DateFormats

You can use the NumberFormat class to help you display numbers in locale-specific ways. You create an instance of a NumberFormat by passing in the locale to the constructor.

For example, the following scriptlet displays the total number of shopping carts in a format appropriate to the locale:

```
<%  
    NumberFormat numberFormat =  
        NumberFormat.getInstance(session.getLocale());  
    int number = request.getParameter("ShoppingCartsTotal");  
%>  
<P>The number of active shopping carts in use is:  
<%= numberFormat.format(number) %>  
</P>
```

Similarly, use the DateFormat class to help you display date in locale-specific ways. You create an instance of a DateFormat by passing in the locale to the constructor.

For example, the following scriptlet displays the current date in a format appropriate to the locale:


```
<%  
    DateFormat dateFormat =  
        DateFormat.getInstance(session.getLocale());  
    Date todaysDate = new Date();  
%>  
<P>It is now:  
<%= dateFormat.format(todaysDate) %>  
</P>
```

This chapter describes the framework for exception handling in the Sterling Multi-Channel Selling Solution. You should follow this to ensure consistency across your implementation of the system, and to help other people working on the implementation.

Comergent Exception Hierarchy

Exception Root

ComergentException

All compile time exception classes declared in the production software should inherit ultimately from `com.comergent.dcm.util.ComergentException` class. This class extends `java.lang.Exception` to provide chaining and an independent user message.

ICCEException

`ICCEException` provides a convenience subclass of `ComergentException`. Rather than create a set of exception classes for a subsystem, you can use the `ICCEException` class uniformly across a subsystem.

ComergentRuntimeException

All runtime exception classes should inherit from `com.comergent.dcm.util.ComergentRuntimeException`, which extends `java.lang.RuntimeException` to provide identical functionality.

Subsystem Grouping

A subsystem of the Sterling Multi-Channel Selling Solution is defined to be either a distinct and separable application, or an application level or a system level service. A subsystem is a logical organization. It may span multiple packages in the Java package hierarchy or comprise part of a package.

Each logical subsystem is expected to declare its own exception root class. This root inherits from `ComergentException` and is the parent class of all compile time exceptions within the subsystem. The subsystem is defined to be either a distinct and separable application, or an application level or a system level service. A subsystem is a logical organization. It may span multiple packages in the Java package hierarchy or comprise part of a package, although you should organize your package structure in conformance with the logical subsystem organization.

For example, suppose there is a subsystem named `Foo`. There should be a class `FooException`:

```
public class FooException extends ComergentException
{
    public FooException(String msg)
    {
        super(msg);
    }

    public FooException(String msg, Exception ex)
    {
        super(msg, ex);
    }
}
```

Suppose `Foo` responds to a bad initialization state by throwing `BadInitializationException` for all subsequent requests. This exception would inherit from `FooException`:

```
public class BadInitializationException extends FooException
{
    ...
}
```

Subsystem by Subsystem Exception Policy

Each subsystem should implement a consistent policy for differentiating exceptions. Either it should subclass the subsystem exception class for each distinct exception type (this is the standard Java style policy) or the subsystem's root exception should inherit from `ICCEException`, and should set the status parameter to differentiate exceptions (this is the `ICCEException` policy).

For example, if subsystem Foo chooses a Java style exception policy, then `FooException` should extend `ComergentException`. If subsystem Bar chooses an `ICCEException` policy, then `FooException` should extend `ICCEException` (which in turn extends `ComergentException`).

```
public class BarException extends ICCEException
{
    ...
}
```

Exception Chaining

Each subsystem is expected to throw only exceptions from its own subsystem to its caller. If an underlying service throws an exception that a given subsystem cannot handle, then it is expected to catch that exception and rethrow an exception that is meaningful in its own context. The new exception should use a chaining constructor to include the original exception, so that when the exception is finally handled and logged, the original exception is not lost.

For example, suppose subsystem Foo attempts to open a property file and could incur an IO exception. If it implements a Java style exception policy, then it may declare a new exception class, `FooPropertyFileException`, which extends `FooException`. The IO Exception catch statement would throw a new `FooPropertyFileException` with a constructor that passes a message and the original I/O exception.

```
try
{
    ...
    Properties props = new Properties();
    props.load(input);
    ...
}
catch (IOException ex)
{
    // chain the io exception
    throw new FooPropertyFileException("Loading file" + filename, ex);
}
```

Throwing, Catching, and Logging Exceptions

When to Throw Exceptions

Exceptions should be thrown when the contract between a method and its caller cannot be fulfilled. This is the usage identified in the Java Language Specification. Unfortunately, this provides only a little guidance since the contract can be defined so broadly that exceptions are unnecessary, or defined so narrowly that exceptions occur frequently. As a general rule of thumb, exception usage should balance the following two opposing goals:

Exceptions should not be the norm.

- They involve the creation of an additional object, so, if only from a performance standpoint, it is problematic if exceptions can occur frequently.
- Mixing data and control should be avoided. The alternative to throwing an exception is often returning a null value from a method. This means that the return value encapsulates two meanings (success or failure and whatever the data means when present). It is good programming practice to avoid this usage where possible.

If null is a reasonable value for the stated purpose of a method, or if a method is expected to fail often in the normal course of operation, then it is reasonable to return null to indicate failure; otherwise it is better to throw an exception.

Throwing Runtime or Compile Time Exceptions

According to the Java Language Specification, runtime exceptions should be thrown when the caller has provided erroneous input (in essence, breached the method contract) and it would be burdensome to declare a compile time exception. For example, if a caller invokes a method passing a negative value for a parameter that is an array index, it is reasonable to throw a runtime exception. Otherwise throw compile time exceptions.

Catch Clauses and Throws Declarations

Catch clauses and throws declarations should avoid being overly general. If the called method throws, for example, `FileNotFoundException`, then the caller should catch `FileNotFoundException`, not `Exception` or `Throwable`. The reason for this is that if the underlying code changes to throw a new exception, or ceases throwing

this exception, then it is desirable that the change produces a compilation error to signal to the programmer to consider the new situation.

There are exceptions to this rule where practicality should prevail. If the variety of exceptions that can be thrown is large and our response is the same in all cases, then there is no reason to catch each individually.

Logging Exceptions

If a method catches an exception and handles it (that is, does not rethrow it) then it should log it. Presumably this method knows the significance of the exception, and knows whether to log it with an error severity or some other lower level severity. Empty catch statements should be regarded with great suspicion.

Never do this:

```
catch (SomeException ex)
{

}
```

Do this:

```
catch (SomeException ex)
{
    Global.logVerbose(ex);
}
```

Or this:

```
catch (SomeException ex)
{
    ex.printStackTrace(Global.debugStream);
}
```

When exceptions from underlying subsystems or third party packages are caught and chained to a new exception, there is no need to log the exception. Some process further up the hierarchy will eventually catch and handle it, and the process will know how to log it.

Displaying Exceptions

In general, users of the Sterling Multi-Channel Selling Solution should not see exceptions: the appropriate subsystem must handle the exception gracefully by responding appropriately to the error condition.

The Sterling Multi-Channel Selling Solution error pages place the exception stack trace between HTML comments. By viewing the source of the displayed Web page, you can read the stack trace.

If an exception stack trace is passed to the JSP page, then bear in mind that the buffer limits of the JSP page may prevent a full exception message from being passed to the Web page. If a long exception stack trace is passed to a JSP page, then you can display it by modifying the buffer of the JSP page. Use the buffer tag as follows:

```
<%@ page buffer=1024kb %>
```

Once the error condition has been diagnosed and fixed, then you should remove this tag because it impacts performance.

This chapter describes the creation of cron jobs that run as part of the Sterling Multi-Channel Selling Solution.

Overview

Certain tasks within an implementation of the Sterling Multi-Channel Selling Solution are not initiated in response to user input. For example, the hourly synchronization of order data with an external system or the weekly import of catalog data from a third party is best done without user intervention. These jobs can be scheduled to run at suitable intervals using the Job Scheduler functionality provided by the Sterling Multi-Channel Selling Solution.

Cron jobs can be defined either as system cron jobs or as application cron jobs.

- A system cron job is run by the Sterling Multi-Channel Selling Solution and is not associated with any user. A system cron job calls Sterling Multi-Channel Selling Solution classes directly. A system cron job must be run by a class that extends the `SystemCron` abstract class. Typically, system cron jobs perform tasks such as cleaning the cache.
- Each application cron job is run as a user: the username and password of the user are provided when the cron job is created using the Job Scheduler user interface. Application cron jobs work by posting XML messages to the Sterling Multi-Channel Selling Solution which are then processed by

the system. An application cron job must be run by a class that extends the `ApplicationCron` abstract class. Typically, you use application cron jobs to perform necessary administrative tasks that touch user or product data such as order synchronization.

Attention: Note that a system cron job should not attempt <i>restore()</i> and <i>persist()</i> operations itself. There is no user associated with the cron job class and so the access checking built in to the data access methods will throw an exception.

CronManager and CronScheduler

The definition and creation of cron jobs is managed by the `CronManager` class. Cron job configuration information is represented in memory by the `CronConfigBean` data bean. The definition of cron jobs are maintained in the Knowledgebase.

The scheduling and running of cron jobs is managed by the `CronScheduler` class. This singleton class is instantiated at server startup time.

CronJob Interface

Each cron job is a Java class that implements the `CronJob` interface:

```
public interface CronJob extends java.lang Runnable
{
    /**
     * Specify the Cron Configuration bean object.
     *
     * @param config Cron configuration bean object.
     */
    public void setCronConfiguration(CronConfigBean config);

    /**
     * Return the Cron Configuration bean object.
     *
     * @return CronConfigBean object.
     */
    public CronConfigBean getCronConfiguration();

    /**
     * Initialization function. This function is called
     * immediately after the object is created.
     *
     * @return true if initialization success, false otherwise.
     */
    public boolean init();
}
```

```
/**
 * Return the current scheduled time.
 *
 * @return Current schedule time in Calendar object.
 */
public Calendar getSchedule();

/**
 * Reschedule the cron to reflect the changes made to the
 * cronconfiguration parameter. This function is called by the
 * Cron Manager whenever cron configuration changes.
 */
public void reschedule();

/**
 * Whether the job needs to be run again. This function is
 * useful if there is some problem in the current run and you
 * want to retry at specified time.
 *
 * @return true if the job is allowed to retry if the job
 * did not run successfully
 * on the last time of execution
 */
public boolean retry();

/**
 * Determines whether to stop this cron job from running.
 *
 * @return true if the job has been slated to not run again
 */
public boolean stopRun();

/**
 * Compute next cron run time: this is usually based on the cron
 * run interval.
 */
public void computeNextSchedule();

/**
 * Check to determine if the cron job is
 * in a good state to run before triggering the thread to run.
 *
 * @return true or false. True means ready to run.
 */
public boolean isOKtoRun();

/**
 * Is called when the thread starts.
```

```
    *
    * @return false if the job needs to be stopped. Return true to
    * continue running.
    */
    public boolean service();

    /**
    * Checks whether the next run time is later than the end run date.
    *
    * @return true if next run time greater than end run time
    */
    public boolean isExpired();
}
```

To create a new cron job, follow these steps:

1. Write a CronJob class: you must extend either the SystemCron or ApplicationCron classes. Both these classes are abstract and they both extend the abstract class AbstractCronJob.

The only method that you need to implement is *service()*. This is the method that processes the inbound post initiated by the CronScheduler.

- If the job is passed parameters that are defined using the Job Scheduler user interface, then you can retrieve the parameters using the *getParameter(String s)* and *getParameters()* methods of the AbstractCronJob class. These methods behave identically to the corresponding methods of the HttpServletRequest class.
 - If you want the result of the job to be saved to the database, then the *service()* method must call the *setExecutionOutcome(String s)* method.
 - You can specify that the cron job should be re-executed at a later time by calling the *setRetry(Calendar c)* method of the AbstractCronJob class. Use the Calendar parameter to specify when the job should be re-executed.
2. Using the Job Scheduler user interface provided as part of the system administration application, define the cron job by specifying the cron job class, the schedule to determine when it is run, and any parameters to be passed to the cron job at runtime. If the cron job is to run as an application cron job, then you must also provide the username and password of the user. See the *Administration Guide* for further information.

Parameters are passed in to the cron job using the same syntax as for HTTP request parameters. For example: Name1=Value1&Name2=Value2.

This chapter describes how you can customize the process of exporting products using the export functionality in Sterling Product Manager.

Overview

The Sterling Multi-Channel Selling Solution provides the ability to export some or all of the product catalog as a dXML file. This is useful when you want to synchronize your catalog with another catalog installation, or to import your catalog in another catalog application.

When a user initiates a request to export products, the `ProdMgrRunDataSyndController` class invokes the `ExportManager` class to manage the export of the catalog data. The `ExportManager` class invokes the `CatalogItemsExportHandler` class to export the fields of the data object. This class uses the **DataSyndicationConfig.xml** configuration file to determine how to export each of the fields of data objects. By adding elements to this file, you can provide additional instructions on how fields are to be exported.

DataSyndicationConfig.xml Configuration File

The purpose of the **DataSyndicationConfig.xml** configuration file is to specify exactly how data objects should be exported and imported. Its basic structure is to

specify how entities should be exported and imported, and it does this by specifying what Java class should be invoked to process the entity. For example, this is an sample element:

```
<Entity
  Class="com.comergent.api.appservices.productService.IBizProduct">
  <EntityHandler Type="export"
Class="com.comergent.apps.productMgr.dataSynd.ProductExportHandler">
    <Element Name="ProductUpdate" Action="FullUpdateOrInsert"/>
  </EntityHandler>
</Entity>
```

It specifies that when instances of the class `IBizProduct` are exported, the `ProductExportHandler` class should be used to export instances of the `IBizProduct`.

- The `Name` attribute determines the element name of the output from the handler. In this case, the output will begin with “<ProductUpdate>” and end with “</ProductUpdate>”.
- The `Type` attribute specifies whether the handler should be used for export, import, or both (`Type="all"`).

The `ProductExportHandler` exports all of the fields in the `IBizProduct` data object, and so you need only add a custom field handler if you have added a new field to the `IBizProduct` that you want to export.

Field elements can be added to the `Entity` element to specify an additional handler for fields that are not exported by the main entity handler class. For example, suppose that `Weight` is declared as an extrinsic field of the `BizProduct` data object. Then the following element is used to specify that the `ExtrinsicFieldHandler` is used to handle the `Weight` field of the `BizProduct` data object.

```
<Field Mandatory="no" Localized="no"
  ElementName="Weight" BeanProperty="Weight">
  <FieldHandler Type="all"
    Class="com.comergent.apps.productMgr.dataSynd.-
      ExtrinsicFieldHandler"/>
</Field>
```

The `ElementName` attribute is used to specify the element name of the output. The `BeanProperty` attribute specifies the name of the data field which is to be exported. Thus for a particular `IBizProduct` object, the output for this field will look like this:

```
<Extrnisic Name="Weight">n</Extrinsic>
```

Here the value *n* is the value returned from a call to `getWeight()` on the `IBizProduct` object.

Handlers

ExtrinsicFieldHandler Class

The dXML DTD for catalog export supports the definition of Extrinsic elements. Typically, these are used to manage data fields that are added to data objects as part of the customization process. Release 6.3 provides a generic field handler, the `ExtrinsicFieldHandler` class, that can be used to handle fields that are added to a data object by exporting them as Extrinsic elements. This class provides a lightweight means to export custom data fields without creating your own field handler.

To use the `ExtrinsicFieldHandler` class, simply add the appropriate `Field` element to the `Entity` element. For example:

```
<Field Mandatory="no" Localized="no" ElementName="Weight"
  BeanProperty="Weight">
  <FieldHandler Type="all"
    Class="com.comergent.apps.productMgr.dataSynd.-
      ExtrinsicFieldHandler"
  </Field>
```

`ElementName` is the element name when the field is exported, and its value is determined by the call to the `getWeight()` method of the data bean. Make sure that the data object does have a data field called `Weight` (and hence a corresponding method `getWeight()`).

Writing a Custom Handler

Custom handlers for fields must implement the `FieldExportHandler` interface and its `getField()` method. For example, the following is an example implementation of `getField()` in class called `PartNumberHandler`:

```
public String getField(EntityField field, Object bean)
{
    IBizProductBean bizProductBean = (IBizProductBean) bean;
    String productID = bizProductBean.getProductID();
    PartNumberListBean pnlBean = new PartNumberListBean();
    pnlBean.restore(productID);
    StringBuffer temp_StringBuffer = new StringBuffer();
    temp_StringBuffer.append("<PartNumbers>");
    for (int i = 0; i < pnlBean.getCount(); i++)
    {
        PartNumberBean pnBean = pnlBean.getPartNumberBean(i);
        temp_StringBuffer.append("<PartNumber>" +
            pnBean.getPartNumber() + "</PartNumber>");
    }
}
```

```
temp_StringBuffer.append("</PartNumbers>");  
return temp_StringBuffer.toString();  
}
```

Having written and compiled the custom handler, you must add it to the **DataSyndicationConfig.xml** file:

```
<Field Mandatory="no" Localized="no" ElementName="PartNumbers"  
  BeanProperty="none">  
  <FieldHandler Type="export"  
    Class="com.comergent.apps.productMgr.PartNumberHandler" />  
</Field>
```

The `ElementName` attribute determines the name of the element used to enclose the output from the handler. When the product catalog is exported, then the XML file will include text along these lines:

```
<PartNumbers>  
<PartNumber>PN-10056</PartNumber>  
<PartNumber>PN-10058</PartNumber>  
</PartNumbers>
```

This chapter describes how you can customize the Sterling Configurator. It covers:

- "Custom Controls" on page 437
- "Control Handlers" on page 439
- "Function Handlers" on page 439

Custom Controls

When option classes and option items are displayed to end-users you can control how they are displayed by specifying which control should be used to display their content. Out of the box, the Sterling Multi-Channel Selling Solution supports the following choice of controls:

- Radio button
- Checkbox
- Drop down list
- Listbox
- Multiple Selection Listbox
- Display All Children

- User Entered Values
- Tabular Display

When modelers are creating the model for configurations, they determine which control is used for an option class by selecting it from the Control drop-down list on the Display tab of the option class detail page.

Each control corresponds to a JSP page and this correspondence is defined in the **control.properties** configuration file in *debs_home/Sterling/WEB-INF/properties/*. For example:

```
RADIO.name=Radio Button
RADIO.jsp=controls/radio.jsp
RADIO.behavior=single
```

This specifies that for the radio button control, the **radio.jsp** JSP page should be used to render the option class to end-users. The behavior property determines how the Sterling Configurator will handle picks in this control:

- entry: used for user-entered controls.
- expand: expand all the children of this control if the control itself is picked.
- multiple: allow one or more option items to be picked from this control.
- single: if an option item is picked, then remove any previous picks from this option class.

Customizing an Existing Control

You can customize an existing control by modifying the corresponding JSP page or by creating a new JSP page and modifying the **control.properties** file to point to the new JSP page.

Creating a New Control

You can define a new control by adding the name of the control to the list of controls declared. For example, to add a **MATRIX_CUSTOM** control:

```
controls=MATRIX_CUSTOM,RADIO,CHECKBOX,COMBOBOX,LISTBOX,
MULTISELLISTBOX,ALLPICKED,UEV,DISPLAY
```

Then declare the properties of the new control as follows:

```
MATRIX_CUSTOM.name=Matrix Custom Control
MATRIX_CUSTOM.jsp=controls/MatrixCustom.jsp
MATRIX_CUSTOM.behavior=single
```

Customizing and modifying controls does not require a server restart because this file is read each time a Visual Modeler or Sterling Configurator session is launched.

Control Handlers

Control handlers are a mechanism for invoking Java code to handle special actions that may be difficult to handle in a JSP page alone. For example, the `DynamicInstantiationControlHandler` class dynamically adds child option items to a model when it is retrieved from the cache and removes them (the dynamic items) when the model is returned to the model cache.

The control handlers must implement the `IControlHandler` interface (typically they extend the `StandardControlHandler` class). They implement (or override the implementation of a base class) the methods:

- `public void initializeControl(IModelBean model, IOptionClassBean optionClass)`
- `public void resetControl(IModelBean model, IOptionClassBean optionClass)`
- `public void handleComergentRequest(IModelBean model, ComergentRequest request, Map picks)`

The `initializeControl()` method is called just after the model is fetched from the cache. The `resetControl()` method is called just before the model is returned to the cache. The `handleComergentRequest()` method is called to construct the picks map used to apply picks.

Function Handlers

This section describes how to implement function handler classes in the Sterling Multi-Channel Selling Solution. These Java classes are used to define custom functions that can be invoked by the Sterling Configurator rule engine.

Overview

The Sterling Multi-Channel Selling Solution provides a rule engine that is used to evaluate rules defined for each implementation. The rule engine can invoke custom functions to handle situations where existing functions are incapable of solving a configuration specification.

The function handlers are declared in the **functionHandlers.properties** configuration file. This file declares a name for each function handler and the

directory in which the function handler class is. For example, here is a sample fragment from the file:

```
WEB-INF/classes/com/comergent/apps/configurator/functionHan-
dlers=CheckLookupFunctionHandler,ChildSum,CountFunctionHandler,IsSele
ctedHandler,LengthFunctionHandler,ListFunctionHandler,LookupFunctionH
andler,MaxFunctionHandler,MinFunctionHandler,ParentFunctionHandler,Pr
opValHandler,SumFunctionHandler,ValueFunctionHandler,WebServiceLookup
CheckLookupFunctionHandler=com.comergent.apps.configurator.function-
Handlers.CheckLookupFunctionHandler
```

Writing a Custom Function Handler

Follow these steps to create a function handler class:

1. Create a new Java class with the `com.comergent.apps.configurator.functionHandlers` package declaration. The class declaration must declare that the class extends the `AbstractRuleFunctionHandler` class.
2. Implement the following methods:
 - `public String getFuncName():` return the function name, such as “sum” or “max”. This is case-sensitive: you can use different function handlers to manage “sum” and “SUM”.
 - `public int getType():` return the type of value returned by the function. This should be a constant defined in the `com.comergent.api.appsservices.rulesEngine.Value` class. The `AbstractRuleFunctionHandler` class method returns `Value.STRING`, and so you must override this method if the function returns any other type.
 - `public Value handle(State state, String prop):` return the `Value` calculated for the function.
 - `public boolean isPublicHandler():` return true if the function handler may be used by any client application; otherwise return false. The `AbstractRuleFunctionHandler` class method returns true, and so you must only overwrite this method if the function handler is private.

Function Handler Example

The following example of function handler class implements the “max” function:

```
package com.comergent.apps.configurator.functionHandlers;

import com.comergent.api.appsservices.rulesEngine.*;
import com.comergent.apps.configurator.model.*;
import java.util.*;
```

```
/**
 * Handles the logics of <i>Max</i> function for a <code>Property
 * </ code>, given the <code>State</code>.
 *
 * @author Comergerent Technologies
 * @version 1.0
 *
 * @see Value
 * @see Property
 * @see State
 */

public class MaxFunctionHandler extends AbstractRuleFunctionHandler
{
    /**
     * Name of the function, this particular handler serves.
     */
    private static final String m_name = "max"/*I18NOK:23c81106*/;

    /**
     * Return the name of the function this handler supports
     * @return the function name
     */
    public String getFuncName()
    {
        return m_name;
    }

    /**
     * Return the value type this particular function handler
     * returns.
     * Returns <code>Value.NUMERIC</code>, as the type.
     * @return the numeric value.
     * @see Value the container for different types.
     */
    public int getType()
    {
        return IValue.NUMERIC;
    }

    /**
     * Return the <i>Maximum</i> value assigned to the property,
     * given <code>State</code>.
     * <code>Value</code> is returned as a result.
     * Extracts all the matching properties given the name, and
     * sorts them and extracts
     * the maximum value.
     *
     * Returns <i>null</i>, if the requested <code>Property</code>

```

```
* does not exist.
*
* @param state the property pool
* @param prop the property to evaluate the function.
* @return Value the <code>Property</code>, that contains
* the maximum value.
*/
public IValue handle(IState state, String prop)
{
    //double max = 0;
    double [] propList = state.getMatchingNumericProperties(prop);
    if (propList != null)
    {
        Arrays.sort(propList);
        return new ConfigValue(new Double(
            propList[propList.length -1]), IValue.NUMERIC);
    }
    return null;
}
}}
```

In this example, the *handle()* method calculates the maximum value of a property by sorting the list of property values and then returns the last value in the sorted array. The function returns a number of type `IValue.NUMERIC`. It is a public function handler.

Web Service Function Handlers

You can write function handlers that invoke Web services. These classes should extend the `com.comergent.api.apps.configurator.IConfigWebService` interface. They make use of the **webServiceLookup.properties** configuration file: this file specifies how the handler should invoke the Web service. These fragment functions reference Web services:

- `checkwslookup`: this determines whether the correct properties exist to call the Web service
- `wslookup`: invokes the Web service

An example function handler is provided by `com.comergent.reference.apps.configurator.SampleWebService`.

This chapter describes how you can use filters. It covers:

- "Filters Overview" on page 443
- "Available Filters" on page 444

Filters Overview

A filter is an object that performs filtering tasks on either the request to a resource (a servlet or static content), or on the response from a resource, or both. They are defined as part of the J2EE 2.3 specification.

Filters perform filtering in the *doFilter()* method. Every Filter has access to a FilterConfig object from which it can obtain its initialization parameters, a reference to the ServletContext which it can use, for example, to load resources needed for filtering tasks.

Filters are configured in the deployment descriptor of a Web application. Examples of typical filters include:

- Authentication Filters
- Logging and Auditing Filters
- Image conversion Filters

- Data compression Filters
- Encryption Filters
- Tokenizing Filters
- Filters that trigger resource access events
- XSLT filters
- Mime-type Chain Filters

Available Filters

This section describes some of the filters provided in the Sterling Multi-Channel Selling Solution. All the filters are part of the `com.comergent.dcm.core.filters` package. It covers:

- "DosFilter" on page 444
- "WSDLFilter" on page 445

DosFilter

This filter can be used as the basis for filters to protect the Web application from denial-of-service attacks.

To use this filter, write a class that extends the `com.comergent.dcm.core.filters.DosFilter` class, and in it, override the *isRequestDenied()* method to implement the logic you want to use to identify and block denial-of-service attacks.

Then, modify the **web.xml** configuration file, to declare your implementing class as a filter like this:

```
<filter>
  <filter-name>DosFilter</filter-name>
  <filter-class>
    com.comergent.dcm.messaging.CustomDosFilter
  </filter-class>
</filter>
```

and

```
<filter-mapping>
  <filter-name>DosFilter</filter-name>
  <url-pattern>/*</url-pattern>
</filter-mapping>
```


WSDLFilter

The WSDLFilter class is used to transform the Web service WSDLs if they are accessed using the standard URLs: `http://server:port/s/dXML/5.0/OrderInterface.wsdl`, and so on.

Managing and Displaying Constrained Fields

This chapter covers the topic of managing constrained data fields which can take only one of a number of values: we called these data fields *constrained*. Examples include partner levels (such as “Gold”, “Silver”, and so on), partner territories (such as “North-west”, “Benelux”, and so on), and skill levels (such as “Expert”, “Certified”, and so on). You can manage these data fields in different ways in the Sterling Multi-Channel Selling Solution. Your choice depends on how they are to be maintained and used.

Options

You have the following options to specify a constrained data field and the permitted data fields:

- Maintain the data field as a set of values in a database table. Assign values to business objects either by a cross-reference table or by references to a key for each value in the business object table.
- Maintain the values as a constraint element in the XML schema (declared in the **DsConstraints.xml** file). Specify the constraint as an attribute of the DataElement associated with the data field.

- Embed the permitted values as values of a <SELECT> form element in an HTML template.

We recommend that you maintain the permitted values for a field as a database table unless:

- the values are not going to be modified at run-time
- the data field may take only one value in each business object
- the values can be displayed in a natural order that is determined by the values themselves such as their alphabetical order.

We recommend against using the third option for the following reasons:

- It becomes a maintenance problem to update templates or application code if you want to modify the list of permitted data values.
- It represents a security problem because users may modify the HTML to pass back forbidden values. You have to either add Javascript (that a user can remove) to validate the selection or validate the returned value as part of the business logic.

Criteria

Your selection depends on the functionality of the data field. Ask yourself these questions to determine how the data field is being used:

1. Can you assign a business object only one or multiple values of a constrained data field?

If your answer is that multiple values may be assigned to the same business object (example: a partner that may operate in multiple territories), then you *must* use a database table for the field values and a cross-reference table to assign values to the business object.

2. Can you enter new values of the data field when creating a new business object or do you need to verify that a value entered for the data field is a valid member of the constraint set?

If only single values are permitted, and your answer to Question 2 is that new values are permitted, then you *must* use a database table to hold the field values. However, you do not have to use a cross-reference table to assign data field values to business objects. You cannot dynamically add values to the list of permitted values of a constraint element through the current Sterling Multi-Channel Selling Solution interface.

3. Are the possible values that the constrained data field may take maintained dynamically or are they read once at start-up?

If your answer to Question 1 was single value, and your answer to Question 2 is that new values are not permitted, but you do require dynamic updating, then you *must* use a database table. If the constrained values are unchanged once the Sterling Multi-Channel Selling Solution has started, then you can use a constraint element.

4. Do you need to sort the constrained data values for display? If yes, then is it sorted by value (say, alphabetically) or by some defined order that cannot be inferred from the values themselves?

Finally, if the data field values need to be sorted by an order not inherent in the values themselves, then this ordering information must be maintained in a database table. However, if you only order the values using some self-evident ordering (such as alphabetical), then you can use the constraint element choice.

Overview

Users can create and maintain the following types of lists of items:

- **Wish List:** A wish list is a list of items that a user wants someone else to purchase for him. A wish list can be shared among users.
- **Template:** A template is a list of items that a user purchases frequently. Templates cannot be shared among users. Users can purchase items only from their own templates and to do so they must first copy the items to their cart and then place the order.
- **Registry:** A registry is a list of items that a user may want someone else to purchase for him for special occasions, such as the birth of a baby or a wedding. Registries can be of two types: Baby Registry and Wedding Registry. Users can have more than one registry of each type but not more than one active registry of each type at any given time. Registries can be shared among users.

Architecture

The implementation of wish lists, templates, and registries remain close to that of a cart in order to leverage the functionality of schema from tables CMGT_OIL and

CMGT_OIL_LI and the OrderInquiryList and OrderInquiryListItem data objects.

Tables

The CMGT_OIL table includes the following OIL_TYPES:

TABLE 18.

OIL_TYPE Code	Oil Type
2	Order
3	Quote
11	Proposal
40	Sales Contract
100	Cart
130	Wish List
140	Template
150	Registry

The template, wish list, and registry each have a header (EXTN) table:

- CMGT_WISHLIST_EXTN
- CMGT_TEMPLATE_EXTN
- CMGT_REGISTRY_EXTN

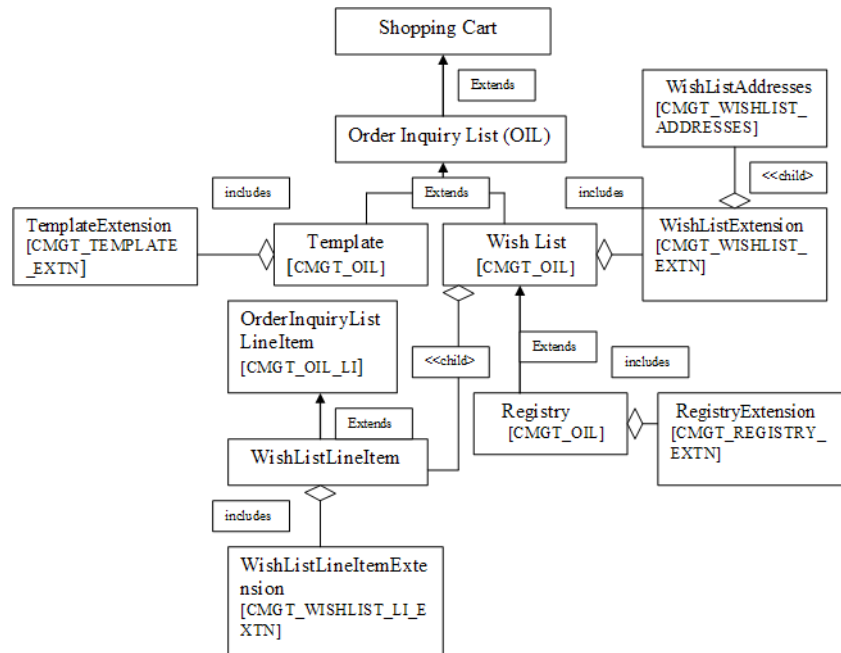
See Chapter 8 "Knowledgebase Schema" in the *Sterling Multi-Channel Selling Solution Reference Guide* for details about these tables.

Data Objects

The Wishlist and Template data objects both extend the OrderInquiryList object. The Registry object extends the Wishlist object.

Furthermore, the WishList data object includes WishListItem as a child object, which extends OrderInquiryListItem [CMGT_OIL_LI] and includes WishListItemExtension [CMGT_WISHLIST_LI_EXTN].

The following diagram demonstrates the relationship between the different objects. (Note: The diagram may deviate from strict UML guidelines.)



Default/Active Lists

A user may have multiple wish lists, templates, and registries at one time, but only one of these will be the default or active list of its type. The default list is applicable to wish lists/registries; the active list is applicable to templates.

The **CMGT_USER_X_CARTDEFAULTS** table indicates the default/active list for each list type.

The **DEFAULT_TYPE** column can include the following values:

TABLE 19.

DEFAULT_TYPE Code	Description
10	Cart
20	Template
30	Wish List

TABLE 19.

DEFAULT_TYPE Code	Description
40	Baby Registry
50	Wedding Registry

Registry Addresses

A wish list or registry may have several address associated with it. These list addresses are included in the CMGT_WISHLIST_ADDRESSES table and the WishListAddress data object.

The following address types are available:

TABLE 20.

Address_Type Code	Description
10	Shipping address
10	Future shipping address
20	Registrant's billing address
30	Co-Registrant's billing address

Note that both the current and future shipping address have a value of 10. Whether an address is current or future will be determined by the date in the EFFECTIVE_DATE column.

Lokup Types

The following lookup types related to wish list/registry/template features are included in the lookup table:

- BabyGender
- EventType
- InquiryListType
- Priority
- RegistryType
- RelativeReminderDate
- ReminderFrequency
- ShareCode
- TemplateSort
- WishListSort

See “Lookup Codes” in the *Sterling Multi-Channel Selling Solution Reference Guide* for details.

APIs

The following packages provide APIs related to the wish list/registry/template features:

- com.comergent.api.apps.registry
- com.comergent.api.apps.templatecards
- com.comergent.api.apps.wishlist

See the Javadoc for further details.

This chapter covers concepts that have been covered in earlier versions of this document, but which have now become deprecated. The material here is intended to be used to support legacy applications and should not be used to create new functionality.

DsElement Tree

This section describes methods to retrieve metadata about databeans. It also describes the DsElement tree used to store data in the data object and business object classes. It is covered here only to support legacy applications: all new applications that use the data bean classes should not need to be concerned with it.

Data objects are created as objects of data bean classes. Each data object holds its content as a tree of components called DsElements (see "DsElements" on

page 458). Their content is retrieved from external systems using the XML schema, and the recipes and data sources defined in the XML schema.

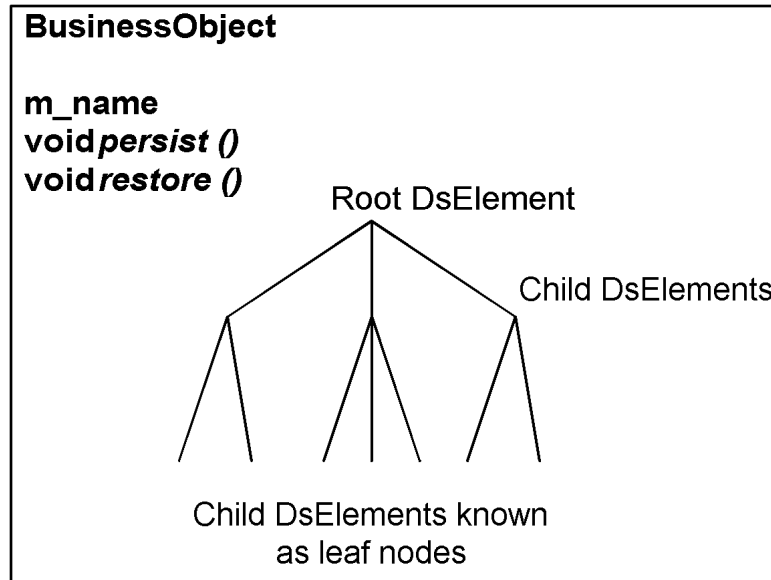


FIGURE 13. Business Object

When the DataManager creates a data bean or business object, it uses the XML schema to determine the structure of its DsElement tree. The DsElement tree is the Java representation of the structure of the business object. The schema also determines the data types that may be inserted at leaf nodes and whether constraints are placed on the values of the node. You access the DsElement tree by invoking the business object method *getRootElement()*.

DsElements

Each DsElement contains data and a DataMap that defines how its data corresponds to its data source. A DsElement may be the child of another DsElement (its *parent*). A DsElement tree is a collection of DsElements, all but one of which have another element in the tree as its parent. By definition, the DsElement with a null parent is the *root* DsElement.

DsElement**m_children**
m_parent
m_dataMap
m_value**DsElementcloneDsElement ()**
DsElementaddChild (DataMap dataMap)
voiddelete ()
StringgetName ()
intgetType ()
DsElementgetParent ()
DsElementgetByName (String s)
voiddeleteChild (DsElement child)**FIGURE 14. DsElement Methods**

The DsElement class provides various additional methods to support navigating through a DsElement tree, notably *children()* that returns an Iterator of the child DsElements of a given DsElement. As well as *getRootElement()*, the business object class also provides the *getElementByName()* method to access directly a named DsElement in its tree.

All DsElements that have the same name, for example *child_name*, and which are children of a DsElement must have a parent whose name is *<child_name>List*. The XML schema identifies such elements by defining their ordinality to be "n" as opposed to "1". A DsElement maintains its children in a Vector called *m_children*.

The DsElement has these important methods:

- *addChild()*: adds a new DsElement defined by the DataMap of this DsElement.
- *cloneDsElement()*: returns a copy of this DsElement.
- *delete()*: sets the DsElemState to DsElemState.DELETED.

- *deleteChild()*: removes a child from the vector `m_children` by specifying it as a `DsElement`.
- *getName()*: returns the name of the element as defined by its `MetaData`.
- *getParent()*: returns the parent of this `DsElement`.
- *getType()*: returns the type of the element as defined by its `DataMap`.

DsElement MetaData

It is sometimes useful to retrieve information about a data field and its underlying `DsElement`. You can use the `IData` interface method *getMetaData(String elementName)* to this. It returns an object that implements the `IMetaData` interface. This interface supports the following methods:

- `public int getDataType()`: returns values as defined in `DsDataTypes`
- `public long getMaxLength()`: returns maximum length in bytes
- `public long getMaxCharLength(Locale locale)`: returns maximum length in characters
- `public Object getMinValue()`: returns the minimum allowed value (or null if there is no minimum)
- `public Object getMaxValue()`: returns the maximum allowed value (or null if there is no maximum)
- `public int getCountAllowedValues()`
- `public ListIterator getAllowValueIterator()`
- `public Object getDefaultValue()`

Note that each generated `DataBean` class implements the `IData` interface, and so these methods are available to all the generated data beans.

BusinessObject Methods

Use of business objects is deprecated. This section provides information about some business object methods for reference only.

You can create each business object as an instance of the Java class `BusinessObject`. The `BusinessObject` class is a sub-class of the `CacheableAdapter` class. This super

class provides a means of caching information during the lifetime of the business object. Each business object has a *type*: it defines the structure of the data it holds.

Note:	In general, where possible, you should avoid the use of business object classes: they are primarily a legacy of Release 4.0 and earlier releases.
--------------	---

In Release 6.3.1 and earlier releases, you could retrieve a business object representation of a business entity from the corresponding data bean by calling the data bean's *getBizobj()* method. This method is not supported in later releases.

In Release 6.3.1 and earlier releases, you could create a data bean from a business object by using the *DataBean* constructor method that takes the business object as its one argument. This constructor throws an *InvalidBizobjException* if the business object type does not match the data bean. This method is not supported in later releases.

***restore()* Method**

This section provides description of the main forms of the *BusinessObject restore()* method.

```
public void restore(BusinessObject queryObj, int maxResults,  
                  boolean accessCheck)
```

The principal form of the *restore()* method. Use the *queryObj* parameter to specify query to be executed by the restore operation. The *maxResults* parameter determines the maximum number of objects returned. Use the *accessCheck* parameter to specify whether to check that the current user has the correct entitlements to perform this operation. Once the access check has been performed, then the *restore(BusinessObject queryObj, int maxResults)* is called.

```
public void restore(BusinessObject queryObj, int maxResults)
```

This method calls the *restore()* method *restore(this, queryObj, maxResults, false)* of the underlying data object.

```
public void restore(BusinessObject queryObj)
```

This is equivalent to calling *restore(queryObj, 0)*.

```
public void restore()
```

This form of the method calls the *restore(null, 0)* method.

***persist()* Method**

This section provides descriptions of the main forms of the *BusinessObject persist()* method.

```
public void persist(boolean synch, boolean commit,
```

```
boolean accessCheck)
```

The boolean parameters determine respectively whether the persist operation is synchronized, should be committed to the underlying data source, and whether an access check should be performed prior to persisting.

```
public void persist(boolean synch, boolean commit)
```

This form of the method is equivalent to *persist(synch, commit, false)* for business objects whose Version attribute is 4.0 or less. It is equivalent to *persist(synch, commit, true)* for business objects whose Version attribute is 5.0 or more.

```
public void persist()
```

This form of the method calls *persist(false, true)*.

The BusinessObject class also has these methods:

- *delete()*: empties the business object by deleting its DsElement tree.
- *getRootElement()*: returns the root DsElement of the DsElement tree.
- *getType()*: returns the name of the root element of the DsElement tree. This is the type of the business object.
- *setRootElement()*: sets the root element of this business object.

Business Logic Classes

The base business logic class is BLC class. It implements the ApplicationObject interface and in particular defines *prolog()* and *service()* methods.

Note:	The use of BLCs is deprecated. This section is provided to support legacy applications that still use BLCs.
--------------	---

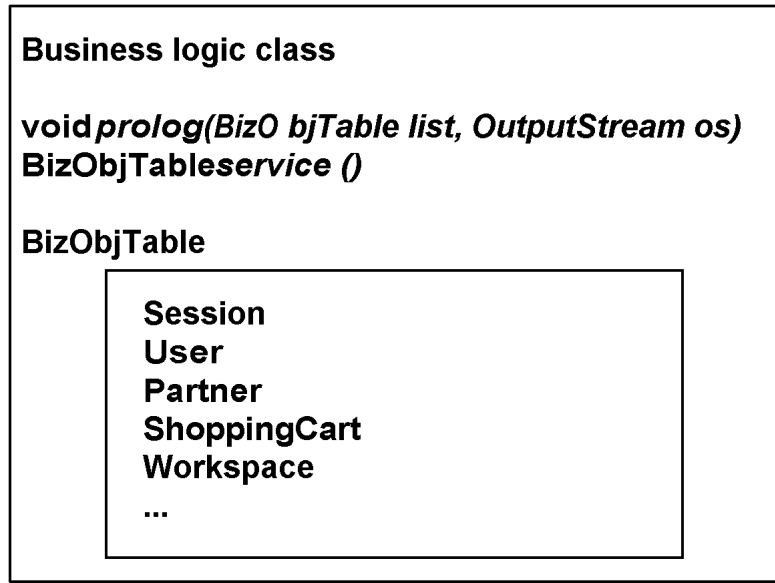


FIGURE 15. Business Logic Class

The BLC class implements *prolog()* by populating its business object table, and by recovering the session object. The business object table class, BizObjTable, is passed a vector of business objects when the controller creates the business logic class.

The BLC base class implements *service()* by returning null. Its subclasses overwrite *service()* to process the business objects.

In turn, each BLC class that extends BLC defines exactly how the *prolog()* and *service()* methods process the business object table it receives. Typically, the *prolog()* method of a BLC processes the business object table to look for an business object of the correct business object type, and then it creates a business object of that type. The *service()* method of the BLC then calls the *persist()* or *restore()* method of the corresponding business object class to either save the data to the database or to retrieve data from an external system.

Business Logic Class Example

As an example, consider the code for the BLC PriceAvailabilityGet. The purpose of this BLC is to process a request for price availability.

The *prolog()* method receives a set of business objects in the form of a BizObjTable and parses it to find a business object of type PriceAvailability. It places the business object in the m_PriceAvailability variable.

When the *service()* method of the BLC is called, it invokes the *restore()* method of the PriceAvailability object that retrieves the price availability information. A new BizObjTable is created and returned.

```
/**
 * Copyright (c) 1999 Comergent Technologies Inc. All Rights Reserved.
 */
package com.comergent.dcms.blc;

import java.util.*;
import java.io.*;

import com.comergent.dcm.caf.blc.*;
import com.comergent.dcm.core.*;
import com.comergent.dcm.util.ICCException;
import com.comergent.dcm.dataservices.*

/**
 * A class which performs the pricing and availability on the given
 * shopping cart
 *
 * @author Comergent Technologies
 * @version 1.0
 * @see BLC
 */
public class PriceAvailabilityGet extends BLC
{
    /**
    Initialize the object with the business objects in the given vector.
    @param v the array of business objects
    @param os the output stream to which the html is written
    */
    public void prolog(BizObjTable vector, OutputStream os)
        throws ICCException
    {
        super.prolog(vector, os);
        // find the price availability BizObj in the vector
        for (Enumeration enum = vector.elements();
            enum.hasMoreElements();)
        {
            Object object = enum.nextElement();
            if (object instanceof BusinessObject)
            {
                BusinessObject bizObj = (BusinessObject) object;
                if (bizObj.getType().equals(
```

```
        BusinessObjectTypes.PRICE_AVAILABILITY))
        m_priceAvailability = bizObj;

    else
    {
        throw new ICCEException(
            this.getClass().getName() + ":" +
            BLCResourceBundle.getDefaultBLCResourceBundle().getString(
                BLCErrors.NON_BUSINESS_OBJECT));
    }
}

if (m_priceAvailability == null)
{
    throw new ICCEException(
        this.getClass().getName() + ":" +
        BLCResourceBundle.getDefaultBLCResourceBundle().getString(
            BLCErrors.NO_PRICE_AVAILABILITY_OBJECT));
}
}

/**
 * Perform the requested operation
 *
 * @return a vector containing the populated PricingAvailability
 * business object.
 */
public BizObjTable service() throws ICCEException
{
    /**
    On the enterprise server, a restore on pa object will send a message
    to the partner server and retrieve the data. On the partner server, a
    restore on pa object will obtain the actual numbers from a local data
    source.
    */
    m_priceAvailability.restore();
    BizObjTable vector = new BizObjTableDefault();
    vector.put(m_priceAvailability);
    return vector;
}
protected BusinessObject m_priceAvailability;
}
```

Global Class

The Global class is used for two main purposes: it provides access to the log stream and it provides values for system-wide parameters.

Logging

You can output logging information to the log stream by invoking one of the static *logLevel* methods: *logVerbose()*, *logInfo()*, *logWarning()*, and *logError()*. These methods take the logging message as a String parameter.

You can specify a package flag as part of the method call:

```
Global.logVerbose("<Package name>", "<Log message>");
```

For example:

```
Global.logVerbose("SQLTRACE", "Starting query " + queryString);
```

By setting the names of particular package flags in the **packageFlags** element of **Comergent.xml**, you can manage which logging messages are generated as the Sterling Multi-Channel Selling Solution runs. This is particularly useful if you want to customize some code, and track its behavior as you debug the customization because you can isolate the logging messages from other logging messages using a custom flag.

You can use any string you like as a package flag: for example:

```
Global.logVerbose("MyProject", "This is my customization");
```

The following flags are pre-defined in the Sterling Multi-Channel Selling Solution:

TABLE 21. Current Package Flags

Flag	Usage
AUTH	Authentication (user, login, logout, and so on)
CONFIGURATOR	Configurator
CONVERTER	Converter (converting XML message into internal representation)
CORE	Core packages (wrapper, dispatch servlet, and so on)
CRON	Cron jobs
DATASERVICES	Data layer
ENTL	Entitlement
Events	Event bus
GlobalCache	Global caching
LOADDATOBJ	Schema loader
MC	Not used
MESSAGING	XML messaging layer (include RosettaNet)

TABLE 21. Current Package Flags (Continued)

Flag	Usage
METADATA	Data layer
ModelTabXMLHandler	Visual Modeler
MSG	Messaging controller
MSGT	MessageTypes
PunchOut	PunchOut
RearrangeLookUpValues	Data layer
RULES	Configurator rules
showHeader	Show incoming HTTP headers
showRequest	Show incoming HTTP request (URL with query strings)
SQLTRACE	Show SQL statements
UTIL	Not used
VM	Visual Modeler
XMLU	XML

Note that if you are using the SDK, then you can specify which flags should be logged using the `DEBUG_FLAGS` property set in your properties files.

Parameters

When the Sterling Multi-Channel Selling Solution starts up, it reads in system configuration parameters from the **Comergent.xml** configuration file and its ancillary configuration files. These parameters are accessed by the Sterling Multi-Channel Selling Solution applications using the static methods *Global.getString()* and *Global.getBoolean()*. These methods take a String as an argument: the String must uniquely identify the name of a configuration parameter. For example, the call *Global.getString("General.ServerName")* returns the value of the `ServerName` child element of the `General` element defined in the **Comergent.xml** file.

If you need to retrieve a number from one of the configuration file parameters, then you retrieve it as a String using the *Global.getString()* method and then you must use one of the standard methods to convert it to a number. You must capture and handle any exceptions that can be thrown. For example:

```
int requestTimeout = -1;
String strRequestTimeout =
    Global.getString("C3_Commerce_Manager.General.-
        partnerRequestTimeout");
if (strRequestTimeout != null)
```

```
{
    try
    {
        requestTimeout = (new Integer(strRequestTimeout)).intValue();
    }
    catch (NumberFormatException nfe)
    {
        requestTimeout = -1;
    }
}
```

If the top-level element of the parameter points to an ancillary file, then the second and subsequent components of the parameter name point to elements in the ancillary file. For example, consider the call:

```
Global.getString("DataServices.General.schemaRepository")
```

This accesses the child element `schemaRepository` of the `General` element in the configuration file whose location is specified by the `DataServices` element of **Comergent.xml**.

Both `getString()` and `getBoolean()` can take an optional second parameter that specifies a default value to be returned if the parameter does not exist in the configuration files.

Managing Access to Data Objects Using ACL's

Use of access control lists (ACL's) is deprecated.

If an access policy is defined for a data object in the **AccessPolicy.xml** configuration file, then it determines access to the data object. If no access policy is defined, then the legacy ACL mechanism is used.

Data objects to which access must be managed must extend the `C3PrimaryRW` data object. You should make sure that whenever such a data object is created, that it has an appropriate ACL attached to it. Subsequent accesses to the data object should always be checked to verify that the user is authorized to act on the data object as intended.

Make sure that all of your data objects have gone through this ACL exercise. Make sure your application has implemented the security controls. Double-check that ACLs are set properly in reference data and minimal data sets.

The following access privileges are defined for each data object that extends the `C3PrimaryRW` data object:

- delete
- insert
- read
- write

If you want to control access to a data object using ACLs, then an access control list (ACL) must be attached to it when it is created. When an application retrieves a data object, you can query the data object to determine what access the current user has to it.

Data Bean Methods

- *boolean isReadable()*: returns true if the specified user has read access to the specified business object; otherwise, returns false. This method is declared in the IRdC3PrimaryRW interface.
- *boolean isWriteable()*: returns true if the specified user has write access to the specified business object; otherwise, returns false. This method is declared in the IAccC3PrimaryRW interface.
- *boolean isInsertable()*: returns true if the specified user has insert access to the specified business object; otherwise, returns false. This method is declared in the IAccC3PrimaryRW interface.
- *boolean isDeletable()*: returns true if the specified user has delete access to the specified business object; otherwise, returns false. This method is declared in the IAccC3PrimaryRW interface.
- *boolean CheckPermission(int i)*: is a general method to check for permissions on data objects that extend the C3PrimaryRW data object. The int parameter is typically one of AccessControl.READ_PERMIT, AccessControl.WRITE_PERMIT, and so on, but it may be any permission bit mask.

Attaching an ACL to a Data Object

In general, you simply need to perform the following steps:

1. Create the data bean. Typically, if you are creating a new data bean, then this step comprises using the ObjectManager to retrieve a new data bean and then setting its fields using the standard accessor methods.
2. Retrieve or create the ACL.

- You can retrieve ACLs by name using the `AccessControlFactory` class `getAccessControlListByName(String s)` method. Note that uniqueness of ACL name is not enforced by the system, so take care to enforce uniqueness as you create ACLs.
 - You can create an ACL by first calling `AccessControlFactory` class `getEditableAccessControlList()` method: this returns an instance of the `EditableAccessControlList` class. You can then use its accessor methods to set the users, groups, fixed, and roles fields as required. Then call its `save()` method to persist the new ACL to the Knowledgebase.
3. Attach the ACL to the data bean. Use the `attachACL()` method of the `com.comergent.api.dcm.entitlement.AccessControlAPI` class: it takes as parameters the data bean, the ACL, the user key of the current user, and a boolean to indicate whether a `persist()` call should be made to save the data object. A check is performed to verify that the current user is entitled to attach the ACL to the data object.

Examples

Here is a fragment of code indicating how an existing, named ACL is attached to a data object.

```
Long userKey = CommerceUtils.getCurrentUserKey();
IOrderInquiryList temp_IOrderInquiryList = (IOrderInquiryList)
    OMWrapper.getObject("com.comergent.api.apps.orderMgmt.oil.
        IOrderInquiryList");
...
various fields are set
...
AccessControlList temp_AccessControlList =
AccessControlFactory.getAccessControlListByName("Inquiry List ACL");
AccessControlAPI.attachACL(temp_AccessControlList,
    temp_IOrderInquiryList, userKey, true);
```

Here is a fragment of code indicating how a newly-created ACL is attached to a data object.

```
Long userKey = CommerceUtils.getCurrentUserKey();
IOrderInquiryList temp_IOrderInquiryList = (IOrderInquiryList)
    OMWrapper.getObject("com.comergent.api.apps.orderMgmt.oil.
        IOrderInquiryList");
...
various fields are set
...
EditableAccessControlList temp_EditableAccessControlList =
AccessControlFactory.getEditableAccessControlList();
temp_EditableAccessControlList.setName("New Inquiry List ACL");
```

```
//Prevent owner from deleting object
temp_EditableAccessControlList.addUser(AccessControl.DELET_PERMIT,
    false, userKey);
//Allow users in owner's group or owner's root group to modify object
temp_EditableAccessControlList.addFixed(AccessControl.WRITE_PERMIT,
    true, AccessControl.GROUP);
temp_EditableAccessControlList.addFixed(AccessControl.WRITE_PERMIT,
    true, AccessControl.ROOT);
//Allow world to read object
temp_EditableAccessControlList.addFixed(AccessControl.READ_PERMIT,
    true, AccessControl.WORLD);
AccessControlAPI.attachACL(temp_EditableAccessControlList,
    temp_IOrderInquiryList, userKey, true);
```

Creating an ACL

The example in the previous section describes how to create an ACL using the available `EditableAccessControlList` methods. You can also use the `ACLBuilder` class to create an ACL or to modify an ACL attached to a data object. It provides helper methods designed to make the process of creating a new ACL as simple as possible.

Note that if you do create custom ACLs for individual data objects, then this can be a performance drag on the system. You should consider carefully whether an appropriate general ACL can be attached to all data objects of a particular type.

Use the `AccessControlFactory` class `getAccessBuilder()` method to create an `AccessBuilder`. By default, an object of the `AccessControlAdapter` class is returned. Its `grantAccess()` and `denyAccess()` methods act directly on the ACL attached to a data object. Consequently, if you use these methods to modify an ACL attached to a data object, then bear in mind that the underlying ACL may also be attached to other data objects and changes will affect changes to these data objects too.

Troubleshooting ACL Issues

This section describes a simple use case to illustrate how to identify and fix problems that you can encounter when modifying or creating ACLs.

In this example, a user tries to log in, but clicking the **Login** button causes an error page to be displayed with the following message: “User akite does not have READ permission on: Partner”. This means that when the access check is being performed on the partner object, the ACL attached to the partner does not grant read access to akite.

1. Find additional information about the user “akite” in the `CMGT_USER_CONTACTS` table. For example:

```
SELECT * FROM CMGT_USER_CONTACTS WHERE USER_NAME = 'akite'
```

Results:

- the USER_KEY is 57901
 - the ROLES are Partner.User, Partner.DirectCommerce
 - the user's group key is 4
 - the user's partner key is 4
2. Find information about the user's partner in the CMGT_PARTNERS table. For example:

```
SELECT * FROM CMGT_PARTNERS WHERE PARTNER_KEY = 4
```

Results:

- this partner object has ACL key 3 (ACL key is the ACCESS_KEY field in the CMGT_PARTNERS table)
 - this partner's owner is identified by USER_KEY 0
3. Find the relevant lines in the CMGT_ACCESSLIST table.

The error message tells us that either akite is not being granted read access by virtue of their user key or group membership or that the roles that are assigned to akite do not have access to the partner object. From Step 2, we know that the partner object has an ACL key = 3. So, we need to find all rows in the CMGT_ACCESSLIST table with ACL_KEY = 3 and PERMISSION = 0 (read) to investigate if at least one of these rows allows Partner.User or Partner.DirectCommerce read access. Use the SQL query:

```
SELECT USER_KEY, GROUP_KEY, FIXED, ROLES FROM CMGT_ACCESSLIST  
WHERE ACL_KEY = 3 and Permission = 0
```

Inspect the USER_KEY, GROUP_KEY, and FIXED columns: typically, you should look to see that akite's user key is listed in one of the USER_KEY columns; or that akite's group is in one of the GROUP_KEY columns; or that the akite is included by virtue of one of the FIXED values. Since the owner of the partner object has user key 0, you can identify the group to which this user belongs as follows:

```
SELECT GROUP_KEY FROM CMGT_GROUP_USERS WHERE USER_KEY = 0
```

If there are roles defined, then make sure that either Partner.User or Partner.DirectCommerce are listed as roles in any row which grant read access to akite.

4. In this particular example, you may find that the fix is to update CMGT_ACCESSLIST to append the Partner.User role to one of the rows whose ACL_KEY = 3.

How do I control ACL checking?

In certain special cases it may be useful to disable ACL checking. This can improve the performance of large requests, but it should only be done if access permissions have already been verified.

The DataContext class provides the following methods to control ACL checking on Data Bean restore and persist requests:

- void disableAccessCheck(): Turns off ACL checking for persist and restore operations.
- void enableAccessCheck(): Turns on ACL checking for persist and restore operations.
- boolean doAccessCheck(): Returns the current setting for ACL checking.

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